

Before the
UNITED STATES COPYRIGHT ROYALTY JUDGES
The Library of Congress

In the Matter of

DETERMINATION OF RATES AND
TERMS FOR MAKING AND
DISTRIBUTING PHONORECORDS
(PHONORECORDS III)

Docket No. 16-CRB-0003-PR (2018-2022)

**EXPERT REPORT OF ANINDYA GHOSE (REPLACEMENT COPY)AG
NOVEMBER 1, 2016**

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I. ASSIGNMENT

1. My name is Anindya Ghose. I have been asked by counsel for Apple Inc. (“Apple”) to provide an economic opinion relevant to the proceeding before the Copyright Royalty Board (“CRB”) to determine reasonable mechanical royalty rates and terms for making and distributing phonorecords for the period beginning January 1, 2018 and ending on December 31, 2022 (“Phonorecords III”). In particular, I have been asked to conduct an economic analysis of the digital music industry and mechanical royalty rates for permanent downloads, ringtones, interactive streams, and locker services, considering the following four objectives set forth in Section 801(b) of the Copyright Law:

- To maximize the availability of creative works to the public.
- To afford the copyright owner a fair return for his or her creative work and the copyright user a fair income under existing conditions.
- To reflect the relative roles of the copyright owner and the copyright user in the product made available to the public with respect to relative creative contribution, technological contribution, capital investment, cost, risk, and contribution to the opening of new markets for creative expression and media for their communication.
- To minimize any disruptive impact on the structure of the industries involved and on generally prevailing industry practices.

II. SUMMARY OF OPINIONS

2. Apple’s proposed royalty rates for permanent downloads and ringtones, which are the same as the current royalty rates for those products, are consistent with the Copyright Royalty Board’s finding in the prior Section 115 proceeding in 2008. The Copyright Royalty Board’s analysis from that proceeding applies even today and there is no compelling reason to change the royalty rates for permanent downloads and ringtones.

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Apple’s proposal for permanent downloads and ringtones is, therefore, reasonable.

3. A per-play rate structure, such as that proposed by Apple, is the appropriate structure for interactive streaming. It appropriately balances the rewards to songwriters and streaming services. As long as the per-play-rate is appropriately determined and streams are measured in a way that is indicative of demand, then the royalty payments to songwriters are likely to be

commensurate with the demand for their songs. In other words, under Apple's proposal, if the demand for their songs increases (i.e., if their songs are streamed more), their income also will increase. Under a per-play rate structure, streaming services also would be rewarded appropriately for the risks they take, as the payment to songwriters would not be tied to the financial outcomes of the streaming services' decisions about how to develop their platforms. If those decisions lead to greater revenues then the services would retain the additional financial rewards, thus incentivizing them to take such risks.

4. A per-play rate structure for interactive streaming is consistent with the rate structures for other prominent forms of music distribution (e.g., permanent downloads have a per-unit rate structure). As interactive streaming becomes a major means of music consumption and replaces other forms of music delivery, it is reasonable to bring the royalty rate structure in line with these other forms.

5. A per-play rate structure for interactive streaming is simple, transparent, and easy to administer. Under a per-play rate structure, the royalty payments to songwriters would correspond directly to the number of times a song is streamed (where a stream is appropriately measured). Songwriters would know exactly how royalty payments are calculated, and there would be no variability in the per-stream rates that songwriters receive from different services or from the same service over time.

6. Apple's proposed royalty rate for interactive streaming also is reasonable in that it is consistent with benchmarks from the music industry and academic research.

7. Apple's proposed royalty rates for paid locker services and purchased content locker services are similarly simple, transparent, and appropriate.

III. QUALIFICATIONS

8. I am a Professor of Information, Operations and Management Sciences (IOMS) and a Professor of Marketing, a Stern Faculty Scholar, and a NEC Faculty Fellow at New York University's ("NYU") Leonard Stern School of Business. At NYU, I have served in a number of capacities, including: Director of the Center for Business Analytics, Co-Director of the Center for Digital Economy Research, and Chair of the NYU-AIG Partnership on Innovation for Global Resilience. The principal focus of my research and teaching at NYU has been on analyzing the

economic consequences of the Internet on industries and markets transformed by its shared technology infrastructure. Specifically, I have worked on economic issues arising in online markets, Internet commerce, digital marketing, mobile advertising, and social media. I am the author or co-author of over 80 peer-reviewed journal and conference articles on these and other topics. I have also co-authored about 90 additional workshop articles.

9. I have served as a Senior Editor of *Information Systems Research* and an Associate Editor of *Management Science*. I have received numerous awards for excellence in research in Information Systems, Computer Science, and Marketing. In 2014, I was named by BusinessWeek as one of the “Top 40 Professors Under 40 Worldwide.” I am a winner of the CAREER award from the National Science Foundation (“NSF”) for my work on estimating the economic value of user-generated content on social media platforms on the Internet. I have received other NSF grants and grants from corporations recognizing my research.

10. I have consulted in various capacities with several leading Fortune 500 corporations on realizing business value from Information Technology (“IT”) investments, internet marketing, business analytics, mobile marketing, and digital marketing analytics. I have served in a senior advisory role to Internet start-ups. I have been interviewed by and/or my research has been profiled numerous times in the BBC, Bloomberg TV, CNBC, China Daily, The Economist, The Economic Times, Financial Times, Forbes, NBC, Xinhua, Time, LA Times, Marketplace Radio, MSNBC, National Public Radio, Newsweek, The New York Times, New York Daily, Reuters, Washington Post, The Wall Street Journal, Knowledge@Wharton, and elsewhere. I have taught courses on the role of IT in business and society, Internet commerce, social media, digital marketing, and business analytics at the undergraduate, MBA, Executive MBA, Master of Science in Business Analytics, Executive Education and Ph.D. levels worldwide. I am a frequent keynote speaker in executive gatherings and thought leader events globally.

11. I have previously provided expert testimony in the matter of *In re Facebook, Inc., IPO Securities and Derivative Litigation*, on April 30, 2015.¹ A copy of my curriculum vitae is attached as Appendix A. A list of materials I have relied upon in forming my opinions in this expert report is attached as Appendix B.

¹ *In re Facebook, Inc., IPO Securities and Derivative Litigation*, on behalf of Facebook, Inc. and the individual defendants, United States District Court, Southern District of New York, Case No. 1:12-md-02389.

12. I am being compensated at my standard billing rate of \$800 per hour. I have been assisted in this matter by staff of Cornerstone Research, who worked under my direction. I may receive compensation from Cornerstone Research based on its collected staff billings for its support of me in this matter. Neither my compensation in this matter nor my compensation from Cornerstone Research is in any way contingent or based on the content of my opinion or the outcome of this or any other matter.

IV. BRIEF BACKGROUND ON PERMANENT DOWNLOADS, RINGTONES, INTERACTIVE STREAMING, AND LOCKER SERVICES, AND ON RELATED INDUSTRY TRENDS

13. In the past two decades, the music industry has expanded both in terms of breadth and accessibility. The digital era has largely moved music consumption from physical format sales, such as vinyl records and compact discs, to digital formats, which can be played on a greater variety of devices, both portable and non-portable. Primary among these digital formats are permanent downloads, ringtones, interactive streaming, and locker services.

A. Permanent Downloads and Ringtones

14. Permanent digital downloads are digitally transmitted sound recordings that are purchased and owned by a user (although the copyright still resides with the copyright owner).² Apple's iTunes software, a major innovation in digital downloads, was launched in January 2001.³ The iTunes Music Store opened shortly thereafter, in April 2003.⁴ Today, iTunes offers music, movie, and TV show downloads, as well as a radio service.⁵ In the last decade, other

² "Digital Definitions," *Harry Fox Agency*, <https://secure.harryfox.com/public/DigitalDefinitions.jsp#20>, a true and correct copy of which is attached hereto as **APL-081**. In the Code of Federal Regulations, a "permanent digital download" is defined as a "digital phonorecord delivery that is distributed in the form of a download that may be retained and played on a permanent basis." See 37 C.F.R. § 385.2.

³ "Apple Introduces iTunes – World's Best and Easiest to Use Jukebox Software," *Apple Press Info*, January 9, 2001, <http://www.apple.com/pr/library/2001/01/09Apple-Introduces-iTunes-Worlds-Best-and-Easiest-To-Use-Jukebox-Software.html>, a true and correct copy of which is attached hereto as **APL-027**.

⁴ "Apple Launches the iTunes Music Store," *Apple Press Info*, April 28, 2003, <https://www.apple.com/pr/library/2003/04/28Apple-Launches-the-iTunes-Music-Store.html>, a true and correct copy of which is attached hereto as **APL-027**.

⁵ "iTunes. Your Music, Movies, and TV Shows Take Center Stage," *Apple*, <http://www.apple.com/itunes/>, a true and correct copy of which is attached hereto as **APL-027**.

competitors such as Amazon Music,⁶ Zune Marketplace (later renamed Xbox music, then Groove Music),⁷ Rhapsody (later renamed Napster),⁸ and Google Play Music have entered the market.⁹

15. The business models for most of these services are fairly similar: digital downloads are sold in single units or bundles, and each unit is associated with a price (typically within the \$1 range for single digital tracks).¹⁰

16. Ringtones are excerpts of sound recordings that are used as alerts on mobile communications devices.¹¹ Ringtones are provided by a variety of websites and applications (“apps”). Some of these allow users to download ringtones for free.¹² Among these, Zedge and

⁶ “Digital Music,” *Amazon*, <https://www.amazon.com/MP3-Music-Download/b?ie=UTF8&node=163856011>, a true and correct copy of which is attached hereto as **APL-026**.

⁷ Richard Devine and Jez Corden, “Everything You Need to Know about the Groove Music App on Windows 10,” *Windows Central*, July 9, 2016, <http://www.windowscentral.com/everything-you-need-know-about-groove-music-app-windows-10>, a true and correct copy of which is attached hereto as **APL-166**.

⁸ Jack Schofield, “Napster Launches World’s Biggest DRM-Free Music Store,” *The Guardian*, May 20, 2008, <https://www.theguardian.com/technology/blog/2008/may/20/napsterlaunchesworldsbiggies>, a true and correct copy of which is attached hereto as **APL-174**; “We Are Napster,” *Napster Music News*, <http://blog.napster.com/us/2016/07/14/wearenapster/>, a true and correct copy of which is attached hereto as **APL-138**.

⁹ “Music on Google Play,” *Google Play*, <https://play.google.com/store/music?hl=en>, a true and correct copy of which is attached hereto as **APL-030**. Catering to a different niche, eMusic (later acquired by TriPlay) and Amie Street (later acquired and shut down by Amazon) provided consumers with access to music from independent artists. See Ingrid Lunden, “Music Download Site eMusic Gets Acquired Again, This Time by Israeli Media Startup TriPlay,” *TechCrunch*, October 20, 2015, <https://techcrunch.com/2015/10/20/music-download-site-emu-sic-gets-acquired-again-this-time-by-israeli-media-startup-triplay/>, a true and correct copy of which is attached hereto as **APL-112**; Michael Arrington, “Amazon Acquires Amie Street, But Not In A Good Way,” *TechCrunch*, September 8, 2010, <https://techcrunch.com/2010/09/08/amazon-acquires-amie-street-but-not-in-a-good-way/>, a true and correct copy of which is attached hereto as **APL-148**.

¹⁰ Amazon offers many digital downloads in a price range of \$0.69–\$1.29. See “Deals,” *Amazon*, <https://www.amazon.com/MP3-Deals/b?node=678551011>, a true and correct copy of which is attached hereto as **APL-026**; “Digital Music: \$0.69–\$1.29,” *Amazon*, https://www.amazon.com/s/ref=st?rh=n%3A163856011%2Cp_36%3A69-129%2Cp_n_feature_browse-bin%3A625151011&qid=1477349398&bbn=163856011&sort=price-desc-rank, a true and correct copy of which is attached hereto as **APL-026**. iTunes offers digital downloads in a price range of \$0.69–\$1.29. See **APL-027**, “iTunes,” Apple, <http://www.apple.com/itunes/music/>. eMusic differs from competitors in that it offers several tiers of monthly plans in which users may purchase a certain number of MP3s. For example, a \$15.99 monthly plan includes up to 34 downloads per month and a \$1 bonus. Higher tiers offer more downloads per subscription dollar. Amie Street, though now defunct, offered a demand-based pricing system in which the price of a specific MP3 would vary with the number of times it was downloaded. See “Amplify Your Music Collection: Member Plans,” *eMusic*, <http://www.emusic.com/info/plans-pricing/>, a true and correct copy of which is attached hereto as **APL-046**; **APL-148**, Michael Arrington, “Amazon Acquires Amie Street, But Not in a Good Way,” *TechCrunch*, September 8, 2010, <https://techcrunch.com/2010/09/08/amazon-acquires-amie-street-but-not-in-a-good-way/>.

¹¹ **APL-081**, “Digital Definitions,” *Harry Fox Agency*, <https://secure.harryfox.com/public/DigitalDefinitions.jsp#20>.

¹² Ivan Cook, “Top 5 Free Ringtone Websites to Download Free Ringtones,” *iSkysoft*, October 17, 2016, <https://www.iskysoft.com/topic-iphone/free-ringtone-websites.htm>, a true and correct copy of which is attached as **APL-116**; “Browsing Featured Ringtones,” *Zedge*, <http://www.zedge.net/ringtones/>; “Free Ringtones,” a true and correct copy of which is attached hereto as **APL-061**; *MyTinyPhone*, <http://www.mytinyphone.com/ringtones/?ord=views>, a true and correct copy of which is attached hereto as **APL-**

Mobile9 are the most popular.¹³ Other business models ask users to pay a fee for each ringtone downloaded; in these models, ringtone prices are similar to those for digital downloads.¹⁴

B. Interactive Streaming

17. In contrast to digital download providers, streaming services (such as Apple Music, Google Play, and Spotify) enable users to access or “stream” music files from various devices (as opposed to allowing users to purchase and own the music files). These services do not provide users with permanent copies of the songs or albums, and they require an internet or mobile connection for access.¹⁵ Interactive streaming services (as opposed to non-interactive streaming services) provide “on-demand” access to music files and afford users a high degree of freedom with respect to music consumption. For example, not only can users play any song in the interactive streaming service provider’s catalog, they also can move forward or backward within a song and replay a song at any time. In addition, these services may add innovative features that enhance a user’s experience beyond pure streaming (e.g., ability to create playlists, ability to read lyrics of the songs being played, and customized recommendations).¹⁶ Many of these services also offer offline listening and limited downloads, which are digital deliveries of a sound recording that are available only for a pre-specified amount of time.¹⁷

092; “Phonezoo.com Frequently Asked Questions (FAQ),” *Phonezoo*, <http://www.phonezoo.com/Phonezoo-FAQ.aspx>, a true and correct copy of which is attached hereto as **APL-162**.

¹³ **APL-116**, Ivan Cook, “Top 5 Free Ringtone Websites to Download Free Ringtones,” *iSkysoft*, October 17, 2016, <https://www.iskysoft.com/topic-iphone/free-ringtone-websites.html>; Ellon Smith, “Top 30 Websites to Download Free Ringtones,” *Wondershare*, February 1, 2016, <https://www.wondershare.com/mp3/free-ringtone-sites.html>, a true and correct copy of which is attached hereto as **APL-089**.

¹⁴ “Ringtones,” *Google Play*, <https://play.google.com/store/music/artist/Ringtones?id=Arr75mtdzvckmqklyjrg4fa553u&hl=en>, a true and correct copy of which is attached hereto as **APL-030**.

¹⁵ 37 C.F.R. § 385.11.

¹⁶ Testimony of David Dorn, §§ IV.A.–B.; Aylin Zafar, “13 Things You Didn’t Know You Could Do On Spotify,” *BuzzFeed*, April 8 2014, https://www.buzzfeed.com/azafar/13-things-you-didnt-know-you-could-do-on-spotify?utm_term= hvDMWgKJY#.bIJOnVw1g, a true and correct copy of which is attached hereto as **APL-052**.

¹⁷ In the Code of Federal Regulations, a “limited download” is defined as a “digital transmission of a sound recording of a musical work to an end user, other than a stream, that results in a specifically identifiable reproduction of that sound recording that is only accessible for listening for:

- (1) An amount of time not to exceed 1 month from the time of the transmission (unless the service provider, in lieu of retransmitting the same sound recording as another limited download, separately and upon specific request of the end user made through a live network connection, reauthorizes use for another time period not to exceed 1 month), or in the case of a subscription transmission, a period of time following the end of the applicable subscription no longer than a subscription renewal period or 3 months, whichever is shorter; or
- (2) A specified number of times not to exceed 12 (unless the service provider, in lieu of retransmitting the same sound recording as another limited download, separately and upon specific request of the end user made through a live network connection, reauthorizes use of another series of 12 or fewer plays), or in the case of a subscription transmission, 12 times after the end of the applicable subscription.” *See* 37 C.F.R. § 385.11.

18. Interactive streaming services typically require users to have a subscription in order to access the service’s features. Some online services offer interactive streaming as a perk or incremental feature to a primary, subscription-based offering, but do not require users to pay the full monthly fee for the use of the streaming component (i.e., subscribers of the primary service pay a lower monthly fee for the streaming component than do non-subscribers). One example of such a service is Amazon Music Unlimited, which is an interactive streaming service provided for \$7.99 per month to Amazon Prime subscribers, and \$9.99 per month to all others.¹⁸ Amazon Prime subscribers also may access, at no additional charge, a streaming service called “Amazon Prime Music,” which offers ad-free access to a smaller library of music.¹⁹ Standalone subscription services are also offered, such as Apple Music and Spotify Premium. Lastly, some providers allow consumers to sign up and use interactive streaming services free of charge. These services are typically ad-supported, i.e., they generate revenues through the sale of advertising (e.g., Spotify Desktop).²⁰

C. Locker Services

19. Digital music locker services, which are a complement to streaming services, enable users to conveniently access their digital music files from a compatible device, such as a smartphone or desktop. Digital music files are uploaded to a locker either manually, by individual users, or via the locker service’s software, which scans each user’s music database and matches the files from this database to music files stored in a centralized repository (“the cloud”).²¹ In the latter method, the user’s original music file is not uploaded to the locker; rather,

¹⁸ “Amazon Music Unlimited,” *Amazon*, <https://www.amazon.com/gp/dmusic/promotions/AmazonMusicUnlimited?tag=timecom-20>, a true and correct copy of which is attached hereto as **APL-026**.

¹⁹ Rick Brodia, “Here’s Everything That’s Included with Amazon Prime,” *CNET*, October 18, 2016, <https://www.cnet.com/how-to/heres-everything-thats-included-with-amazon-prime/>, a true and correct copy of which is attached hereto as **APL-169**.

²⁰ Some services such as Spotify offer a combination of subscription based services and ad-supported free services. These are called “freemium” services in industry parlance. *See* “Free, Freemium and Premium: What Do the 2014 US Music Sales Figures Tell Us?” *Musically*, March 20, 2015, <http://musically.com/2015/03/20/free-freemium-premium-us-music-sales-figures/>, a true and correct copy of which is attached hereto as **APL-093**.

²¹ Michael Walker Jr., “A Better Public Performance Analysis for Digital Music Locker Storage,” *St. John’s Law Review* 87, no. 2, 2013, pp. 629–667 at pp. 629–630, a true and correct copy of which is attached hereto as **APL-149**.

the service affords the user access to a “matched” music file stored in the centralized repository. This “matched” file may be higher in sound quality than the user’s original music file.²²

20. All three major digital music locker providers (Apple, Amazon and Google) employ match-based technology and provide two types of services: a purchased-content locker service and a paid locker service.²³ A purchased-content locker service allows its users to access songs stored in the provider’s cloud, provided such songs were purchased through the same locker service provider or one of its affiliates.²⁴ For example, when an Apple user purchases a song from Apple’s digital music store (iTunes), that user automatically gain access to the purchased song through Apple’s cloud, and can re-download that song at any time.²⁵

21. A paid locker service, on the other hand, is subscription-based and provides users with access to songs that they store in the provider’s cloud without requiring the user to have purchased these songs from the provider.²⁶ A user could, for example, manually rip or extract songs from a CD that was not purchased through the provider. The paid locker service would then “match” these ripped or extracted songs to songs in the service’s cloud. While this service is referred to as a “paid” locker service, some companies provide this service as a free benefit to their existing customers. For example, Amazon allows its customers to “match” up to 250 songs to its cloud.²⁷ Users gain access to these songs through the Amazon Cloud Player.²⁸ A paid locker service also may be bundled with another product. Apple Music, for example, provides its paid locker service (iTunes Match) to Apple Music users for free.²⁹

²² For example, songs are matched to a file with a format 256kbps AAC, 256kbps MP3, and 320kbps MP3 in Apple, Amazon, and Google’s digital music locker service, respectively. See Dan Graziano, “Comparing Music Storage Services from Apple, Amazon, Google,” *CNET*, March 10, 2015, <https://www.cnet.com/how-to/itunes-match-vs-google-play-vs-amazon-music/>, a true and correct copy of which is attached hereto as **APL-070**.

²³ **APL-070**, Dan Graziano, “Comparing Music Storage Services from Apple, Amazon, Google,” *CNET*, March 10, 2015, <https://www.cnet.com/how-to/itunes-match-vs-google-play-vs-amazon-music/>.

²⁴ 37 C.F.R. § 385.21.

²⁵ “Download Your Past Purchases,” *Apple*, July 1, 2016, <https://support.apple.com/en-us/HT201272>, a true and correct copy of which is attached hereto as **APL-028**.

²⁶ 37 C.F.R. § 385.21.

²⁷ “Your Amazon Music Settings,” *Amazon*, https://www.amazon.com/gp/dmusic/player/settings?ie=UTF8&ref=dp_amp_settings_yasettings_click&, a true and correct copy of which is attached hereto as **APL-184**.

²⁸ “Amazon Music is Even Better with More Imported Songs in Your Library,” *Amazon*, <https://www.amazon.com/gp/feature.html?ie=UTF8&docId=1001432841>, a true and correct copy of which is attached hereto as **APL-026**.

²⁹ “What Happens to Your Existing Music Collection When You Join Apple Music,” *Apple*, September 23, 2016, <https://support.apple.com/en-us/HT204925>, a true and correct copy of which is attached hereto as **APL-028**.

22. Ultimately, the main difference between a purchased-content locker service and a paid locker service is the type of files it allows its users to “match,” with paid locker service allowing more flexibility.³⁰

D. Related Trends in the Digital Music Industry

23. The music industry has undergone changes at an accelerating pace since the first form of music recording was invented, as discussed in detail in Dr. Ramaprasad’s report.³¹ This change in pace has been characterized by several shifts in music consumption. In the past decade, since the advent of MP3 files and the iPod device, digital music delivery has been established as the main form of music delivery to consumers. The share of digital downloads as a fraction of the total music purchased (including physical distributions like CDs, vinyl, and digital downloads) has risen from less than 2% in 2004 to 54% in 2015,³² such that digital downloads now account for more than half of the revenues from music ownership. Meanwhile, revenues from streaming services have dramatically increased since 2010, and in 2015 were close to overtaking other forms of music consumption.³³ As revenues from streaming services have increased, there has been a corresponding decrease in revenues from CD sales and permanent digital downloads.³⁴ Given the trends in interactive streaming, CD sales, and digital downloads, it seems likely that future increases in streaming will continue to come at the expense of other forms of music distribution, such as digital permanent downloads and physical media (e.g., CDs).³⁵

³⁰ 37 C.F.R. § 385.21.

³¹ Expert Report of Jui Ramaprasad, November 1, 2016 (“Ramaprasad Report”), § VII.A.

³² Ramaprasad Report, ¶ 53.

³³ Ramaprasad Report, Figure 1.

³⁴ Ramaprasad Report, ¶ 55.

³⁵ Prior academic research has found that music streaming also can stimulate sales of digital music (e.g., downloads). *See, for example, Luis Aguiar and Bertin Martens, “Digital Music Consumption on the Internet: Evidence from Clickstream Data,” Information Economics and Policy 34, 2016, pp. 27–43, a true and correct copy of which is attached hereto as APL-137.* With the rapid rise of Spotify, however, digital music sales have been decreasing, suggesting that there is a net substitution effect between streaming and digital music sales. *See, for example, Luis Aguiar and Joel Waldfogel, “Streaming Reaches Flood Stage: Does Spotify Stimulate or Depress Music Sales?,” Institute for Prospective Technological Studies Digital Economy Working Paper 2015/05, 2015, pp. 1–37, a true and correct copy of which is attached hereto as APL-038.*

V. CURRENT AND PROPOSED MECHANICAL ROYALTY RATES FOR PERMANENT DOWNLOADS, RINGTONES, INTERACTIVE STREAMING, AND LOCKER SERVICES

A. The Current Mechanical Royalty Rates

24. Title 37, Part 385 of the Electronic Code of Federal Regulations (“C.F.R”), titled “Rates and Terms for Use of Music Works Under Compulsory License for Making and Distributing of Physical and Digital Phonorecords,” is the subject of the current proceedings. It contains three subparts, each describing a different statutory category of music distribution: (i) Subpart A addresses physical phonorecord deliveries, permanent digital downloads, and ringtones; (ii) Subpart B addresses interactive streaming and limited downloads; and (iii) Subpart C addresses limited offerings, mixed service bundles, music bundles, paid locker services, and purchased content locker services.³⁶ The royalty rates currently in effect for each of the three subparts were originally defined in 2008 and later extended to 2017 via negotiations in April 2012 among music industry participants, including the Recording Industry Association of America (“RIAA”), the National Music Publishers’ Association (“NMPA”), and the Digital Media Association (“DiMA”).³⁷

1. The Current Mechanical Royalty Rates for Permanent Downloads and Ringtones

25. The current statutory mechanical royalty rates under Subpart A of Section 115 for physical phonorecord deliveries, permanent digital downloads, and ringtones are based on a per-unit structure that has been in effect since January 2006:³⁸ \$0.091 for each phonorecord delivery or permanent digital download (or \$0.0175 per minute of playing time or fraction thereof,

³⁶ 37 C.F.R. § 385. Limited offerings are subscription-based services that provided access only to specific music genres or playlists. Mixed service bundles combine various music and non-music services (such as locker service and ringtones plus a mobile phone), while music bundles offer various music products (such as CDs and ringtones).

³⁷ Luiz Buff and Nicholas Spanos, “A Bundle of Mechanicals,” *Music Business Journal*, July 2012, <http://www.thembj.org/2012/07/a-bundle-of-mechanicals/>, a true and correct copy of which is attached hereto as **APL-139**; United States Copyright Office, “Copyright and the Music Marketplace,” Register of Copyrights Report, February 2015, NMPA00001047–1291 at 1083, a true and correct copy of which is attached hereto as **APL-025**; Copyright Royalty Board, “Adjustment of Determination of Compulsory License Rates for Mechanical and Digital Phonorecords,” *Federal Register* 78, no. 219, November 13, 2013, 67938–67951 at 67938–67939.

³⁸ Ringtones were not subject to compulsory licensing until 2006. The rate setting proceedings established a \$0.24 mechanical royalty for ringtones as of 2009, but this rate was based on the market rates that were in effect under various existing contracts. See “What Are Mechanical Royalty Rates?,” *Harry Fox Agency*, https://www.harryfox.com/license_music/what_mechanical_royalty_rates.html, a true and correct copy of which is attached hereto as **APL-099**; Final Determination of Rates and Terms, *In the Matter of Mechanical and Digital Phonorecord Delivery Rate Determination Proceeding*, November 24, 2008 (“Final Determination of Rates and Terms”), pp. 1–2, 7–8, 49, 53, 56–57, 60, 72, a true and correct copy of which is attached hereto as **APL-071**.

whichever is greater), and \$0.24 for every ringtone.³⁹ In 2008, these rates were re-established by the United States Copyright Royalty Judges.⁴⁰

2. The Current Mechanical Royalty Rate for Interactive Streaming

26. The current rate structure for interactive streaming and limited downloads was determined through a settlement between copyright owners, the Digital Media Association (“DiMA”), the Recording Industry Association of America (“RIAA”), and several others in 2008.⁴¹ The rate structure involves a complicated calculation in order to determine the mechanical royalty with respect to interactive streaming and limited downloads for any particular song. First, one must calculate the difference between (a) a percentage of service revenue, subject to a minimum as defined below, and (b) the royalty paid for the public performance of the musical work (as opposed to the public performance of the sound recording):⁴²

- a) 10.5% of service revenue, subject to a minimum of the lesser of:
 - a percentage of royalties for sound recordings (depending on the licensing record company’s status under U.S.C. 115), and
 - a per-subscriber rate of \$0.80;⁴³
- b) Public performance royalties that have been or will be expensed on public performance licenses for performance of the musical composition.

27. Second, one has to determine whether the royalty number that results from the calculation above is less than a per-subscriber rate of \$0.50 per subscriber per month, in which case the per-subscriber rate applies instead.⁴⁴ Finally, the royalty amount must be allocated, or divided,

³⁹ 37 C.F.R. §§ 385.3(a)–(b).

⁴⁰ APL-071, Final Determination of Rates and Terms, pp. 1–2, 72.

⁴¹ APL-071, Final Determination of Rates and Terms, pp. 2, 17–20.

⁴² 37 C.F.R. § 385.12.

⁴³ 37 C.F.R. § 385.13. Should the interactive streaming service be a free non-subscription or ad-supported service, the percentage of royalties minimum is a slightly higher percentage of expenses. *See* 37 C.F.R. § 385.13(c). The per-subscriber minimum also varies by type of service. For example, the per-subscriber minimum is \$0.50 for standalone non-portable subscriptions, and \$0.80 for standalone portable subscriptions. *See* 37 C.F.R. § 385.13(a).

⁴⁴ The \$0.50 per-subscriber royalty floor applies to standalone portable subscription services, the category into which Google Play, Spotify, and Apple Music fall. Standalone non-portable streaming only subscription services and standalone non-portable mixed subscription services are subject to a \$0.15 and \$0.30 per-subscriber per-month royalty floor, respectively. Bundled subscription services are subject to a floor of \$0.25 per active subscriber (i.e., a subscriber who has played at least one licensed work in the month). There is no per-subscriber royalty floor for free non-subscription or ad-supported services. *See* 37 C.F.R. § 385.13(a).

among the songwriters and publishers who own the particular song, proportional to the number of plays of each licensed song during the reporting period.⁴⁵

28. Streaming services that offer promotional rates to subscribers, such as free trial periods, may not be required to pay royalties during these periods.⁴⁶

3. The Current Mechanical Royalty Rates for Locker Services

29. The current rate structure for locker services also involves a complicated calculation that is similar to the rate structure for interactive streaming. The royalties owed are calculated as the difference between (a) a percentage of service revenue,⁴⁷ subject to a minimum of a percentage of royalties for sound recordings and, for paid locker services and limited offerings, a per-subscriber minimum;⁴⁸ and (b) public performance royalties that have been or will be expensed on public performance licenses for performance of the musical composition.⁴⁹ Similar to the mechanical royalty for interactive streaming and limited downloads, the royalty amount that results from this calculation then is divided among songwriters and publishers in various ways, according to the service licensed.⁵⁰ Another complication is that the individual components of the calculation for paid locker services and purchased locker services are different.

30. The current “all-in” rate (inclusive of mechanical and performance rights) for paid locker service is the maximum of:⁵¹

- a) 12% of service revenue;
- b) 20.65% of a service’s payments to record companies for sound recording rights only (if licenses are not pass-through), or 17.11% of a service’s all-in payments to record companies for sound recording and mechanical rights together (if licenses are pass-through); and

⁴⁵ 37 C.F.R. § 385.12(b)(4); “How the Money Flows Back to Songwriters, Artists, Publishers, and Labels,” *Future of Music Coalition*, undated, <http://futureofmusic.org/sites/default/files/moneyflow.streams.png>, a true and correct copy of which is attached hereto as **APL-110**.

⁴⁶ 37 C.F.R. § 385.14.

⁴⁷ The percentage of service revenue involved in the calculation ranges from 10.5% for limited offerings, to 11.35% for music bundles and mixed service bundles, to 12% for paid locker service, to 12% of incremental service revenue for purchased content locker service. See 37 C.F.R. § 385.23(a).

⁴⁸ The percentage-of-royalties minimum is the lower of a percentage of all-in royalties (mechanical rights and sound recording rights) owed for sound recordings and a (different and higher) percentage of royalties owed for sound recording rights only. This percentage varies by service as well. The per-subscriber minimum is \$0.17 for paid locker services and \$0.18 for limited offerings. See 37 C.F.R. § 385.23.

⁴⁹ 37 C.F.R. § 385.22(b)(2).

⁵⁰ 37 C.F.R. § 385.22(b)(3).

⁵¹ 37 C.F.R. §§ 385.22(b)(1), 385.23(a)(4).

- c) the aggregate amount of \$0.17 per subscriber-month.
31. The all-in rate for purchased content locker service, on the other hand, is the greater of:⁵²
- a) 12% of incremental service revenue for purchased content locker service; and
 - b) 22% of a service's incremental payments to record companies (above the otherwise applicable payments for the permanent digital downloads) for sound recording rights only (if licenses are not pass-through), or 18% of a service's all-in payments to record companies for sound recording and mechanical rights together (if licenses are pass-through).

B. Apple's Proposal

32. Apple proposes no change to the rates under Subpart A for phonorecords or permanent digital downloads.⁵³

33. Apple proposes simplifying the rate structure for the second statutory category under Subpart B (interactive streaming and limited downloads) in a way that matches the rate structure for phonorecord deliveries, permanent digital downloads, and ringtones under Subpart A. For interactive streams and limited downloads, Apple proposes an all-in per-play rate of \$0.00091 for all non-fraudulent interactive streams greater than or equal to 30 seconds. The mechanical royalty would be equal to this all-in rate minus performance royalties paid for performance of the musical composition. Fraudulent interactive streams and interactive streams less than 30 seconds would have a royalty rate of zero.⁵⁴

34. The third statutory category, under Subpart C, currently contains five types of services: limited offerings, mixed service bundles, music bundles, paid locker services, and purchased content locker services. Apple proposes eliminating these separate categories and simplifying the existing complex rate structures to a single monthly per-subscriber all-in rate (inclusive of mechanical and performance rights) of \$0.17 for paid locker services. The royalty rate for purchased content locker services proposed by Apple is zero.⁵⁵

⁵² 37 C.F.R. §§ 385.22(b)(1), 385.23(a)(5).

⁵³ Apple Inc. Proposed Rates and Terms, *In the Matter of Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)*, November 1, 2016 ("Apple Inc. Proposed Rates and Terms"), p. 1.

⁵⁴ Apple Inc. Proposed Rates and Terms, p. 2.

⁵⁵ Apple Inc. Proposed Rates and Terms, p. 3.

C. The Various Participants' Proposals

1. The Various Participants' Proposals for Permanent Downloads and Ringtones

35. In addition to Apple, **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**
⁵⁶ **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**

⁵⁷ Further, the National Music Publishers' Association ("NMPA"), National Songwriters' Association International ("NSAI"), Universal Music Group, Warner Music Group, the Church Music Publishers Association, the Songwriters of North America, and the Harry Fox Agency reached a settlement in June 2016 to extend the current rate structure for these formats through the next rate setting period (2018-2022).⁵⁸ Should the settlement fail to consummate, however, NMPA and NSAI propose higher rates for phonorecords, digital downloads, and ringtones.⁵⁹ On October 28, 2016, the NMPA, NSAI, and Sony Music Entertainment also agreed to the settlement and urged the Judges to adopt the settlement industry-wide for the statutory rates and terms under Subpart A.⁶⁰

2. The Various Participants' Proposals for Interactive Streaming

36. In summary, the structures of the eight rate proposals of the various participants, including Apple, with respect to Subpart B rates for interactive streaming are of the following three types: (i) per-play rate structures; **RESTRICTED — Subject to Protective Order in Docket No. 16 CRB 0001 PR (2018 2022)**

⁵⁶ **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**

⁵⁷ **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**

The exception is George Johnson. *See* George Johnson's (GEO) Preliminary Disclosures, *In the Matter of Determination of Royalty Rates for Making and Distributing Phonorecords (Phonorecords III)*, July 17, 2016 ("George Johnson's (GEO) Preliminary Disclosures"). George Johnson is an individual singer, songwriter, self-publisher, investor, and sound recording copyright creator doing business as George Johnson Music publishing company and Geo Music Group. It is my understanding that George Johnson does not represent the music industry or the copyright owners.

⁵⁸ Copyright Royalty Board, "Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)," Federal Register 81, no. 142, July 25, 2016, 48371–48372.

⁵⁹ **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)**, p. 3. **(Phonorecords III)**

⁶⁰ Motion to Adopt Settlement Industry-Wide, *In re Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)*, October 28, 2016.

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(Phonorecords III)

37. George Johnson proposes a per-play rate for interactive streaming, and a one-time fee plus a per-play rate for locker services.⁶¹

38. RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)
(Phonorecords III)

⁶² RESTRICTED — Subject to
Protective Order in Docket No. 16-
CRB-0001-PR (2018-2022)
(Phonorecords III)

⁶³

39. RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)
(Phonorecords III)

⁶⁴

3. The Various Participants' Proposals for Locker Services

40. In addition to Apple, RESTRICTED — in this proceeding submitted rate proposals for
locker services under Subpart C. ^{Subject to} RESTRICTED — Subject to Protective Order in Docket No. 16-
CRB-0001-PR (2018-2022) (Phonorecords III)

⁶¹ George Johnson's (GEO) Preliminary Disclosures, pp. 3–4.

⁶² As discussed in Dr. Ramaprasad's report, these are minima based on the number of subscribers. *See* Ramaprasad Report, § IV.B.2.

⁶³ RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)
(Phonorecords III)

⁶⁴ RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)
(Phonorecords III)

RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022)
(Phonorecords III)

⁶⁵ RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR
(2018-2022) (Phonorecords III)

⁶⁶

41. In the subsequent sections, I discuss why Apple’s proposal makes the most sense from an economic perspective and why the other proposals are not appropriate.

VI. APPLE’S PROPOSED RATES FOR PERMANENT DOWNLOADS AND RINGTONES ARE CONSISTENT WITH THE COPYRIGHT ROYALTY BOARD’S FINDING IN THE PRIOR SECTION 115 PROCEEDING

42. In the Mechanical and Digital Phonorecord Delivery Rate Determination Proceeding that took place between 2006 and 2008, the Copyright Royalty Board determined that statutory mechanical royalty rates under Section 115 for physical phonorecord deliveries, permanent digital downloads, and ringtones are to be based on a per-unit structure (also known as a “usage fee” or “usage-based” structure).⁶⁷ In their 2008 determination, the Copyright Royalty Judges held that “several factors tip the scales in favor of a usage fee structure,” as opposed to the alternative “revenue-based” proposals.⁶⁸ In light of the difficulties associated with revenue-based proposals, the Judges concluded that “it is more reasonable to adopt a usage-based fee structure.”⁶⁹

43. In their analysis, the Copyright Royalty Board Judges highlighted various advantages associated with a usage-based (per-download or per-reproduction) royalty structure. First, the Judges determined that measuring usage for downloads and ringtones is “straightforward” and does not involve any intractable problems.⁷⁰ The Judges observed that “each reproduction of the musical work on a physical CD (or some other older physical format such as cassette tapes or

⁶⁵ RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR , p. 3.

⁶⁶ RESTRICTED — Subject to Protective Order in Docket No. , p. 2; RESTRICTED — Subject to Protective Order in

⁶⁷ APL-071, Final Determination of Rates and Terms, p. 23.

⁶⁸ APL-071, Final Determination of Rates and Terms, p. 23.

⁶⁹ APL-071, Final Determination of Rates and Terms, p. 23.

⁷⁰ APL-071, Final Determination of Rates and Terms, p. 23.

vinyl LPs), a permanent digital download or a digital ringtone counts as a use of the musical work, [n]o proxies need be formulated to establish the number of such reproductions. They are readily calculable as the number of units in transactions between the parties.”⁷¹ In contrast, the Judges identified numerous difficulties with using a “percentage of revenue” approach, such as “differences and disagreements related to the definition of revenues” in the proposals of different parties.⁷² The Judges also noted that “auditing and enforcement costs are likely to be lower” in a usage-based rate structure as “fewer data elements are required to be collected and reviewed...compared to a revenue-based metric.”⁷³ Ultimately, the Judges concluded that the “ease of application [of the usage-based structure] offers an efficiency in valuing the rights at issue not available under the percentage of revenue alternatives.”⁷⁴

44. The Judges also addressed arguments raised by proponents of a revenue-based structure. For example, some participants in that proceeding claimed that a usage-based rate structure would have a negative impact on service providers’ business, and that a revenue-based structure would allow more flexibility to lower the prices of music delivered to consumers.⁷⁵ In response, the Judges stated that the royalties in question constitute “just one component of industry expenses (as distinguished from several other major cost components),” that these other costs can serve as a source for price reductions and that there is no persuasive evidence that the application of a per-unit structure would have an adverse impact on business.⁷⁶ Moreover, the Judges indicated that the flexibility that would be provided to businesses by virtue of using revenue-based structures raises “serious questions of fairness precisely because the percentage of revenue metric may be a less than fully satisfactory proxy for measuring more usage or the actual intensity of the usage of the rights in question.”⁷⁷

45. I concur with the Copyright Royalty Board’s assessments from the prior Section 115 proceeding. Based on my review and analysis, its assessment continues to apply to today’s music industry, and there is no compelling reason to introduce changes to either the structure or the magnitude of these royalty rates. The fact that

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⁷¹ **APL-071**, Final Determination of Rates and Terms, p. 23.

⁷² **APL-071**, Final Determination of Rates and Terms, pp. 24–25.

⁷³ **APL-071**, Final Determination of Rates and Terms, p. 25, footnote 18.

⁷⁴ **APL-071**, Final Determination of Rates and Terms, p. 24.

⁷⁵ **APL-071**, Final Determination of Rates and Terms, pp. 25–26.

⁷⁶ **APL-071**, Final Determination of Rates and Terms, pp. 26–27.

⁷⁷ **APL-071**, Final Determination of Rates and Terms, p. 27.

RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III) the notion that the findings set forth by the Copyright Royalty Board Judges in 2008 pertaining to statutory Subpart A mechanical royalty rates under Section 115 for physical phonorecord deliveries, permanent digital downloads, and ringtones continue to apply today. Apple’s proposal, consequently, is consistent with and supportive of the policy objectives laid out in Section 801(b). The **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**

further supports
my conclusions.

VII. APPLE’S PROPOSED RATE FOR INTERACTIVE STREAMING IS APPROPRIATE

A. On Balance, A Per-Play Rate Structure Is the Appropriate Structure For Interactive Streaming

46. Interactive streaming is a fundamental departure from the norm of music consumption because it shifts the model for how we consume music from music ownership (buying an album or a song to listen to it) to music access (wherein it is no longer necessary to buy a particular album or song to listen to it). Below, I discuss why this alters how “value” is created by the various stakeholders involved and why the royalty rate structure for interactive streaming needs to be realigned to ensure that music creators and music distributors each are appropriately rewarded for their relative contributions. In my opinion, Apple’s proposed per-play rate structure for interactive streaming royalties is more likely to achieve that goal of realignment than are the proposals submitted by the other participants in this proceeding.

1. The Economics of an Appropriate Rate Structure

47. A piece of music passes through many stages before it reaches the final consumer. Each entity in this chain of music creation and distribution creates value.⁷⁸

48. On the copyright creator/owner side, songwriters are the first link. They expend their creative talent and effort to compose the songs that a performing artist records in a recording studio. Many songwriters work with publishers who take care of the many administrative tasks, such as registering the creative work with the correct organizations, collecting and distributing

⁷⁸ Joeri M. Mol et al., “Value Chain Envy: Explaining New Entry and Vertical Integration in Popular Music,” *Journal of Management Studies* 42, no. 2, 2005, pp. 251–276 at p. 260, a true and correct copy of which is attached hereto as **APL-123**.

the royalties received, and creating commercial opportunities for songwriters.⁷⁹ These songwriters and publishers own the copyrights in their musical compositions.⁸⁰

49. Once a song is written, it may be recorded. The record labels are the copyright holders of the final sound recording and are responsible for marketing the song, collecting and distributing the royalties, and at times also nurturing and developing the artist.⁸¹ The final link in this chain, which directly connects consumers to the piece of music, is the distributor. A distributor could be a retail store (e.g. Virgin Megastores, Best Buy, Walmart, etc.), a digital download store (e.g. iTunes), or a streaming service provider (e.g. Apple Music, Spotify).⁸²

50. On the copyright user side, interactive streaming services provide consumers access to a large catalog of songs that they can listen to “on-demand” without owning the songs (and paying for that ownership).⁸³ The value provided by these services has increased their popularity.⁸⁴ In addition to the convenience of offering music on-demand, these services also create value for consumers by offering a variety of features, such as curated playlists,⁸⁵ song lyrics, and ways to discover new music, which enhances the listening experience.⁸⁶ Academic research has found that because streaming services encourage discovery of new music, consumers of such services

⁷⁹ Paul Resnikoff, “Now You Know Everything about Music Publishing,” *Digital Music News*, February 28, 2014, <http://www.digitalmusicnews.com/2014/02/28/understandpublishing/>, a true and correct copy of which is attached hereto as **APL-154**.

⁸⁰ **APL-025**, United States Copyright Office, “Copyright and the Music Marketplace,” Register of Copyrights Report, February 2015, NMPA00001047–1291 at 1116.

⁸¹ Helienne Lindvall, “Behind the Music: What Do Record Labels Actually Do? You’d Be Surprised,” *The Guardian*, February 2, 2012, <https://www.theguardian.com/music/musicblog/2012/feb/02/behind-music-record-labels>, a true and correct copy of which is attached hereto as **APL-107**; **APL-154**, Paul Resnikoff, “Now You Know Everything about Music Publishing,” *Digital Music News*, February 28, 2014, <http://www.digitalmusicnews.com/2014/02/28/understandpublishing/>.

⁸² Of course, artists could directly connect with consumers through live shows or, as has been the case more recently, through channels such as YouTube and Facebook without going through a record label. *See*, for example, Kristen Philipkoski, “Why Not Winning America’s Got Talent and Avoiding a Major Record Label Was Awesome for Lindsey Stirling,” *Forbes*, August 31, 2015, <http://www.forbes.com/sites/kristenphilipkoski/2015/08/31/why-not-winning-americas-got-talent-and-avoiding-a-major-record-label-was-awesome-for-lindsey-stirling/print/>, a true and correct copy of which is attached hereto as **APL-134**.

⁸³ Madi Alexander and Ben Sisario, “Apple Music, Spotify and a Guide to Music Streaming Services,” *The New York Times*, April 5, 2016, <http://www.nytimes.com/interactive/2015/06/30/business/media/music-streaming-guide.html>, a true and correct copy of which is attached hereto as **APL-140**.

⁸⁴ Ramaprasad Report, ¶ 64; Joshua Cornell Jenkins, “Going With the Flow: How the Convenience of Streaming Has Changed the Way We Consume Media,” *The Odyssey Online*, July 14, 2015, <https://www.theodysseyonline.com/media-streaming>, a true and correct copy of which is attached hereto as **APL-128**; Testimony of David Dorn, §§ IV.A.–B.

⁸⁵ A curated playlist is a collection of songs personalized for music listeners based on the information the streaming services have. *See* Testimony of David Dorn, ¶¶ 55–57.

⁸⁶ Testimony of David Dorn, §§ IV.B.

listen to a wider variety of music.⁸⁷ From the artists' perspective, this could increase the likelihood that they will find an audience if they create high quality songs.⁸⁸

51. Because songs are a critical input for a streaming service, and because songwriters hold copyright over their musical compositions, streaming services compensate songwriters through royalty payments.

52. People spend a lot of time and money listening to music.⁸⁹ Consumers listen to music for various reasons, including to relieve stress or boredom, or to express feelings and emotions.⁹⁰ Listening to music is regarded as an important leisure activity for a variety of people.⁹¹ If a consumer actively listens to a song instead of spending the time doing something else, it suggests that the song has some value to the consumer. Even if a consumer is listening to music while engaging in some other activity, for instance while working, exercising, or cooking, he actively made the decision to turn on the music, which again suggests that listening to music is an activity that the consumer enjoys doing. Furthermore, the fact that consumers buy songs in the form of CDs and permanent downloads and pay for subscriptions to stream songs demonstrates that songs have value for consumers.

53. Songwriters expect to be compensated appropriately for the value their creations provide to consumers. They also expect their compensation to be commensurate with the demand for their songs. If the demand for their creations increases, they expect their compensation to increase. Although artists may create art for art's sake, economic incentives matter to many artists.⁹² Accordingly, from a commercial perspective, if artists were not sufficiently compensated for the demand for their songs, their incentives to create songs would decrease.

⁸⁷ Hannes Datta et al., "Changing Their Tune: How Consumers' Adoption of Online Streaming Affects Music Consumption and Discovery," Working Paper, 2016, pp. 1–50 at p. 29, a true and correct copy of which is attached hereto as **APL-106**.

⁸⁸ **APL-106**, Hannes Datta et al., "Changing Their Tune: How Consumers' Adoption of Online Streaming Affects Music Consumption and Discovery," Working Paper, 2016, pp. 1–50 at p. 27.

⁸⁹ Adam J. Lonsdale and Adrian C. North, "Why Do We Listen to Music? A Uses and Gratification Analysis," *British Journal of Psychology* 102, 2011, pp. 108–134 at p. 108, a true and correct copy of which is attached hereto as **APL-037**.

⁹⁰ **APL-037**, Adam J. Lonsdale and Adrian C. North, "Why Do We Listen to Music? A Uses and Gratification Analysis," *British Journal of Psychology* 102, 2011, pp. 108–134 at p. 112.

⁹¹ **APL-037**, Adam J. Lonsdale and Adrian C. North, "Why Do We Listen to Music? A Uses and Gratification Analysis," *British Journal of Psychology* 102, 2011, pp. 108–134 at p. 132.

⁹² Richard E. Caves, "Organizing to Collect Rents: Music Copyrights" in *Creative Industries: Contracts between Art and Commerce* (Cambridge, MA: Harvard University Press, 2002), p. 297 ("If the song is free for the taking, the songwriter reaps no reward for her creative labors. Valuing *art for art's sake*, she may still bestow her lyrical

54. Notably, the mere initiation of a stream is not necessarily indicative of demand for the song. Music is an “experience good” that generates value to a consumer once it is consumed.⁹³ As a result, interactive steaming services provide consumers with convenient means to “sample” and discover new music—consumers may only play a snippet of a song and skip the rest if they decide that they do not like the song. Therefore, the demand for a song on an interactive streaming service can be captured by the number of times the song is streamed where the duration of each stream is sufficiently long to indicate demand from consumers for that song.⁹⁴ Put simply, instances where a consumer sampled a small snippet of short duration and “moved on” would not be considered a reflection of true consumer demand for the sampled song.

55. Streaming services, like any business, expect to be rewarded appropriately for the risks they take and the investments they make. In a competitive marketplace, firms try to differentiate themselves by innovating and adding/improving features.⁹⁵ This innovation enables firms to attract customers and succeed in the marketplace.⁹⁶ Streaming services must also innovate to differentiate themselves from competitors, and that requires taking risks. Developing a new, innovative feature may require a substantial amount of investment in idea generation, development, planning, and execution. The success of a new product or a feature is not known until it is made available to the target market, however, which is why there is risk involved in developing new products and features.⁹⁷ For example, Spotify developed the ‘Discover page’

gifts on the world; but she must earn a living somehow, so supplies even of creative goods shrivel when no economic rewards can be claimed.”), a true and correct copy of which is attached hereto as **APL-167**.

⁹³ Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston, MA: Harvard Business School Press), 1999, p. 5, a true and correct copy of which is attached hereto as **APL-063**.

⁹⁴ Several industry sources believe that a stream should last for more than 30 seconds in order to be counted as a stream. See, for example, “Royalties: How Many Seconds Counts [sic] As A Stream?,” Spotify Community, August 16, 2013, <https://community.spotify.com/t5/Newcomers-and-Contribution/Royalties-How-many-seconds-counts-as-a-stream/td-p/505614>, a true and correct copy of which is attached hereto as **APL-175**; Richard Smirke, “U.K. Singles Chart To Incorporate Music Streams For First Time,” *Billboard*, June 23, 2014, <http://www.billboard.com/articles/columns/chart-beat/6128763/uk-singles-chart-to-incorporate-music-streams-for-first-time>, a true and correct copy of which is attached hereto as **APL-168**.

⁹⁵ Philip Kotler and Kevin Lane Keller, *Marketing Management*, 15th edition (New York: Pearson, 2016), pp. 282–283, 370–372, 432–433, a true and correct copy of which is attached hereto as **APL-161**.

⁹⁶ **APL-161**, Philip Kotler and Kevin Lane Keller, *Marketing Management*, 15th edition (New York: Pearson, 2016), p. 432; see also Robert Atkinson and Stephen J. Ezell, “What is Innovation Policy?” in *Innovation Economics: The Race For Global Advantage* (New Haven, CT: Yale University Press, 2012), p. 131 (“[R]esearch . . . suggests that firms not replacing at least 10 percent of their revenue streams annually with new products or services are likely to be out of business within five years. . . . In fact, [disruptive innovation] has contributed to a dramatic widening since the mid-1990s in the disparity in profits between the leading firms in industries that use technology intensively.”), a true and correct copy of which is attached hereto as **APL-056**.

⁹⁷ **APL-161**, Philip Kotler and Kevin Lane Keller, *Marketing Management*, 15th edition (New York: Pearson, 2016), p. 433; see also Thomas M. Jorde and David J. Teece, “Innovation and Cooperation: Implications for

feature to help users identify new music they might like but did not know about. Though the feature was not used by many consumers initially, Spotify incorporated the feedback from the lack of success of this feature and continued to develop it. Today, the current incarnation of the ‘Discover weekly’ page is very popular.⁹⁸ As another example, Apple Music developed many features that benefit consumers and musicians. These include recommender systems that increase music discovery; tools that enable subscribers to easily share songs, albums, and personally curated playlists; and communities that connect musicians, music experts, and fans to enhance the music experience.⁹⁹

56. There also are many examples of products and services that failed to take off. Sony developed Music Unlimited, a music streaming service, and launched it in the U.S. in 2011.¹⁰⁰ Sony believed that its “global reach and wide range of devices would help make the service a success. Sony is leapfrogging into this space [cloud based music]. That is a very visionary and bold thing to do.”¹⁰¹ Sony was not able to attract a large subscriber base, however, and four years after launch it decided to shut down its streaming service.¹⁰² Similarly, Microsoft launched a portable music player named Zune in 2006 to compete with the Apple iPod.¹⁰³ Because the “Zune was too little, too late,” “Microsoft never gave consumers a real clear reason to buy [a Zune] instead of the market leading iPod,” and because “the initial marketing for the Zune was

Competition and Antitrust,” *Journal of Economic Perspectives* 4, no. 3, 1990, pp. 75–96 at p. 76 (“[Innovation] involves uncertainty, risk taking, probing and reprobating, experimenting, and testing. It is an activity in which ‘dry holes’ and ‘blind alleys’ are the rule, not the exception.”), a true and correct copy of which is attached hereto as **APL-049**.

⁹⁸ Marty Swant, “Even Spotify is Surprised by the Huge Success of Its Discover Weekly Playlists: A ‘Musical Addiction’ That Has the Company Rethinking Everything,” *Adweek*, August 28, 2016, <http://www.adweek.com/news/technology/even-spotify-surprised-huge-success-its-discover-weekly-playlists-173129>, a true and correct copy of which is attached hereto as **APL-143**.

⁹⁹ Testimony of David Dorn, ¶¶ 49–62.

¹⁰⁰ Mark Milian, “Sony Launches Music-Streaming Service in U.S.,” *CNN*, February 17, 2011, <http://www.cnn.com/2011/TECH/web/02/17/sony.qriocity/>, a true and correct copy of which is attached hereto as **APL-142**.

¹⁰¹ Alexandra Topping, “Sony to Expand Music Streaming Service,” *The Guardian*, January 25, 2011, <https://www.theguardian.com/media/2011/jan/25/sony-music-unlimited-streaming-service>, a true and correct copy of which is attached hereto as **APL-041**.

¹⁰² Hannah Karp, “Sony Bails Out of Music Streaming,” *The Wall Street Journal*, January 29, 2015, <http://www.wsj.com/articles/sony-bails-out-of-music-streaming-1422481528>, a true and correct copy of which is attached hereto as **APL-104**.

¹⁰³ Douglas McIntyre, “The 10 Biggest Tech Failures of the Last Decade,” *Time*, May 14, 2009, http://content.time.com/time/specials/packages/article/0,28804,1898610_1898625_1898633,00.html, a true and correct copy of which is attached hereto as **APL-082**.

too narrow,” it failed to get a large share of the portable music player market.¹⁰⁴ Microsoft announced in 2011 that it would no longer be producing the Zune.¹⁰⁵

57. Given the risks associated with developing new products and features, streaming services expect returns commensurate with the risks they take. If they do not earn sufficient returns when their innovations create value for consumers, their incentives to take risks and to innovate decrease.¹⁰⁶ In general, firms would be expected to embark on new, risky, projects only if the expected return is positive.¹⁰⁷

58. In summary, the “value” that music creates for music consumers is passed on to the streaming services in the form of subscription revenues or ad-generated revenues. As discussed above, both the songwriters and the streaming services need to be appropriately rewarded for their creative talent, effort, and risk-taking. Thus, the value extracted from consumers must be shared appropriately between songwriters and streaming services.

59. If the payment to songwriters is too high at the expense of the streaming services, the latter’s incentive to innovate, and perhaps the ability to provide a sustainable service, would decrease. If the payment to streaming services is too high at the expense of the songwriters, the latter’s incentive to create songs would decrease. An appropriate rate structure must balance the interests of these two important components of the music ecosystem.

2. A Per-Play Rate Structure Appropriately Balances the Rewards to Songwriters and Streaming Services

60. A per-play rate structure appropriately balances the rewards to songwriters and streaming services. Under a per-play rate structure, songwriters are paid each time their songs are

¹⁰⁴ Matt Rosoff, “Former Microsoft Zune Boss Explains Why it Flopped,” *Business Insider*, May 11, 2012, <http://www.businessinsider.com/robbie-bach-explains-why-the-zune-flopped-2012-5>, a true and correct copy of which is attached hereto as **APL-145**; **APL-082**, Douglas McIntyre, “The 10 Biggest Tech Failures of the Last Decade,” *Time*, May 14, 2009, http://content.time.com/time/specials/packages/article/0,28804,1898610_1898625_1898633,00.html.

¹⁰⁵ Devin Coldewey, “Microsoft Puts The Zune Down The Memory Hole,” *TechCrunch*, October 4, 2011, <https://techcrunch.com/2011/10/04/microsoft-puts-the-zune-down-the-memory-hole/>, a true and correct copy of which is attached hereto as **APL-079**.

¹⁰⁶ Industrial Organization economics is aware of the necessity to create noncompetitive situations (by granting patents) in order to encourage innovation and absent such guarantees, “no one firm is willing to pay the sums of money (often huge) necessary to (innovate) without compensation.” See Jean Tirole, *The Theory of Industrial Organization* (Cambridge, MA: The MIT Press, 1988), p. 390, a true and correct copy of which is attached hereto as **APL-057**.

¹⁰⁷ Erik Brynjolfsson and Xiaoquan (Michael) Zhang, “Innovation Incentives for Information Goods,” *Innovation Policy and the Economy* 7, 2006, pp. 99–123 at p. 99, a true and correct copy of which is attached hereto as **APL-091**.

streamed. As long as the per-play rate is appropriately determined and streams are measured in a way that is indicative of demand (e.g., by considering the streams that are longer than 30 seconds to eliminate accidental streams or streams of snippets of songs where users are merely sampling a song),¹⁰⁸ payments to songwriters are likely to be commensurate with the demand for their songs. If the demand for their songs were to increase (i.e., if their songs are streamed more), their income also would increase.

61. Under a per-play rate structure, streaming services also would be rewarded for the risks they take, as the payments to songwriters would not be tied to the financial outcomes of the streaming services' decisions as to how to develop their services. If a streaming service makes certain decisions (e.g., to invest in developing a new feature that benefits consumers), and its revenues increase because of that decision, the streaming service alone should receive the additional revenue attributable to that innovation because it is not connected to any particular songwriter. Accordingly, increased revenue due to any innovation specific to the service should not have to be shared with songwriters. This properly apportioned and incentivized structure makes it more likely that the streaming service will innovate and create additional value for consumers.

62. In contrast, a percent-of-revenue structure does not always appropriately balance the rewards to songwriters and streaming services. As an initial matter, the compensation to songwriters from the streaming services is inherently "risky," whether under a percent-of-revenue or a per-play rate structure, because it depends on whether and to what extent the songwriters' songs are streamed. Put simply, there is always a risk that the songwriter will earn \$0 because there is no demand for his or her songs.

63. A percent-of-revenue structure exposes songwriters' compensation to two additional types of risk, however. First, there also is risk arising from uncertainty related to the financial performance of the streaming service. Revenues for ad-supported streaming services (e.g., Spotify Free) depend on the revenues such services are able to obtain from advertisers.

¹⁰⁸ Several industry sources believe that a stream should last for more than 30 seconds in order to count as a stream. See, for example, **APL-175**, "Royalties: How Many Seconds Counts [sic] As A Stream?," *Spotify Community*, August 16, 2013, <https://community.spotify.com/t5/Newcomers-and-Contribution/Royalties-How-many-seconds-counts-as-a-stream/td-p/505614>; **APL-168**, Richard Smirke, "U.K. Singles Chart To Incorporate Music Streams For First Time," *Billboard*, June 23, 2014, <http://www.billboard.com/articles/columns/chart-beat/6128763/uk-singles-chart-to-incorporate-music-streams-for-first-time>.

Likewise, the revenues for subscription streaming services (e.g., Apple Music) depend on the number of subscribers such services are able to attract. The revenues in both cases are, by their nature, uncertain, and depend on the actions taken by the streaming services. Consequently, they increase the variability in the payments received by songwriters. If the streaming service were to suffer low revenues, songwriters' compensation would be adversely affected. Indeed, the streaming business model, under the current royalty structure, has been blamed for making it tougher for songwriters to finance their creative efforts, and for the "collapse of Nashville's musical middle class."¹⁰⁹

64. Second, the percent-of-revenue rate structure also gives rise to risk if the songwriters' compensation is decoupled from the demand for their songs. It is possible that songwriters' compensation may not increase even when the demand for their songs increases. For example, consider the revenues of a paid subscription service. If the streaming of every song were to double, but the number of subscribers did not change (so that the revenue does not change), the songwriters' royalties might not change even though the demand for their songs increased. Because songwriters' royalties could remain the same even as the number of streams doubles, the value of each stream would necessarily fall. Such an outcome would not occur under a per-play rate structure, where each stream has the same value, regardless of the number of streams.

65. Another feature of the percent-of-revenue structure is that it may expose songwriters to variable compensation across different streaming services even if the demand for their songs does not vary. Because different streaming services may have different business models (e.g., ad-supported, subscription-based), and may make different business decisions such as how to price their services (for subscription-based services) or how to place and what to charge for ads (for ad-supported services), their revenues may vary. It is plausible that different streaming services might pay different royalties to the same songwriter for the same number of streams under the percent-of-revenue structure. For example, if two ad-supported streaming services had exactly 1 million streams of the same songs in a month, but one streaming service had revenues of \$1 million while the other had revenues of \$1.5 million, the royalty payments made by the two

¹⁰⁹ **APL-025**, United States Copyright Office, "Copyright and the Music Marketplace," Register of Copyrights Report, February 2015, NMPA00001047-1291 at 1133; Nate Rau, "Nashville's Musical Middle Class Collapses," *The Tennessean*, January 28, 2015, <http://www.tennessean.com/story/entertainment/music/2015/01/04/nashville-musical-middle-class-collapses-new-dylans/21236245/>, a true and correct copy of which is attached hereto as **APL-151**.

streaming services under a percent-of-revenue structure could be different. The streaming service with greater revenues would likely make greater royalty payments. This would imply that the same songs are more “valuable” when played on one service than on the other, despite identical levels of demand (i.e., number of streams).

66. To understand the incentives at play in the current context, the academic literature that has examined revenue-sharing arrangements between upstream firms (e.g., manufacturers) and downstream firms (e.g., retailers) is instructive. That literature has found that revenue sharing can help align the incentives of the two entities when the downstream firm faces uncertain demand.¹¹⁰ For example, a revenue sharing arrangement can incentivize the downstream firm to increase inventory in a way that is beneficial to both entities of the vertical channel. However, a revenue sharing arrangement can also create a perverse incentive for the downstream firm (which may have other, complementary business lines that do not rely on the upstream firm) to employ a “loss leader” strategy that hurts the upstream firm in an effort to drive demand for the complementary products.¹¹¹ A loss leader strategy is one in which a multiproduct firm sells one or more products below cost to attract customers that would then buy other more profitable products.¹¹²

67. Translating this to the current proceeding, the upstream entity is the songwriter and the downstream entity is the streaming service. Because streaming services do not have to pay per stream under a percent-of-revenue structure, they could be incentivized to use a loss leader strategy. A streaming service might offer a low price to attract customers to its regular service with the hope that these customers would later convert to the premium service and pay a higher

¹¹⁰ See, for example, James D. Dana, Jr. and Kathryn E. Spier, “Revenue Sharing and Vertical Control in the Video Rental Market,” *The Journal of Industrial Economics* 49, no. 3, 2001, pp. 223–245, a true and correct copy of which is attached hereto as **APL-118**; V.G. Narayanan and Ananth Raman, “Aligning Incentives in Supply Chains,” *Harvard Business Review* 82, no. 11, 2004, pp. 94–102, a true and correct copy of which is attached hereto as **APL-163**.

¹¹¹ For example, Cachon and Lariviere state that “[i]n the case of complements (say, personal computers and printers), the retailer may discount the product offered under revenue sharing to spur sales of the other product. Here, revenue sharing may result in a product being used as a loss leader.” See Gérard Cachon and Martin Lariviere, “Supply Chain Coordination with Revenue Sharing Contracts: Strengths and Limitations,” *Management Science* 51, no. 1, 2005, pp. 30–44, a true and correct copy of which is attached hereto as **APL-097**.

¹¹² James Hess and Eitan Gerstner, “Loss Leader Pricing and Rain Check Policy,” *Marketing Science* 6, no. 4, 1987, pp. 358–374 at p. 358, a true and correct copy of which is attached hereto as **APL-119**.

price. For example, Spotify employs a loss-leader strategy in its “freemium” offering.¹¹³ Although less than one-third of Spotify’s user base consists of paid subscribers, 89.9% of its revenues came from subscription fees in 2015.¹¹⁴ Spotify, on its website, explains that once it attracts listeners to its freemium product, it works on drawing these users into the premium subscription tier.¹¹⁵ Because such a loss leader, or free service, will have lower revenues (by definition) relative to a subscription-based service, the compensation to songwriters for the use of their songs on that service is also lower, although such use may ultimately be highly beneficial to the service.

68. For the streaming services, the percent-of-revenue structure decreases the upside rewards of innovation because songwriters share those rewards. Streaming services create value for consumers beyond the pure distribution of music. For example, streaming services offer a variety of innovative features such as curated suggestions, social media integration, and the “playlist of the week.”¹¹⁶ As discussed earlier in this report, such innovations enhance the user experience, increase user exposure to different artists, and enable users to discover music.¹¹⁷ This facilitation of music discovery and exploration increases consumer welfare.¹¹⁸ Streaming services would expect to obtain all incremental revenues associated with the value created through these features which are not connected to any particular songwriter. Under the percent-of-revenue structure, however, a portion of this value is shared with songwriters.

69. A hybrid structure (i.e., a maximum of multiple structures) also does not appropriately balance rewards to songwriters and streaming services. Because one of the prongs of a hybrid structure is a percent-of-revenue structure, it has the undesirable feature of decreasing the upside rewards of innovation. At the same time, other prongs may effectively protect songwriters from

¹¹³ Will Oremus, “Spotify’s New Features Aren’t Just About You. They’re About Money.,” *Slate*, May 20, 2015, http://www.slate.com/blogs/moneybox/2015/05/20/spotify_now_streaming_music_leader_adds_video_podcasts_running_features.html, a true and correct copy of which is attached hereto as **APL-170**.

¹¹⁴ Tim Ingham, “Spotify Revenues Topped \$2BN Last Year as Losses Hit \$194M,” *Music Business Worldwide*, May 23, 2016, <http://musicbusinessworldwide.com/spotify-revenues-topped-2bn-last-year-as-losses-hit-194m/>, a true and correct copy of which is attached hereto as **APL-035**.

¹¹⁵ “Spotify Explained,” *Spotify Artists*, <https://www.spotifyartists.com/spotify-explained/>, a true and correct copy of which is attached hereto as **APL-176**.

¹¹⁶ Stuart Dredge, “Which is the Best Music Streaming Service?,” *The Guardian*, February 16, 2016, <https://www.theguardian.com/technology/2016/feb/16/which-is-the-best-music-streaming-service-spotify-apple-music>, a true and correct copy of which is attached hereto as **APL-120**; Testimony of David Dorn, § IV.

¹¹⁷ See also, Ramaprasad Report, § VII.B.1.

¹¹⁸ See Ramaprasad Report, § VII.B.

the downside, as is the case with the current rate structure. Specifically, one of the prongs in the current structure is based on the number of subscribers. If the streaming service has low revenues but a large number of subscribers, the songwriters would likely not suffer, because their royalty payment would be based on the number of subscribers rather than on revenues. This structure may tilt the balance of rewards towards songwriters at the expense of streaming services.

70. Therefore, a per-play rate structure is a more appropriate rate structure for streaming services, and is more likely to balance the rewards to songwriters and streaming services.

3. A Per-Play Rate Structure is Consistent with Accepted Royalty Rate Structures for Other Prominent Forms of Music Distribution

71. Music distribution has evolved from physical media to digital downloads to streaming.¹¹⁹ In the past, for every prominent form of music distribution, royalties were paid for each incremental unit consumed (i.e., there was a royalty payment associated with every song/album sold). As the number of music units sold increased, the royalty payments increased commensurately.

72. As discussed earlier (in Section VI), in 2008 the Copyright Royalty Board weighed the appropriate size and structure of the mechanical royalty rate for physical phonorecord deliveries, permanent digital downloads, and ringtones. It concluded that a per-unit structure was properly suited for the industry and was consistent with the four Section 801(b) factors. At the time of the 2008 decision, the per-unit structure covered virtually all forms of music delivery prevalent at the time (i.e., physical phonorecords and digital downloads).¹²⁰

73. The current royalty rates based on the per-unit structure for physical formats and permanent digital downloads have been in effect since January 2006 (before that, they were

¹¹⁹ See Ramaprasad Report, ¶¶ 46–47.

¹²⁰ Note that royalty rates for streaming services and locker services were first determined through a 2008 decision, and that Spotify did not reach the U.S. market until 2011. See “Copyright Royalty Board Establishes First-Time Mechanical Rates for Ringtones and Ad-Supported Streaming Music,” Hughes Hubbard eAlert, November 2008, http://www.hugheshubbard.com/PublicationDocuments/schnapp_Copyright%20Royalty%20Board%20Establishes_nov2008.pdf, a true and correct copy of which is attached hereto as **APL-067**; Daniel Ek, “Hello America. Spotify Here.,” *Spotify News*, July 14, 2011, <https://news.spotify.com/us/2011/07/14/hello-america-spotify-here/>, a true and correct copy of which is attached hereto as **APL-31**.

slightly lower in magnitude).¹²¹ As discussed in Section V.C., in the current proceeding many key players in the industry, including NMPA, NSAI, other copyright owners, Warner Music Group, Universal Music Group, and Sony Music Entertainment entered into a settlement to keep the existing royalty rates for physical phonorecords, permanent digital downloads, and ringtones for the rate period 2018-2022.¹²² This suggests that the music industry continues to be comfortable with the magnitude and structure of the statutory rates in place today, and, with a single exception, has requested to extend them for another rate period.

74. Because other prominent forms of music distribution are based on a per-unit royalty structure, as the music units sold increase, the royalty payments increase commensurately. In contrast, if royalty payments to publishers and songwriters are calculated as a share of revenues, there is no guarantee that the royalty payments would increase commensurately with music consumption. For example, if the growth of streaming music consumption, as measured by number of streams, outpaces associated revenues (and any royalties calculated as a percentage of those revenues), there will be a divergence between the growth in music consumption on the one hand, and royalty payments to publishers and song writers on the other.¹²³ This was indeed the case in the ad-supported streaming industry in recent years, as shown in Figure 1 below. Although the number of streams via ad-supported services increased 63% between 2013 and 2014, and 101% between 2014 and 2015, revenues over the same time period only increased by 34% and 31%, respectively.

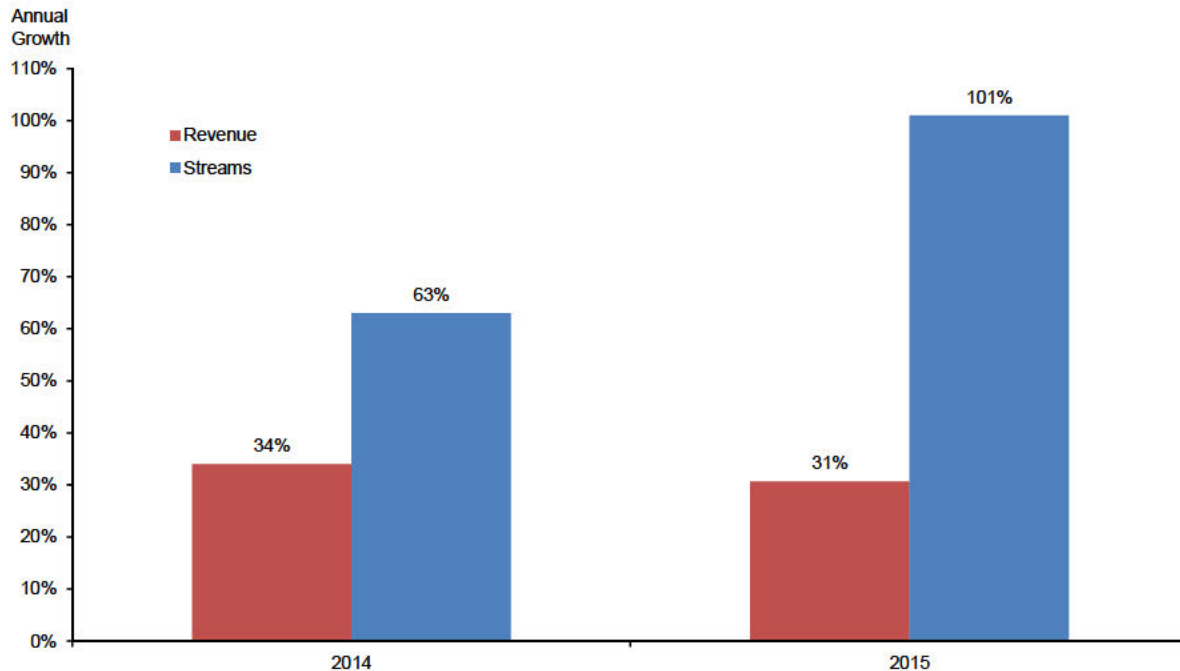
¹²¹ **APL-099**, “What Are Mechanical Royalty Rates?,” *Harry Fox Agency*, https://www.harryfox.com/license_music/what_mechanical_royalty_rates.html.

¹²² Copyright Royalty Board, “Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III),” Federal Register 81, no. 142, July 25, 2016, 48371–48372; Motion to Adopt Settlement Industry-Wide, *In re Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)*, October 28, 2016.

¹²³ For example, Spotify calculates royalty payments to publishers and songwriters based, among other things, on Spotify’s revenue (through advertising and subscriptions) and the share of the songwriters’ songs relative to the overall streams on Spotify. With an increase in the number of streams for a song, all else equal, the total royalty payment for that song would increase. However, if the revenue does not increase as the streaming of a song increases, the royalty payment per stream would decrease. See “Spotify Explained,” *Spotify Artists*, <https://www.spotifyartists.com/spotify-explained/>, a true and correct copy of which is attached hereto as **APL-176**.

Figure 1

Growth of Ad-Supported Interactive Music Streaming in the U.S.
Revenues and Number of Streams
2014 – 2015



Source: “Music streaming is getting bigger and bigger, but artist revenue isn’t keeping up,” March 22, 2016, Mashable, a true and correct copy of which is attached hereto as **APL-177**; “News and Notes on 2015 RIAA Shipment and Revenue Statistics,” RIAA, a true and correct copy of which is attached hereto as **APL-095**.

Note: “Annual Growth” refers to the change from the previous year.

75. Moreover, interactive streaming is growing as other forms of music delivery (e.g., physical, permanent downloads) are declining.¹²⁴ As interactive streaming becomes a major means of music consumption, it is reasonable to bring the streaming rate structure in line with that of other key methods of music delivery. Since copyright owners continue to lose guaranteed per-unit income for reproduction of their works in these other forms, bringing the structure of interactive streaming royalties in line with those methods would provide copyright owners with protection against those losses. Indeed, the finding by the Copyright Royalty Board in its 2008 opinion that a per-unit rate (or a per-play rate, in this case) is appropriate for permanent downloads because it appropriately balances the rewards to songwriters and publishers with the

¹²⁴ See Ramaprasad Report, ¶¶ 53–55.

costs to distributors also applies to streaming services. As with the previous forms of music distribution, a per-play rate structure is needed to appropriately compensate copyright owners.

4. A Per-Play Rate Structure is Simple and Transparent

76. The calculation of royalty payments for interactive streaming under a percent-of-revenue rate structure or a hybrid rate structure is complex. As an initial matter, it requires the determination of the relevant revenue of the streaming service or the “service revenue,” as it is called under the current statutory rates.¹²⁵ Service revenue under the current statutory rates is not simply the total revenue of the streaming service, but rather the total revenue minus exclusions such as:¹²⁶

- “Revenue derived from non-music voice, content and text services;”
- “Revenue derived from other non-music products and services (including search services, sponsored searches and click-through commissions); and”
- “Revenue derived from music or music-related products and services that are not or do not include licensed activity.”

77. Further, for ad-supported streaming services, the current statutory rates provide that “advertising or sponsorship revenue shall be reduced by the actual cost of obtaining such revenue, not to exceed 15%.”¹²⁷

78. The determination of service revenue for streaming could be particularly challenging when the service provider offers a streaming service as part of a larger bundle of services for which it charges a single price. For example, Amazon Prime subscribers are offered multiple bundled services such as expedited shipping on eligible goods (e.g., free two-day shipping), music streaming and access to personalized and curated playlists (e.g., Prime Music, not to be confused with Amazon Music Unlimited, which is not bundled with Amazon Prime),¹²⁸ e-book rentals (e.g., Kindle Owner’s Lending Library), and select movies and TV shows (e.g., Prime

¹²⁵ 37 C.F.R. §§ 385.11–12.

¹²⁶ 37 C.F.R. § 385.11.

¹²⁷ 37 C.F.R. § 385.11.

¹²⁸ **APL-169**, Rick Brodia, “Here’s Everything That’s Included with Amazon Prime,” *CNET*, October 18, 2016, <https://www.cnet.com/how-to/heres-everything-thats-included-with-amazon-prime/>.

Video) for a price of \$10.99/month.¹²⁹ Under the current statutory rates, the service revenue for such bundles is subjective and can be interpreted differently by different service providers.¹³⁰

“Where the licensed activity is provided to end users as part of the same transaction with one or more other products or services that are not a music service engaged in licensed activity, then the revenue deemed to be recognized from end users for the service for the purpose of the definition in paragraph (1) of the definition of ‘Service revenue’ shall be the revenue recognized from end users for the bundle less the standalone published price for end users for each of the other component(s) of the bundle; provided that, if there is no such standalone published price for a component of the bundle, then the average standalone published price for end users for the most closely comparable product or service in the U.S. shall be used or, if more than one such comparable exists, the average of such standalone prices for such comparables shall be used.”

79. A hybrid rate structure, which may have percent-of-revenue as one of its prongs, also has other implications for calculating royalty payments. For example, under the current statutory rates, the number of subscribers and the royalty payments made for sound recordings also need to be considered in the calculation of royalty payments to songwriters.¹³¹

80. The number and variety of factors to consider under the percent-of-revenue structure or the hybrid structure make the calculation of royalty rates complicated. The particular business model of the service provider (e.g., ad-supported or subscription-based) and the strategic decisions made by the service provider could affect service revenue and may lead to widely varying effective per-stream rates: a songwriter could receive different per-stream rates for the same song streamed on different services, and could even receive different per-stream rates from the same service for different time periods, depending on the actual magnitude of the revenue and how the service revenue is determined.

81. Accordingly, because the magnitude of service revenue is inherently idiosyncratic, the calculation of the royalty payment based on service revenue is opaque to songwriters. For example, consider Service A and Service B, two interactive streaming services, each with 1

¹²⁹ “Amazon Prime One Year Membership,” *Amazon*, <https://www.amazon.com/Amazon-Prime-One-Year-Membership/dp/B00DBYBNEE>, a true and correct copy of which is attached hereto as **APL-026**.

¹³⁰ 37 C.F.R. § 385.11.

¹³¹ 37 C.F.R. § 385.13.

million users. Suppose 700,000 of Service A’s users are paid subscribers, whereas only 400,000 of Service B’s users are paid subscribers, and the rest are free trial users. If both services charge the same subscription price per month, their service revenues would be different. As a result, even if the total number of streams on both Service A and Service B for a particular song are identical, the royalty payments made by the two services for that same song would be different. In such a system, songwriters may not be able to understand why they are being paid differently by the two services.

82. The complexity and the resulting potential confusion surrounding the calculation of royalty payments has been recognized by the Copyright Royalty Board Judges in a different setting (Web IV proceeding):

“Moreover, other parties raised numerous, valid objections to the use of a greater-of-structure with a percent-of-revenue prong, *See, e.g.*, NAB Ex. 4011 (Weil WRT) (a percent-of-revenue would create uncertainty and controversy regarding the definition and allocation of revenue).”¹³²

83. A per-play rate structure, on the other hand, is simple to understand and administer. The royalty payment made to the songwriters would correspond directly to the number of times a song is streamed multiplied by the per-play rate. It also is transparent. The songwriters would know precisely how their payment was calculated given a certain number of streams of their songs. There would be no variability in the per-stream rates that songwriters would receive from different services or from the same service over time.

84. In summary, Apple’s proposal for interactive streaming supports the CRB’s Section 115 rate objectives¹³³:

- a) Objective: To maximize the availability of creative works to the public.
 - Per-play rate structures have been used successfully in other methods of music distribution and are likely to be successful for interactive streaming, as well. Moreover, these rate structures provide incentives for songwriters and publishers to continue creating new musical works, and for interactive

¹³² Copyright Royalty Board, “Determination of Royalty Rates and Terms for Ephemeral Recording and Webcasting Digital Performance of Sound Recordings (Web IV),” *Federal Register* 81, no. 84, May 2, 2016, 26316–26410 at 26326, a true and correct copies of which is attached hereto as **APL-036**.

¹³³ 17 U.S.C. § 801(a).

streaming services to continue innovating and developing their music distribution platforms.

- b) Objective: To afford the copyright owner a fair return for his or her creative work and the copyright user a fair income under existing conditions.
- Under Apple’s proposal, the copyright owners would be protected because the intrinsic value of their work is recognized by the per-play rate. The copyright user, too, would have the opportunity to earn a fair income, particularly in light of the current growth and popularity of the interactive streaming industry.
- c) Objective: To reflect the relative roles of the copyright owner and the copyright user in the product made available to the public with respect to relative creative contribution, technological contribution, capital investment, cost, risk, and contribution to the opening of new markets for creative expression and media for their communication.
- Apple’s proposal appropriately balances the rewards to songwriters and streaming services. Songwriters are paid each time their songs are streamed and receive a payment commensurate with the demand for their songs that is not tied to the financial outcomes of the streaming services’ decisions. On the other hand, streaming services enjoy the benefits of their innovations and relative contributions that generate increased revenue.
- d) Objective: To minimize any disruptive impact on the structure of the industries involved and on generally prevailing industry practices.
- Per-unit rates are well established for various different forms of music distribution, and are very familiar to the music industry. Because a per-play rate only requires two metrics for calculation (the rate, and the number of streams), administering this system would retain the intuitive simplicity of other prevailing per-play rate structures.

B. Apple’s Proposed Per-Play Rate for Interactive Streaming is Consistent with Relevant Benchmarks

85. Dr. Ramaprasad has compared Apple’s proposed per-play rate for interactive streaming with benchmarks from the music industry and academic research.¹³⁴ Based on my review of her analysis, I understand that both music industry professionals and academics agree that the streams-to-downloads ratio is, or has recently been, close to 100:1.¹³⁵ Applying this ratio to the royalty rate for downloads (\$0.091) results in a per-play rate of \$0.00091 for interactive streaming, which is the rate proposed by Apple. Dr. Ramaprasad’s finding is sound and I

¹³⁴ See Ramaprasad Report, § VIII.

¹³⁵ See Ramaprasad Report, § VIII.

therefore conclude that Apple's proposal is also reasonable in that it is consistent with accepted benchmarks.

VIII. APPLE'S PROPOSED RATES FOR LOCKER SERVICES ARE APPROPRIATE

86. Apple's proposal for locker services under Subpart C also simplifies the royalty structure currently governing the mechanical royalties for locker services. It also balances the rewards to the songwriters and to the streaming services, and is, therefore, appropriate.

A. A Per-Subscriber Rate Structure for Paid Locker Services is Simple, And Balances the Rewards to Songwriters and Locker Services

87. A per-subscriber rate structure, rather than a percent-of-revenue rate structure or a hybrid rate structure, is appropriate for paid locker services. The per-subscriber rate structure proposed by Apple is simpler and easier to understand than the current rate structure. It further balances the rewards to the songwriters and to the streaming services. Some of the disadvantages of percent-of-revenue and hybrid rate structures discussed earlier in the context of interactive streaming are also relevant for locker services. However, a per-play rate structure, such as that proposed by Apple for interactive streaming, would not be appropriate for locker services.

88. First, as was the case with a per-play rate structure in interactive streaming, a per-subscriber rate structure for locker services would be transparent and simpler to understand. The calculation of royalties based on a percent-of-revenue rate structure or a hybrid rate structure, on the other hand, is a complex exercise and is likely to confuse songwriters. Furthermore, many paid locker services are bundled with other services. Apportioning the revenue attributable to the paid locker service part of the bundle is challenging and subject to interpretation. Under a per-subscriber rate, copyright owners would know precisely how their royalty payments were calculated.

89. Second, paid locker services cater to consumers who previously purchased a song or album, either as a digital download (from any service) or a physical medium (e.g., CD or Vinyl). These consumers typically "upload" a previously purchased CD album after extracting its songs (this process is also known as "ripping" the files from the CD).¹³⁶ Thus, one can think of a paid

¹³⁶ Mark Harris, "CD Ripping: Is it Legal to Rip Your Own CDs?," *About.com*, September 23, 2016, http://mp3.about.com/od/digitalmusicfaq/f/CDripping_legal.htm, a true and correct copies of which is attached hereto as **APL-141**.

locker service as a service that enhances the value of a previously purchased album or song by allowing users to stream their purchased music from any device that connects to the locker service. More simply, a locker service gives users access to all of their music without the inconvenience of physically carrying a collection of CDs.¹³⁷

90. It is for this ease of access that paid locker services may charge a subscription fee, a portion of which is paid (as royalty payments) to copyright owners. A per-subscriber rate best reflects the value a consumer derives from the paid locker service. Moreover, it ensures that copyright owners are paid even when consumers use the paid locker service to upload songs but choose not to exercise the option to stream that music. A per-play rate structure, in that scenario, would pay copyright owners nothing. More importantly, applying a per-play rate for songs streamed through a paid locker service would not be justifiable because consumers own those songs and royalties have already been paid for those songs.

91. Third, a percent-of-revenue rate structure would penalize copyright owners when a service provider chooses to discount its service as a loss-leader. A service provider may have complementary products and offer the service at a discount or for free in order to attract users to the complementary products. For example, Google Play offers locker services for free to its users.¹³⁸ In a percent-of-revenue rate structure, copyright owners would be forced to share the burden of this subsidy.

92. Fourth, under a per-subscriber rate, service providers would be better rewarded for the risks they take in creating value for consumers. Locker service providers may add an innovative feature, such as an easy-to-use interface. The providers also may invest in technologies that lead to higher quality service, such as increased upload/download speeds. If a service provider is able to add more innovative features and charge a higher price, a per-subscriber rate structure, as opposed to a percent-of-revenue rate structure, would allow them to reap the rewards of such innovation.

¹³⁷ Maura Johnston, a music journalist, recalled her experience of bringing 24 CDs while commuting and having to decide which to bring. However, she notes, the advent of the MP3 in 2009 eliminated the decision-making process. See Jacob Ganz, "The Decade in Music: The Way We Listen Now," *National Public Radio*, December 2, 2009, <http://www.npr.org/2009/12/02/121023882/the-decade-in-music-the-way-we-listen-now>, a true and correct copies of which is attached hereto as **APL-117**.

¹³⁸ Darrell Etherington, "Google Play Music Increases Cloud Storage Limit to 50,000 Songs," *TechCrunch*, February 25, 2015, <https://techcrunch.com/2015/02/25/google-play-music-increases-cloud-storage-limit-to-50000-songs/>, a true and correct copies of which is attached hereto as **APL-076**.

B. Songwriters May Not Need to be Paid for Purchased Content Locker Services

93. Purchased content locker services provide users the ability to access music that they have already purchased through the same locker service provider for free.¹³⁹ For example, a consumer that purchases a song from iTunes has access to his or her copy of the song from the iTunes locker and can re-download the song at any time without any charge.¹⁴⁰ In other words, iTunes locker service is an additional service that comes bundled with the purchase of a digitally downloaded song. It is important to note that songwriters are paid royalties when consumers purchase songs. Because the only purpose of the service is to allow users to continue to access the music they have already purchased from that service,¹⁴¹ an additional royalty for purchased content locker service is not justifiable.

IX. CONCLUSION

94. Apple's proposed royalty rates for permanent downloads and ringtones under Subpart A, which are the same as the current royalty rates for those products, are consistent with the Copyright Royalty Board's finding in the prior Section 115 proceeding in 2008.¹⁴² The Copyright Royalty Board's analysis and findings from that proceeding apply to the current proceeding and there is no compelling reason to change the royalty rates for permanent downloads and ringtones. **RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)**. Apple's proposal for permanent downloads and ringtones is, therefore, reasonable.

95. A per-play rate structure, such as that proposed by Apple, is the appropriate structure for interactive streaming under Subpart B because it balances the rewards to songwriters and streaming services. As long as the per-play rate is appropriately determined and streams are measured in a way that is indicative of demand, royalty payments to songwriters are likely to be commensurate with the demand for their songs. If the demand for their songs increases (i.e., if their songs are streamed more), their income also will increase. Under a per-play rate structure,

¹³⁹ 37 C.F.R. § 385.21.

¹⁴⁰ **APL-028**, "Download Your Past Purchases," *Apple*, <https://support.apple.com/en-us/HT201272>.

¹⁴¹ **APL-070**, Dan Graziano, "Comparing Music Storage Services from Apple, Amazon, Google," *CNET*, March 10, 2015, <https://www.cnet.com/how-to/itunes-match-vs-google-play-vs-amazon-music/>.

¹⁴² Apple Inc. Proposed Rates and Terms, p. 1; **APL-071**, Final Determination of Rates and Terms, p. 1.

streaming services also would be rewarded for the risks they take, as the payment to songwriters would not be tied to the financial outcomes of the streaming services' decisions.


96. A per-play rate structure for interactive streaming is consistent with the rate structures for other prominent forms of music distribution (e.g., permanent downloads have a per-unit rate structure). As interactive streaming becomes a major means of music consumption and replaces other forms of music delivery, it is reasonable to bring the royalty rate structure in line with these other forms.

97. A per-play rate structure for interactive streaming is simple, transparent, and easy to administer. Under a per-play rate structure, the royalty payments to songwriters would correspond directly to the number of times a song is streamed (where a stream is appropriately measured). Songwriters would know exactly how royalty payments are calculated, and there would not be variability in per-stream rates that songwriters receive from different services or from the same service over time.

98. Apple's proposed royalty rate for interactive streaming is also reasonable in that it is consistent with benchmarks from the music industry and academic research.

99. Apple's proposed royalty rates for paid lockers services and purchased content locker services under Subpart C are similarly simple, transparent, and appropriate.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.



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 23. Ghose, A. and S. Han. 2009. An Empirical Analysis of User Content Generation and Usage Behavior in Mobile Media. *Proceedings of the International Conference on Information Systems (ICIS 2009)*, Arizona, December.
 24. Ghose, A., P. Ipeirotis, and B. Li. 2009. Towards Designing Ranking Systems for Hotels on Travel Search Engines: Combining Text mining with Demand Estimation in the Hotel Industry. *Proceedings of the Workshop on Information Technology and Systems (WITS 2009)*, Phoenix, December.
 25. Ghose, A., and S. Yang. 2008. Modeling and Estimating the Relationship Between Organic and Paid Search Advertising. *Proceedings of the Workshop on Information Technology and Systems (WITS 2008)*, Paris, December. **Best Paper Award Nominee**
 26. Ghose, A., and B. Gu. 2008. Market Frictions, Demand Structure and Price Competition in Online Markets. *Proceedings of the International Conference on Information Systems (ICIS 2008)*, Paris, December.
 27. Archak, N., A. Ghose and P. Ipeirotis. 2008. Deriving the Pricing Power of Product Features by Mining User-Generated Reviews. *INFORMS Conference on Information Systems and Technology (CIST 2008)*, Washington DC, October.
 28. Balakrishnan, K., A. Ghose, and P. Ipeirotis: 2008. The Impact of Information Disclosure on Stock Market Returns: The SOX Act and the Role of Media as an Information Intermediary. *Proceedings of the Workshop on Economics and Information Security (WEIS 2008)*, Dartmouth College,

June.

29. Ghose, A., and S. Yang. 2008. Analyzing Search Engine Advertising: Sponsored Search and Cross-Selling in Electronic Markets. *Proceedings of the World Wide Web Conference (WWW 2008)*, Beijing.
30. Ghose, A., and S. Yang. 2008. An Empirical Analysis of Sponsored Search Performance in Search Engine Advertising. *Proceedings of the First ACM International Conference on Web Search and Datamining Conference (WSDM 2008)*, Stanford.
31. Ghose, A., and B. Gu. 2007. Estimating Menu Costs in Electronic Markets. *Proceedings of the International Conference on Information Systems (ICIS 2007)*, Montreal, December. **Nominee for Best Overall Paper and Best Track Paper Award**
32. Ghose, A., and S. Yang. 2007. An Empirical Analysis of Sponsored Search Performance in Search Engine Advertising. *INFORMS Conference on Information Systems and Technology (CIST 2007)*, Seattle, November.
33. Forman, C., A. Ghose and A. Goldfarb. 2007. Geography and Ecommerce: Measuring Convenience, Selection and Price. *INFORMS Conference on Information Systems and Technology (CIST 2007)*, Seattle, November.
34. Archak, N., A. Ghose, and P. Ipeirotis. 2007. Show me the money! Deriving the Pricing Power of Product Features by Mining Consumer Reviews. *Proceedings of the Thirteenth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2007)*, San Jose.
35. Ghose, A., P. Ipeirotis, and A. Sundararajan. 2007. Opinion Mining Using Econometrics: A Case Study on Reputation Systems. *Proceedings of the Association for Computational Linguistics (ACL 2007)*, Prague.
36. Ghose, A., and P. Ipeirotis. 2007. Towards an Understanding of the Impact of Customer Sentiment on Product Sales and Review Quality. *Proceedings of the Workshop on Information Technology and Systems (WITS 2006)*, Wisconsin, December.
37. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Location on Consumer Purchases in Electronic Markets. *Proceedings of the International Conference on Information Systems (ICIS 2006)*, Milwaukee, Wisconsin, December.
38. Ghose, A., and B. Gu. 2006. Estimating the Costs of Price Adjustment in Electronic Markets. *Proceedings of the INFORMS Conference on Information Systems and Technology (CIST 2006)*, Pittsburgh, November.
39. Ghose, A., and A. Sundararajan. 2006. Software Versioning and Quality Degradation? An Exploratory Study of the Evidence. *Proceedings of the INFORMS Conference on Information Systems and Technology (CIST 2006)*, Pittsburgh, November.
40. Ghose, A., and U. Rajan. 2006. The Economic Impact of Regulatory Information Disclosure on Information Security Investments, Competition, and Social Welfare. *Proceedings of the Workshop on Economics and Information Security (WEIS 2006)*, Cambridge University, June.
41. Ghose, A., and A. Sundararajan. 2005. Software Versioning and Quality Degradation? An Exploratory Study of the Evidence. *Proceedings of the International Conference on Information Systems (ICIS 2005)*, Las Vegas, Nevada, December.
42. Ghose, A., K. Huang and A. Sundararajan 2005. Versions and Successive Generations: An Analysis of Product Line Strategies and Cannibalization in Software Markets. *Proceedings of the INFORMS Conference on Information Systems and Technology (CIST)*, San Francisco, November.
43. Ghose, A., P. Ipeirotis and A. Sundararajan 2005. Reputation Premium and Network Structure in Electronic Peer-to-Peer Markets. *Proceedings of the ACM SIGCOMM Workshop on Economics of P2P*, Philadelphia, August.
44. Ghose, A., and A. Sundararajan. 2005. Pricing Security Software: Theory and Evidence. *Proceedings of the Workshop on Economics and Information Security (WEIS 2005)*, Harvard University, June.
45. Ghose, A., R. Telang, and R. Krishnan. 2005. Welfare Implications of Secondary Electronic Markets. *Proceedings of the Hawaii International Conference on System Sciences (HICSS 2005)*, Hawaii,

January. Best Paper Award Nominee

46. Ghose, A., M. Smith, and R. Telang. 2004. Price Elasticities and Social Welfare in Secondary Electronic Markets. *Proceedings of the International Conference on Information Systems (ICIS 2004), Washington D.C., December. Best Paper Award Nominee*
47. Ghose, A., R. Telang, and R. Krishnan. 2003. Durable Goods Competition in Secondary Electronic Markets. *Proceedings of the International Conference on Information Systems (ICIS 2003), Seattle December.*
48. Ghose, A., M. Smith, and R. Telang. 2003. Internet Exchanges for Used Books: An Empirical Analysis of Welfare Implications and Policy Issues. *Proceedings of the International Conference on Information Systems (ICIS 2003), Seattle, December.*
49. Ghose, A., V. Choudhary, T. Mukhopadhyay, and U. Rajan. 2003. Personalized Pricing: A Strategic Advantage for Electronic Retailers. *Proceedings of the INFORMS Conference on Information Systems and Technology (CIST 2003), Atlanta, October.*
50. Gal-Or, E., and A. Ghose. 2003. The Economic Consequences of Sharing Security Information. *Proceedings of the Workshop on Economics and Information Security (WEIS 2003), College Park, University of Maryland, May.*
51. Ghose, A., T. Mukhopadhyay, and U. Rajan. 2002. Advantage for Electronic Retailers. *Proceedings of the International Conference on Information Systems (ICIS 2002), Barcelona, Spain, December.*
52. Ghose, A., T. Mukhopadhyay, and U. Rajan. 2002. Impact of Referral Services on Channel Profits: Competition between Manufacturers & Infomediaries. *Proceedings of INFORMS Conference on Information Systems and Technology (CIST 2002), San Jose, California, October.*

PAPERS IN CONFERENCE AND WORKSHOP PROGRAMS

1. Chan, J., A. Ghose and K. Xu. 2015. The Rising Star of Digital Channels. *10th Annual Symposium on Statistical Challenges in e-Commerce Research (SCECR), Ethiopia.*
2. Ghose, A., B. Li, and S. Liu. 2015. Mobile Trajectory-based Advertising: Evidence from a Large-scale Randomized Field Experiment. *Productions and Operations Management Society Meetings. Washington DC.*
3. Ghose, A., B. Li, and S. Liu. 2015. Mobile Trajectory-based Advertising: Evidence from a Large-scale Randomized Field Experiment. *INFORMS Marketing Science Conference, Baltimore.*
4. Burtch, G., Ghose, A. and Wattal, S. 2014. The Hidden Costs of Accommodating Crowdfunder Privacy Preferences: A Randomized Field Experiment. *Marketplace Innovation Conference, Columbia University.*
5. Burtch, G., Ghose, A. and Wattal, S. 2014. The Hidden Costs of Accommodating Crowdfunder Privacy Preferences: A Randomized Field Experiment. *ZEW Conference on the Economics of Information and Communication Technologies, Mannheim, Germany.*
6. Burtch, G., Ghose, A. and Wattal, S. 2014. Do As I Say, or Do As I Do? Distinguishing Observational Learning from Word-of-Mouth Effects. *9th Annual Symposium on Statistical Challenges in e-Commerce Research (SCECR), Tel Aviv, Israel.*
7. Burtch, G., Ghose, A. and Wattal, S. 2014. An Examination of Peer Referrals in Crowdfunding. *Crowds 2.0: New Frontiers in Crowdfunding + Crowdsourcing, NYU Stern, NY.*
8. Burtch, G., Ghose, A. and Wattal, S. 2013. The Impact of Online Privacy Controls on User Engagement: Evidence from a Randomized Experiment on a Crowdfunding Platform. *Workshop on Information Systems and Economics (WISE), Milan, Italy.*
9. Burtch, G., Ghose A., and Wattal, S. 2013. Private Displays of Affection: An Empirical Examination of Online Crowdfunder Information Hiding. *Academic Symposium on Crowdfunding, Berkeley, CA.*
10. Burtch, G., Ghose, A. and Wattal, S. 2013. The Impact of Online Privacy Controls on User

- Engagement: Evidence from a Randomized Experiment on a Crowdfunding Platform. *INFORMS Annual Meeting, Minneapolis, MN.*
11. Burtch, G., Ghose, A., and Wattal, S. 2013. Secret Benefactors: Crowdfunder Information Hiding and its Implications for Fundraising Outcomes. *INFORMS Conference on Information Systems and Technology (CIST), Minneapolis, MN.*
 12. Burtch, G., Ghose, A., and Wattal, S. 2013. An Empirical Examination of the Antecedents and Consequences of Information Hiding in Crowdfunded Markets. *INFORMS Marketing Science Conference, Istanbul, Turkey.*
 13. Burtch, G., Ghose, A., and Wattal, S. 2013. An Empirical Examination of Online Information Hiding.” 8th *Symposium on Statistical Challenges in eCommerce Research (SCECR), Lisbon, Portugal.*
 14. Burtch, G., Ghose, A. and Wattal, S. 2013. Cultural Differences and Geographic Proximity in Online Crowd-funding. *International Symposium on Information Systems (ISIS), Goa, India.*
 15. Chan, J., A. Ghose and R. Seamans. 2013. The Internet and Hate Crime. *Workshop on Information Systems and Economics (WISE), Milan, December.*
 16. Ghose, A., S. Han and S. Park. 2013. Analyzing the Interdependence Between Web and Mobile Advertising, *Marketing Science Conference, Istanbul, July.*
 17. Molitor, D., M. Spann and A. Ghose. 2013. Measuring the Effectiveness of Location Based Advertising. Randomized Field Experiments Comparing PC with Mobile, *Marketing Science Conference, Istanbul, July.*
 18. Ghose, A., S. Han and S. Park. 2013. Analyzing the Interdependence Between Web and Mobile Advertising, *Wharton Customer Analytics Conference, Wharton School, May.*
 19. Anindya Ghose, Panos Ipeirotis and Beibei Li. 2012. Surviving Social Media Overload: Predicting Consumer Footprints on Product Search Engines. *Workshop on Information Systems and Economics (WISE), Orlando, December.*
 20. Chan, J. and A. Ghose. 2012. Internet's Dirty Secret: Assessing the Impact of Online Intermediaries on the Outbreaks of STDs, *National Bureau of Economic Research Summer Meetings, Boston.*
 21. Chan, J. and A. Ghose. 2012. Internet's Dirty Secret: Assessing the Impact of Online Intermediaries on the Outbreaks of STDs, *Statistical Challenges in E-Commerce Research (SCECR), Montreal.*
 22. Ghose, A., and S. Han. 2012. Mobile Advertising and App Adoption in the New Mobile Economy, *Statistical Challenges in E-Commerce Research (SCECR), Montreal.*
 23. Ghose, A., P. Ipeirotis, and B. Li. 2012. Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content, *Research Frontiers in Marketing Science Conference, University of Texas at Dallas, February.*
 24. Ghose, A., P. Ipeirotis, and B. Li. 2011. Examining the Impact of Search Engine Ranking and Personalization on Consumer Behavior: Combining Bayesian Modeling with Randomized Field Experiments. *Workshop on Information Systems and Economics (WISE), Shanghai, December.*
 25. Ghose, A., A. Goldfarb, and S. Han. 2011. How is the Mobile Internet Different? Search Costs and Local Activities. *Summer Institute of Competitive Strategy, UC Berkeley, July.*
 26. Ghose, A., A. Goldfarb, and S. Han. 2011 How is the Mobile Internet Different? Search Costs and Local Activities. *Searle Research Symposium on the Economics and Law of Internet Search, Northwestern University, June.*
 27. Ghose, A., A. Goldfarb, and S. Han. 2011. How is the Mobile Internet Different? Search Costs and Local Activities. *Statistical Challenges in E-Commerce Research (SCECR), University of Arizona, June.*
 28. Chan, J., A. Ghose. 2011. Examining the Antecedents and Consequences of Disclosing Medical Privacy Information Online. - *Winter Conference on Business Intelligence, University of Utah, Salt Lake City, March.*
 29. Ghose, A., A. Goldfarb, and S. Han. 2010. Search Costs and Benefits on the Mobile Internet: An Empirical Analysis of Microblogging Behavior. *Workshop on Information Systems and*

- Economics (WISE), St. Louis, December.***
30. Huang, Y., P. Singh, and A. Ghose. 2010. An Empirical Analyses of Dynamics in Enterprise Social Media. ***Workshop on Information Systems and Economics (WISE), St. Louis, December.***
 31. Ghose, A., P. Ipeirotis, and B. Li. 2010. Estimating Demand in the Hotel Industry by Mining User- Generated and Crowd-Sourced Content. ***NBER IT Economics & Productivity Workshop, Boston, July.***
 32. Ghose, A. and S. Han. 2010. A Dynamic Structural Model of User Learning in Mobile Media Content. ***Stanford Institute of Theoretical Economics (SITE), Stanford University, July.***
 33. Ghose, A., P. Ipeirotis, and B. Li. 2010. Estimating Demand in the Hotel Industry by Mining User- Generated and Crowd-Sourced Content. ***Marketing Science Conference, Cologne, June.***
 34. Ghose, A., P. Ipeirotis, and B. Li. 2010. Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content. ***Searle Research Symposium on the Economics and Law of Internet Search, Northwestern University, June.***
 35. Ghose, A., P. Ipeirotis, and B. Li. 2010. Estimating Demand in the Hotel Industry by Mining User- Generated and Crowd-Sourced Content. ***Customer Insights Conference, Yale University, May.***
 36. Ghose, A. and S. Han. 2009. A Dynamic Structural Model of User Learning in Mobile Media Content. ***MSI-WIMI Conference, University of Pennsylvania, Philadelphia, December.***
 37. Ghose, A. and S. Han. 2009. A Dynamic Structural Model of User Learning in Mobile Media Content, ***SIEMR-Microsoft Conference, Stanford University, September.***
 38. Ghose, A. and S. Han. 2009. A Dynamic Structural Model of User Learning in Mobile Media Content. ***INFORMS Marketing Science Conference, Ann Arbor, Michigan, June.***
 39. Combining Text mining with Econometrics: Monetization of User-Generated Content and Online Advertising. ***CITI Conference on User-Generated Content 3.0, Columbia University, April.***
 40. Ghose, A., and S. Yang. 2009. Modeling and Estimating the Relationship Between Paid and Organic Search Advertising. ***Conference on the Economics of Software & Internet Industries, Toulouse, January.***
 41. Ghose, A., and S. Yang. 2008. Organic vs. Paid Search Advertising. ***Workshop on Information Systems and Economics (WISE), Paris, December.***
 42. Ghose, A., and S. Yang. 2008. Modeling and Estimating the Relationship Between Paid and Organic Search Advertising. ***FTC and North-Western Microeconomics Conference, Washington DC, November.***
 43. The Dimensions of Reputation in Electronic Markets, ***INFORMS Annual Meeting, Washington DC, October.***
 44. Ghose, A. and S. Yang. 2008. An Empirical Analysis of Sponsored Search Performance in Search Engine Advertising. ***International Industrial Organization Conference, Washington DC, May.***
 45. Ghose, A., and S. Yang. 2008. An Empirical Analysis of Sponsored Search Performance in Search Engine Advertising, ***Research Frontiers in Marketing Science Conference, University of Texas at Dallas, February.***
 46. Ghose, A., and S. Yang. 2008. An Empirical Analysis of Search Engine Advertising: Sponsored Search and Cross-Selling in Electronic Markets, ***Leveraging Online Media and Online Marketing, Marketing Science Institute. February.***
 47. Ghose, A., and S. Yang. 2007. An Empirical Analysis of Sponsored Search Performance in Search Engine Advertising, ***Workshop on Information Systems and Economics (WISE 2007), December.***
 48. Ghose, A., and P. Ipeirotis. 2007. Designing Novel Review Ranking Systems: Predicting Usefulness and Impact of Reviews. ***Proceedings of the Ninth International Conference on Electronic Commerce (ICEC), Minnesota, August.***
 49. Ghose, A., and S. Yang. 2007. An Empirical Analysis of Paid Placement in Online Keyword Advertising. ***Proceedings of the Ninth International Conference on Electronic Commerce (ICEC), Minnesota, August.***
 50. Ghose, A., M. Smith, and R. Telang. 2007. Internet Exchanges for Used Books: An Empirical

- Analysis of Product Cannibalization and Welfare Implications. *Conference on Operational Excellence in Retailing, Harvard Business School, June.*
51. Ghose, A., and P. Ipeirotis. 2007. Designing Novel Review Ranking Systems on the Web: Combining Economics with Opinion Mining. *Third Research Symposium on Statistical Challenges in E- Commerce Research (SCECR), University of Connecticut, May.*
 52. Ghose, A., and O. Yao. 2007. Goodbye Price Dispersion? New Evidence from Transaction Prices in Electronic Markets. *Third Research Symposium on Statistical Challenges in E-Commerce Research (SCECR), University of Connecticut, May.*
 53. Forman, C., A. Ghose and A. Goldfarb. 2007. Geography and Ecommerce: Measuring Convenience, Selection and Price. *International Industrial Organization Conference, Savannah, April.*
 54. Archak, N., A. Ghose and P. Ipeirotis. 2007. Towards Automating the Pricing Power of Product Attributes: An Analysis of Online Product Reviews. *Winter Business Intelligence Conference, Utah, February.*
 55. Forman, C., A. Ghose and A. Goldfarb. 2007. Geography and Ecommerce: Measuring Convenience, Selection and Price. *DIS Workshop, University of Florida, January.*
 56. Ghose, A. and P. Ipeirotis. 2007. Designing Trusted Ranking Systems for Consumer Reviews: Combining Economics with Opinion Mining. *DIMACS Workshop on Economics of Information Security, Rutgers University, January.*
 57. Ghose, A. and P. Ipeirotis. 2007. Designing Ranking Systems for Consumer Reviews: The Economic Impact of Customer Sentiment in Electronic Markets. *Proceedings of the 2007 International Conference on Decision Support Systems (ICDSS 2007), IIM Kolkata, January.*
 58. Forman, C., A. Ghose and A. Goldfarb. 2007. Geography and Ecommerce: Measuring Convenience, Selection and Price. *HICSS 20th Anniversary Symposium on Competitive Strategy, Economics, and Information Systems, Hawaii, January.*
 59. Ghose, A. and B. Gu. 2006. Estimating Menu Costs in Electronic Markets. *International Symposium on Information Systems (ISIS 2006), India, December.*
 60. Ghose, A., P. Ipeirotis and A. Sundararajan. 2006. The Dimensions of Reputation in Electronic Markets. *International Symposium on Information Systems (ISIS 2006), India, December.*
 61. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Geographical Location on Consumer Use of Electronic Markets. *International Symposium on Information Systems (ISIS 2006), India, December.*
 62. Ghose, A. and B. Gu. 2006. Is Consumer Demand Kinked? Estimating Menu Costs and Search Costs in Electronic Markets. *Workshop on Information Systems and Economics (WISE 2006), Northwestern University, Evanston, December.*
 63. Ghose, A., T. Mukhopadhyay, and U. Rajan. 2006. Impact of Internet Referral Services on the Supply Chain. *INFORMS Annual Meeting, Pittsburgh, Pennsylvania, November.*
 64. Ghose, A. and B. Gu. 2006. Is Consumer Demand Kinked? Estimating Menu Costs and Search Costs in Electronic Markets. *INFORMS Annual Meeting, Pittsburgh, Pennsylvania, November.*
 65. Ghose, A., K. Huang and A. Sundararajan 2006. Versions and Successive Generations: An Analysis of Product Line Strategies and Cannibalization in Software Markets. *INFORMS Annual Meeting, Pittsburgh, Pennsylvania, November.*
 66. Ghose, A. and O. Yao. 2006. Price Dispersion on the Internet: New Evidence from Transaction Prices in B2B Electronic Markets. *INFORMS Annual Meeting, Pittsburgh, Pennsylvania, November.*
 67. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Location on Consumer Purchases in Electronic Markets. *INFORMS Annual Meeting, Pittsburgh, Pennsylvania, November.*
 68. Ghose, A. 2006. Information Uncertainty in Electronic Markets: An Empirical Analysis of Trade Patterns and Adverse Selection. *Proceedings of ZEW Workshop on ICT, Germany, October.*
 69. Ghose, A. and K. Huang. 2006. Personalized Pricing and Quality Design. *INFORMS Marketing Science Conference, Pittsburgh, Pennsylvania, June.*

70. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Location on Consumer Purchases in Electronic Markets. *INFORMS Marketing Science Conference, Pittsburgh, Pennsylvania, June.*
71. Ghose, A. and B. Gu. 2006. Measuring Menu Costs of Online Retailers. *INFORMS Marketing Science Conference, Pittsburgh, Pennsylvania, June.*
72. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Location on Consumer Purchases in Electronic Markets. *Conference on Operational Excellence in Retailing. Wharton School, June.*
73. The Dimensions of Reputation in Electronic Markets. *Decision and Information Sciences Workshop, University of Florida, February.*
74. Ghose, A., P. Ipeirotis and A. Sundararajan. 2006. The Dimensions of Reputation in Electronic Markets. *Statistical Challenges in E-Commerce Research (SCECR), University of Minnesota, May.*
75. Forman, C., A. Ghose and A. Goldfarb. 2006. The Impact of Location on Consumer Purchases in Electronic Markets. *Statistical Challenges in E-Commerce Research (SCECR), University of Minnesota, May.*
76. Ghose, A. and B. Gu. 2006. Is Consumer Demand Kinked? Estimating Menu Costs and Search Costs in Electronic Markets. *Statistical Challenges in E-Commerce Research (SCECR), University of Minnesota, May.*
77. Ghose, A. and K. Huang. 2006. Personalized Pricing and Quality Design. *International Industrial Organization Conference, Boston, Massachusetts, April.*
78. Ghose, A. and K. Huang. 2005. Personalized Pricing and Quality Design. *Workshop on Information Systems and Economics (WISE 2005), UC Irvine, California, December.*
79. Ghose, A. and K. Huang. 2005. A Competitive Analysis of Personalized Pricing and Quality Customization. *Proceedings of the Workshop on CRM, New York University, November.*
80. Ghose, A. and A. Sundararajan. 2005. Pricing and Product Line Strategies for Software: Theory and Evidence. *INFORMS Annual Meeting, San Francisco, California, November.*
81. Ghose, A., M. Smith, and R. Telang. 2005. Internet Exchanges for Used Books: An Empirical Analysis of Product Cannibalization and Welfare Implications. *INFORMS Annual Meeting, San Francisco, California, November.*
82. Ghose, A. 2005. Used Good Trade and Adverse Selection: A Cross-Country Comparison of Electronic Secondary Markets. *INFORMS Annual Meeting, San Francisco, California, November.*
83. Ghose, A. and A. Sundararajan. 2005. Pricing and Product Line Strategies for Software: Theory and Evidence. *Statistical Challenges in E-Commerce Research (SCECR), University of Maryland, College Park, May.*
84. Ghose, A., M. Smith, and R. Telang. 2005. Product Cannibalization and Welfare Implications. *Statistical Challenges in E-Commerce Research (SCECR), University of Maryland, College Park, May.*
85. Gal-Or, E., and A. Ghose. 2005. The Economic Consequences of Sharing Security Information. *International Industrial Organization Conference, Atlanta, Georgia, April.*
86. Ghose, A., M. Smith, and R. Telang. 2005. Internet Exchanges for Used Books: Welfare Implications and Policy Issues. *International Industrial Organization Conference, Atlanta, Georgia, April.*
87. Ghose, A., R. Telang and R. Krishnan. 2004. Impact of Electronic Secondary Markets on Information Goods Suppliers. *Workshop on Information Systems and Economics (WISE 2004), College Park, Maryland, December.*
88. Ghose, A., M. Smith, and R. Telang. 2004. Internet Exchanges for Used Books: An Empirical Analysis of Welfare Implications and Policy Issues. *INFORMS Annual Meeting, Denver, Colorado, October.*
89. Ghose, A., M. Smith, and R. Telang. 2004. Internet Exchanges for Used Books: An Empirical Analysis of Welfare Implications and Policy Issues. *MISRC/CRITO Symposium on the Digital Divide, Minneapolis, Minnesota, August.*
90. Ghose, A., T. Mukhopadhyay, and U. Rajan. 2003. Strategic Benefits of Internet Referral Services.

International Conference on Electronic Commerce (ICEC 2003), Pittsburgh, October.

91. Ghose, A., R. Telang and R. Krishnan. 2003. Durable Goods Competition in Secondary Electronic Markets. ***INFORMS Marketing Science Conference, College Park, University of Maryland, June.***
92. Ghose, A., T. Mukhopadhyay, and U. Rajan. 2002. Strategic Benefits of Internet Referral Services. ***Workshop on Information Systems and Economics (WISE 2002), Barcelona, Spain, December.***
93. Ghose, A., V. Choudhary, T. Mukhopadhyay, and U. Rajan. 2001. Dynamic Pricing on the Internet ***Workshop on Information Systems and Economics (WISE 2001), New Orleans.***

RESEARCH GRANTS AND AWARDS

- 2015 Adobe Faculty Research Award for “Combining Machine Learning with Randomized Field Experiments to Improve Mobile Advertising,” (with B. Li) \$ 50,000.
- 2015 NET Institute Grant for “Towards Digital Attribution,” (with V. Todri), \$3000.
- 2014 Wharton Customer Analytics Institute Award (with V. Todri, P. Adamapolous and P.V. Singh)
- 2014 Kauffman Grant for “Crowd funding Dynamics and its Impact on Entrepreneurial Landscape Empirical Analysis using Big Data,” (with G. Burtch and S. Wattal), \$30,000.
- 2013 Google Faculty Research Award for “Mobile Analytics in the New Mobile Economy,” \$66,500.
- 2012 Marketing Science Institute Grant for “Apps and Advertising in the Mobile Economy,” \$15,000.
- 2012 SEI-Wharton Future of Advertising Grant for “Innovative Approaches to Measuring Advertising Effectiveness,” with (S. Han), \$6000.
- 2012 Institute on Asian Consumer Insights (ACI) Grant for “Mobile Ad Effectiveness and App Adoption in Asian Markets,” \$30,000.
- 2012 Google Faculty Research Award for “Designing Ranking Systems for Product Search Engines,” (With P. Ipeirotis), \$60,000.
- 2012 NET Institute Grant for “Impact of Internet Intermediaries on Spread of STDs,” (with J. Chan), \$7000.
- 2012 NYU Abu Dhabi Institute Seed Grant (with V. Dhar, N. Memon, H. Nissenbaum and R. Karri). Research and Education Program,” (co-PI with R. Karri, N. Menon, H. Nissenbaum, and R. Zimmerman), \$2.9 mn.
- 2010 MSI-Wharton Interactive Media Initiative (WIMI) Grant for “Modeling Consumer Behavior in Social Media: Analyzing the Role of Geographical Location and Multichannel Usage in Microblogging Platforms,” (with S. Han), \$ 10,000.
- 2010 Wharton Interactive Media Initiative (WIMI) Grant for “Modeling and Examining the Interdependence between Search and Display Advertising,” (with A. Goldfarb and S. Bae), \$5000.
- 2010 Google-WPP Marketing Research Award for “Modeling The Dynamics Of Consumer Behavior In Mobile Advertising And Mobile Social Networks,” \$ 75,000.
- 2009 NSF Federal Cyberservice SFS Grant for “ASPIRE: An SFS Program for Interdisciplinary Research and Education” (co-PI with N. Menon, H. Nissenbaum, R. Karri, and R Zimmerman), \$ 2.12 million.
- 2009 NYU Stern Center for Japan-US Business and Economics Studies Grant for “The Economic Value of User-Generated Multimedia Content: A Study of the Mobile Media Market in South Korea,” \$ 10,000.
- 2009 NET Institute Summer Grant for “A Structural Model of User Learning and Dynamics in Mobile Media Content,” (with S. Han).
- 2009 MSI-Wharton Interactive Media Initiative (WIMI) Grant for “The Economic Impact of User-Generated Content: Combining Text mining with Demand Estimation in the Hotel Industry,” (with P. Ipeirotis), \$ 6,500.
- 2009 MSI-Wharton Interactive Media Initiative Grant for “User Content Generation and Usage in Digital Media,” (with S. Han), \$ 6,500.

- 2009 NYU-Poly Research Grant for “The Economics of User-Generated Content in Online Social Media,” (with V. Dhar and K. Ross), \$ 73,500.
- 2008 NET Institute Summer Grant for “Impact of Product Attributes and Geography in Search Engine Advertising”
- 2007 Marketing Science Institute Grant for “An Empirical Analysis of Search Engine Advertising,” (with S. Yang), \$ 10,000.
- 2007 NET Institute Summer Grant for “An Empirical Analysis of Sponsored Search in Online Advertising,” (with S. Yang).
- 2007 NET Institute Summer Grant for “Using Text Analytics to Estimate the Economic Value of Online Product Reviews: An Empirical Analysis,”(with P. Ipeirotis).
- 2007 Microsoft Virtual Earth Award for “Local Search for Hotels and Restaurants using Econometrics, Spatial Data, and Image Classification,” (with P. Ipeirotis), \$ 35,000.
- 2007 NSF CAREER Award, “Identifying and Measuring the Economic Value of Information on the Internet,” IIS-0643847, \$ 498,500.
- 2006 NYU Research Challenge Fund for “Consumer Use of Electronic Markets: An Empirical Analysis of New and Used Good Markets,” \$ 10, 500.
- 2006 Microsoft Live Labs Award for “Combining Econometric and Text Mining Approaches for Measuring the Effect of Online Information Exchanges,” (with P. Ipeirotis) \$ 37,500.
- 2006 NET Institute Summer Grant for “Electronic commerce and Local Competition,” (with C. Forman and A. Goldfarb).
- 2006 NET Institute Summer Grant for “Search Costs and Menu Costs in Electronic Markets: Theory and Evidence,” (with B. Gu).
- 2005 NET Institute Summer Grant for “Used Good Trade and Adverse Selection: A Cross-Country Comparison of Electronic Secondary Markets,” \$10,500.
- 2005 NET Institute Summer Grant for “Pricing and Product Line Strategies for Consumer Software,” (with A. Sundararajan).
- 2003 Finalist, Third Annual e-BRC Doctoral Support Award Competition, 2003

INVITED PRESENTATIONS, PLENARY TALKS, AND KEYNOTES

1. June 2015. Keynote Speech. Harvard Business Review, Latin America Conference, Sao Paulo, Brazil. Title: “Big Data and Analytics.”
2. June 2015. Plenary Speaker. Organization of Economic Cooperation and Development (OECD) Annual Meetings, Paris. Title: “The New Production Revolution”.
3. June 2015. Invited Speaker. ESSEC Business School. Title: “Randomized Field Experiments in Mobile Marketing.”
4. June 2015. Invited Speaker. HEC. Title: “Randomized Field Experiments in Mobile Marketing.”
5. May 2015. Invited Speaker. University of Minnesota. Title: “Randomized Field Experiments in Mobile Marketing.”
6. May 2015. Invited Speaker. Adobe, San Jose. Title: “Combining Machine Learning With Randomized Field Experiments in Mobile Marketing.”
7. May 2015. Invited Speaker. Stanford University. Title: “Randomized Field Experiments in Mobile Marketing.”
8. May 2015. Invited Speaker. John Hopkins University. Title: “Randomized Field Experiments in Mobile Marketing.”
9. April 2015. Invited Speaker. Rotman School (Marketing), University of Toronto. Title: “Randomized Field Experiments in Mobile Marketing.”

10. April 2015. Invited Speaker. KAIST University, Seoul. Title: "Randomized Field and Natural Experiments in Mobile Marketing."
11. February 2015. Invited Speaker. University of British Columbia. Title: "Randomized Field and Natural Experiments in Mobile Marketing."
12. February 2015. Invited Speaker. Arizona State University. Title: "Randomized Field and Natural Experiments in Mobile Marketing."
13. February 2015. Plenary Speech. Big Data Summit, Toronto.
14. December 2014. Keynote Speech. NYCE Day. Title: "Randomized Field Experiments in Mobile Marketing".
15. November 2014. Invited Speaker, David Eccles School of Business (Marketing), University of Utah, Title: "Randomized Field Experiments in Mobile Marketing".
16. June 2014. Keynote Speech. Start-Up Grind, Shanghai. Title: "Big Data=Big Value".
17. June 2014. Keynote Speech. BTO Conference, Milan, Italy. Title: "Leveraging Mobile for Digital Innovation".
18. June 2014. Invited Speaker. Milan, Italy. Title: "Innovations in Mobile Marketing".
19. May 2014. Invited Speaker, Foster School of Business (Marketing), University of Washington, Seattle. Title: "Analyzing the Interdependence between Web and Mobile Advertising: A Randomized Field Experiment".
20. April 2014. Invited Speaker. KAIST University, Seoul. Title: "Randomized Field Experiments in Mobile Marketing."
21. March 2014: Keynote Speech. Workshop on Social & Business Analytics, University of Texas, Austin. Title: "Big Data, Randomized Field Experiments and Mobile Marketing Analytics".
22. December 2013. Keynote Speech. BTO Conference, Milan, Italy. Title: "Leveraging Mobile for Digital Innovation".
23. November 2013. Keynote Speech. Future of Business Event, NYU Stern. Title: "Using Big Data to Leverage The Mobile Consumer."
24. November 2013. Panel Moderator. Stern Graduate Marketing Association, NYU. Title: "Solving the Digital Equation."
25. October 2013. Plenary Speech. eBeverage Conference. Denver. Title: "Big Data and Mobile Analytics.
26. October 2013. Keynote Speech. Data Science and Big Data Initiative, Charlotte. Title: "Using Big Data to Leverage The Mobile Consumer." September 2013. Keynote Speech. NYU Stern Alumni, New York. Title: "Using Big Data to Leverage the Mobile Consumer."
27. September 2013. Plenary Speech. NYC Media Lab Research Summit, New York. Title: "Tapping into Crowd funding."
28. August 2013. Keynote Speech. Digital Summit, Hyderabad. "Mobile Economy and Location-Based Marketing."
29. August 2013. Keynote Speech. MBA Launch Summit. NYU Stern School. Title: "Technology, Innovation, and the Role of Business in Society."
30. August 2013. Keynote Speech. Undergraduate Orientation. NYU Stern School. Title: "Technology, Innovation, and the Role of Business in Society."
31. June 2013. Keynote Speech. E-Metrics Conference, Chicago. Title: "Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy."
32. May 2013. Plenary Panelist. The Economist Innovation Forum Conference, San Francisco. Title: "Mind the Gap: Resolving the Skills Gap in Data Analytics".
33. May 2013. Invited Speaker. Innovative Approaches to Measuring Advertising Effectiveness Conference, Wharton School. Title: "Analyzing the Interdependence Between Web and Mobile Advertising."
34. April 2013. Invited Speaker. ESSEC Business School, (Marketing). Paris. Title: "Apps, Advertising, and Commerce in the New Mobile Economy."
35. April 2013. Invited Speaker. Heinz School, Carnegie Mellon, Pittsburgh. Title: "Apps, Advertising, and

- Commerce in the New Mobile Economy.”
36. March 2013. Invited Speaker. Cheung Kong Graduate School of Business, (Marketing). Beijing. Title: “Ranking Products on Search Engines.”
 37. March 2013. Invited Speaker. Fudan University, (Marketing). Shanghai. Title: “Ranking Products on Search Engines.”
 38. March 2013. Invited Speaker. Tsinghua University School of Economics and Management, (Marketing). Beijing. Title: “Ranking Products on Search Engines.”
 39. March 2013. Invited Speaker. Paul Merage School of Business, University of California, Irvine. Title: “Ranking Products on Search Engines.”
 40. February 2013. Invited Speaker. Lerner School of Business, University of Delaware, Newark. Title: “Ranking Products on Search Engines.”
 41. February 2013. Webinar. International Institute of Business Analysis. Title: “Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy.”
 42. January 2013. Plenary Speech. Minnesota Big Data Analytics Conference. University of Minnesota, Minneapolis. Title: “Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy.”
 43. January 2013. Plenary Speech. Advertising and Data Science Congress. NYU Stern. Title: “Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy.”
 44. January 2013. Invited Speaker. Boston University, Boston. Title: “Ranking Products on Search Engines.”
 45. December 2012. Invited Speaker. Harvard Business School (Marketing), Boston. Title: “Apps, Advertising, and Commerce in the New Mobile Economy.”
 46. December 2012. Invited Speaker. Big Data Conference. MIT, Boston. Title: “Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy.”
 47. December 2012. Invited Speaker. David Eccles School of Business. University of Utah. Title: “Apps, Advertising, and Commerce in the New Mobile Economy.”
 48. November 2012. Keynote Speech. Big Data and Business Analytics. BTO Conference, Rome, Italy.
 49. November 2012. Keynote Speech. Digital Marketing Summit, Indian School of Business. Title: “Mobile Analytics: Apps, Advertising, and Commerce in the New Mobile Economy.”
 50. October 2012. Plenary Speech. Orange Institute. Title: “Mobile Analytics.”
 51. October 2012. Invited Speaker. TED lecture series. TEDxNYU. Title: “Mobile Marketing Trends.”
 52. September 2012. Moderator. NYU Stern Center for Measurable Marketing. Panel on “Measurable Marketing in the Path to Purchase.”
 53. August 2012. Keynote Speech. Launch 2012. NYU Stern School. Title: “Technology, Innovation, and the Role of Business in Society.”
 54. May 2012. Plenary Speech. IBC Workshop, Institute of E-Commerce & Digital Markets (LMU) in Munich, Germany. Title: “Social Media and Digital Marketing Trends.”
 55. May 2012. Invited Speaker. London Business School (Marketing). Title: “London Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
 56. April 2012. Invited Speaker. Korea University, Seoul. Title: “Apps, Advertising, and Commerce in the New Mobile Economy.”
 57. April 2012. Invited Speaker. University of Texas at Austin, Austin. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
 58. March 2012. Invited Speaker. Wharton School, Philadelphia. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
 59. March 2012. Keynote Speech. Allianz Group-CIO Conference, Milan, Italy. Title: “Outlook 2013: Social Media and Digital Marketing Trends.”
 60. March 2012. Plenary Speech. BTO Conference, Milan, Italy. Title: “Social Media and Digital Marketing Trends.”
 61. March 2012. Invited Speaker. University of Connecticut, Storrs. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”

62. February 2012. Moderator. Carlson School, University of Minnesota. Panel on “Leveraging Social Media for Business.”
63. February 2012, Moderator. Stern in Africa Conference, NYU Stern. Panel on “Emerging Industries in Africa.”
64. November 2011. Invited Speaker. UCLA (Economics), Los Angeles. Title “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
65. November 2011. Invited Speaker. Michigan State, East Lansing. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
66. October 2011. Invited Speaker. Harvard Business School, Boston. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
67. September 2011. Invited Speaker. University of Arizona, Tucson. Title: “Interplay Between Search and Social Media: Designing Ranking Systems for Search Engines.”
68. August 2011. Keynote Speech. Launch 2011. NYU Stern School. Title: “Technology, Innovation, and the Role of Business in Society.”
69. June 2011. Plenary Panelist. Statistical Challenges in ecommerce Research (SCECR) conference, Rio De Janeiro, Brazil. Title: “Smart-Everything: Cyber Analytics Platforms and Real-Time Monitoring of the Real World.”
70. May 2011. Plenary Panelist. NYU Stern Conference on Measurable Marketing in a Digital World. Title: “Cross Media Effectiveness Measurement.”
71. September 2009. Invited Speaker. Internet Economics Conference, Stanford University. Title: “User Content Generation and Usage Behavior in Multi-Media Settings: A Dynamic Structural Model of Learning.”
72. April 2009. Invited Speaker. Columbia University. Title: “Combining Text mining with Econometrics: Monetization of User-Generated Content and Online Advertising.”
73. April 2009. Invited Speaker. Microsoft Research, Boston. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
74. April 2009. Invited Speaker. Heinz College, Carnegie Mellon University. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
75. March 2009. Invited Speaker. Wharton School, University of Pennsylvania. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
76. March 2009. Keynote Speech. Ecommerce and Banking 3.0 Conference, Frankfurt, Germany. Title: User Generated Content and Monetization in the New Economy.”
77. March 2009. Invited Speaker. University of Goethe-Frankfurt. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
78. March 2009. Invited Speaker. University of Connecticut. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
79. February 2009. Invited Speaker. University of Calgary. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
80. February 2009. Invited Speaker. Purdue University. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
81. February 2009. Invited Speaker. University of California at Irvine. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
82. November 2008. Invited Speaker. University of Texas at Dallas. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
83. November 2008. Invited Speaker. Polytechnic University of NYU. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
84. November 2008. Invited Speaker. Speaker on the Square Series, NYU. Title: “User Generated Content, Panel on Technology in the Digital Age.”
85. October 2008. Invited Speaker. McGill University. Title: “Search Engine Advertising: Sponsored

- Search, Organic Search, and User-Generated Content in Electronic Markets.”
86. May 2008. Invited Speaker. University of Washington, Seattle. Title “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
 87. March 2008. Invited Speaker. IBM Research. Mining User-Generated Content Using Econometrics: A Case Study on Reputation Systems.
 88. February 2008. Invited Speaker. Yahoo Research. Mining User-Generated Content Using Econometrics: A Case Study on Reputation Systems.
 89. February 2008. Invited Speaker. Marketing Science Institute. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
 90. November 2007. Invited Speaker. University of Minnesota, Minneapolis. Title: “The Dimensions of Reputation in Electronic Markets.”
 91. June 2007. Invited Speaker. City University of Hong Kong. Title: “The Dimensions of Reputation in Electronic Markets.”
 92. June 2007. Invited Speaker. Hong Kong University of Science and Technology. Title: “The Dimensions of Reputation in Electronic Markets.”
 93. June 2007. Invited Speaker. Nanyang Business School, Singapore. Title: “The Dimensions of Reputation in Electronic Markets.”
 94. June 2007. Invited Speaker. Singapore Management University. Title: “The Dimensions of Reputation in Electronic Markets.”
 95. June 2007. Invited Speaker. National University of Singapore. Title: “The Dimensions of Reputation in Electronic Markets.”
 96. June 2007. Invited Speaker. Conference on Operational Excellence in Retailing. Harvard University (HBS). Title: “Internet Exchanges for Used Books: An Empirical Analysis of Product Cannibalization and Welfare Implications.”
 97. June 2007. Invited Speaker. Triennial Invitational Choice Symposium, Wharton School. Personalized Pricing and Quality Design.
 98. February 2007. Invited Speaker. University of Texas at Austin. Title: “Geography and Ecommerce: Measuring Convenience, Selection and Price.”
 99. January 2007. Invited Speaker. University of Florida. Title: “Geography and Ecommerce: Measuring Convenience, Selection and Price.”
 100. November 2006. Invited Speaker. Moore School of Business, University of South Carolina. Geography and Ecommerce: Measuring Convenience, Selection, and Price.
 101. November 2006. Invited Speaker. Marketing Lunchtime Seminar, NYU Stern School of Business. Title: “Geography and Ecommerce: Measuring Convenience, Selection, and Price.”
 102. June 2006. Invited Speaker. Conference on Operational Excellence in Retailing. Wharton School. Title: “The Impact of Location on Consumer Purchases in Electronic Markets.”
 103. April 2006. Invited Speaker. Drexel University. Title: “Personalized Pricing and Quality Design.”
 104. January 2006. Invited Speaker. Ohio State University. Title: “Internet Exchanges for Used Books: An Empirical Analysis of Product Cannibalization and Welfare Implications.”
 105. February 2004: Invited Speaker. University of Southern California. Title: “Impact of Internet Referral Services on the Supply Chain.”
 106. February 2004. Invited Speaker. University of Arizona. Title: “Impact of Internet Referral Services on the Supply Chain.”
 107. February 2004. Invited Speaker. University of Maryland at College Park. Title: “Impact of Internet Referral Services on the Supply Chain.”

CONFERENCE PRESENTATIONS

1. October 2014. Invited Speaker, INFORMS Annual Conference, Thought Leader Series. Title: “Randomized Field Experiments in Mobile Marketing.”
2. May 2014. Conference Presentation. Crowds 2.0 Conference, NYU Stern School. Title: “Privacy

- Controls and Anonymity in Crowd funding.”
3. November 2013. Conference Presentation. Mapping Mobile Conference, NYU Stern School. Title: “Randomized Field Experiments to Measure ROI of Mobile Advertising and Mobile Coupons”.
 4. June 2013. Conference Presentation. Marketing Science Conference, Istanbul. Title: “Estimating Cross Platform and Cross Device Synergies Between Web and Mobile Advertising.”
 5. June 2011. Conference Presentation. Statistical Challenges in ecommerce Research (SCECR) conference, Rio De Janeiro, Brazil. Title: “How is the Mobile Internet Different?”
 6. June 2011. Conference Presentation. ZEW Conference, Mannheim. Title: “Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content.”
 7. June 2010. Conference Presentation. Marketing Science Conference, Cologne. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
 8. June 2010. Conference Presentation. Searle Research Symposium on the Economics and Law of Internet Search, Northwestern University. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
 9. May 2010. Customer Insights Conference, Yale University. Conference Presentation. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
 10. December 2009. Conference Presentation. Workshop on Information Technology and Systems (WITS), Phoenix. Title: “Towards Designing Ranking Systems for Hotels on Travel Search Engines: Combining Text mining with Demand Estimation in the Hotel Industry.”
 11. December 2009. Conference Presentation. MSI-WIMI Conference, University of Pennsylvania, Philadelphia. Title: “User Content Generation and Usage Behavior in Multi-Media Settings: A Dynamic Structural Model of Learning.”
 12. August 2009. Conference Presentation. Marketing Dynamics Conference, NYU Stern, August. Title: “User Content Generation and Usage Behavior in Multi-Media Settings: A Dynamic Structural Model of Learning.”
 13. June 2009. Conference Presentation. Marketing Science Conference, University of Michigan, Ann Arbor. Title: “User Content Generation and Usage Behavior in Multi-Media Settings: A Dynamic Structural Model of Learning.”
 14. January 2009. Conference Presentation. The Economics of the Internet and Software, Toulouse. Title: “Modeling and Estimating the Relationship Between Organic and Paid Search Advertising.”
 15. December 2008. Conference Presentation. International Symposium on Information Systems (ISIS), ISB, Hyderabad. Title: “Modeling and Estimating the Relationship Between Organic and Paid Search Advertising.”
 16. December 2008. Conference Presentation. International Conference on Information Systems (ICIS), Paris. Market Frictions, Demand Structure and Price Competition in Online Markets.
 17. December 2008. Conference Presentation. Workshop on Information Systems and Economics (WISE), Paris. Title: “Modeling and Estimating the Relationship Between Organic and Paid Search Advertising.”
 18. December 2008. Conference Presentation. Workshop on Information Technology and Systems (WITS), Paris. An Empirical Analysis of Search Engine Advertising: Sponsored and Organic Search in Electronic Markets.
 19. November 2008. Conference Presentation. Federal Trade Commission, Washington DC. Title: “Modeling and Estimating the Relationship Between Organic and Paid Search Advertising.”
 20. October 2008. Conference Presentation. INFORMS Annual Meeting, Washington DC. Title: “The Dimensions of Reputation in Electronic Markets.”
 21. October 2008. Conference Presentation. INFORMS CIST, Washington DC. Title: “Deriving the Pricing Power of Product Features by Mining User-Generated Reviews.”
 22. August 2008. Conference Presentation. International Workshop on Data mining and Audience Intelligence for Advertising. ADKDD. Las Vegas. Title: “Comparing Performance Metrics in Organic Search with Sponsored Search Advertising.”

23. June 2008. Conference Presentation. Marketing Science Conference, Vancouver. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
24. May 2008. Conference Presentation. International Industrial Organization Conference, Washington DC. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
25. April 2008. Conference Presentation. NET Institute Conference, NYU. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
26. February 2008. Conference Presentation. ACM WSDM Conference, Stanford University. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
27. December 2007. Conference Presentation. International Conference on Information Systems (ICIS) Montreal. Title: “Estimating Menu Costs in Electronic Markets.”
28. December 2007. Conference Presentation. Workshop on Information Systems and Economics (WISE), Montreal. Title: “Towards Empirically Modeling Consumer and Firm Behavior in Sponsored Search Advertising.”
29. November 2007. Conference Presentation. Conference on Information Systems and Technology (CIST), Seattle. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
30. November 2007. Conference Presentation. INFORMS, Seattle. Title: “Examining the Relationship Between Reviews and Sales: The Role of Reviewer Identify Disclosure in Electronic Markets.”
31. August 2007. Conference Presentation. International Conference on Electronic Commerce (ICEC), Minnesota. Title: “Designing Novel Review Ranking Systems: Predicting Usefulness and Impact.”
32. August 2007. Conference Presentation. International Conference on Electronic Commerce (ICEC), Minnesota. Title: “An Empirical Analyses of Paid Placement in Online Keyword Advertising.”
33. May 2007. Conference Presentation. Statistical Challenges in E-Commerce. Title: “Designing Novel Review Ranking Systems on the Web: Combining Economics with Opinion Mining.”
34. April 2007. Conference Presentation. NET Institute Conference, New York University. Title: “Geography and Ecommerce: Measuring Convenience, Selection and Price.”
35. January 2007. Conference Presentation. DIMACS Workshop, Rutgers University. Title: “Designing Trusted Ranking Systems for Consumer Reviews: Combining Economics with Opinion Mining.”
36. January 2007. Conference Presentation. International Conference on Decision Support Systems (ICDSS), IIM Kolkata, India. Title: “Designing Ranking Systems for Consumer Reviews: The Economic Impact of Customer Sentiment in Electronic Markets.”
37. December 2006. Conference Presentation. International Symposium on Information Systems (ISIS), ISB, Hyderabad. Title: “Estimating Menu Costs in Electronic Markets.”
38. December 2006. Conference Presentation. International Symposium on Information Systems (ISIS), ISB, Hyderabad. Title: “The Dimensions of Reputation in Electronic Markets.”
39. December 2006. Conference Presentation. International Symposium on Information Systems (ISIS), ISB, Hyderabad. Title: “The Impact of Location on Consumer Use of Electronic Markets.”
40. December 2006. Conference Presentation. Workshop on Information Technology and Systems (WITS), Milwaukee. Title: “Towards an Understanding of the Impact of Customer Sentiment on Product Sales and Review Quality.”
41. December 2006. Conference Presentation. International Conference on Information Systems (ICIS), Milwaukee. Title: “The Impact of Location on Consumer Purchases in Electronic Markets.”
42. December 2006. Conference Presentation. Workshop on Information Systems and Economics (WISE), Northwestern University, Evanston. Title: “Search Costs, Demand Structure and Long Tail in Electronic Markets: Theory and Evidence.”
43. November 2006. Conference Presentation. INFORMS Annual Meeting, Pittsburgh. Title: “Impact

- of Internet Referral Services on the Supply Chain.”
44. November 2006. Conference Presentation. INFORMS Annual Meeting, Pittsburgh. Title: “Estimating Menu Costs in Electronic Markets.”
 45. November 2006. Conference Presentation. INFORMS Annual Meeting, Pittsburgh. Title: “The Impact of Location on Consumer Purchases in Electronic Markets.”
 46. November 2006. Conference Presentation. INFORMS Conference on Information Systems and Technology (CIST), Pittsburgh. Title: “Software Versioning and Quality Degradation? An Exploratory Study of the Evidence.”
 47. October 2006. Conference Presentation. ZEW Conference on ICT, Mannheim. Title: “Information Uncertainty in Electronic Markets: An Empirical Analysis of Trade Patterns and Adverse Selection.”
 48. June 2006. Conference Presentation. Workshop on Economics and Information Security (WEIS), Cambridge University. Title: “The Economic Impact of Regulatory Information Disclosure on Information Security Investments, Competition, and Social Welfare.”
 49. June 2006. Conference Presentation. INFORMS Marketing Science Conference, Pittsburgh. Title: “Personalized Pricing and Quality Design.”
 50. May 2006. Conference Presentation. Statistical Challenges in E-Commerce Research, University of Minnesota. Title: “The Dimensions of Reputation in Electronic Markets.”
 51. April 2006. Conference Presentation. International Industrial Organization Conference, Boston. Title: “Personalized Pricing and Quality Design.”
 52. April 2006. Conference Presentation. NET Institute Conference, New York University. Title: “Used Good Trade and Adverse Selection in Electronic Secondary Markets.”
 53. March 2006. Conference Presentation. Impact of Internet Referral Services on the Supply Chain. ISR Workshop, University of Michigan at Ann Arbor.
 54. February 2006. Conference Presentation. University of Florida. Title: “The Dimensions of Reputation in Electronic Markets.”
 55. December 2005. Conference Presentation. International Conference on Information Systems (ICIS), Las Vegas. Title: “Software Versioning and Quality Degradation? An Exploratory Study of the Evidence.”
 56. December 2005. Conference Presentation. Workshop on Information Systems and Economics (WISE), UC Irvine, California. Title: “Personalized Pricing and Quality Design.”
 57. November 2005. Conference Presentation. Workshop on CRM, New York University. Title: “A Competitive Analysis of Personalized Pricing and Quality Customization.”
 58. November 2005. Conference Presentation. INFORMS Annual Meeting, San Francisco, California. Title: “Pricing and Product Line Strategies for Software: Theory and Evidence.”
 59. November 2005. Conference Presentation. INFORMS Annual Meeting, San Francisco, California. Title: “Used Good Trade and Adverse Selection: A Cross-Country Comparison of Electronic Secondary Markets.”
 60. June 2005. Conference Presentation. Workshop on Economics of Information Security, Harvard University, Boston. Title: “Pricing Security Software.”
 61. May 2005. Conference Presentation. Statistical Challenges in ecommerce Research. Maryland. Title: “Pricing and Product Line Strategies for Consumer Software: Evidence from Amazon.”
 62. April 2005. Conference Presentation. International Industrial Organization Conference. Atlanta. Title: “The Economic Incentives for Sharing Security Information.”
 63. January 2005. Conference Presentation. Hawaiian International Conference on System Sciences. Hawaii. Title: “Effect of Electronic Secondary Markets on the Supply Chain.”
 64. December 2004. Conference Presentation. Workshop on Information Systems and Economics (WISE). University of Maryland at College Park. Title: “Impact of Secondary Electronic Markets on Information Goods Suppliers.”
 65. December 2003. Conference Presentation. International Conference on Information Systems (ICIS). Seattle, WA. Title: “Durable Goods Competition in the Presence of Secondary E-Marketplaces.”

66. December 2003. Conference Presentation. International Conference on Information Systems (ICIS). Seattle, WA. Title: "Internet Exchanges for Used Books: An Empirical Investigation into Welfare Implications and Policy Issues."
67. October 2003. Conference Presentation. International Conference on E-Commerce (ICEC). Pittsburgh, PA. Title: "Strategic Benefits of Internet Referral Services."
68. October 2003. Conference Presentation. Conference on Information Systems and Technology (CIST), Atlanta, GA. Title: "Dynamic Pricing: A Strategic Advantage for Electronic Retailers."
69. June 2003. Conference Presentation. Workshop on Economics of Information Security. University of Maryland at College Park. Title: "The Economic Incentives for Sharing Security Information."
70. December 2002. Conference Presentation. Workshop on Information Systems and Economics (WISE). Barcelona, Spain. Title: "Impact of Internet Referral Services on the Supply Chain."
71. December 2002. Conference Presentation. International Conference on Information Systems (ICIS). Barcelona, Spain. Title: "Dynamic Pricing: A Strategic Advantage for Internet Retailers".
72. November 2002. Conference Presentation. INFORMS Conference on Information Systems and Technology (CIST), San Jose. Title: "Impact of Referral Services on Channel Profits: Competition between Manufacturers and Info mediaries."
73. February 2004. Invited Speaker. University of California at Irvine. Title: "Impact of Internet Referral Services on the Supply Chain."
74. February 2004. Invited Speaker. Tulane University. Title: "Impact of Internet Referral Services on The Supply Chain."
75. February 2004. Invited Speaker. University of Connecticut. Title: "Impact of Internet Referral Services on the Supply Chain."
76. February 2004. Invited Speaker. New York University. Title: "Impact of Internet Referral Services on the Supply Chain."
77. January 2004. Invited Speaker. University of Alberta. Title: "Impact of Internet Referral Services on The Supply Chain."
78. May 2011. Plenary Panelist. India World Conference, New York. Title "India's IT Industry: The End of the Beginning".
79. May 2011. Invited Speaker. Rising Star Speaker Series, Case Western University. Cleveland. Title: "Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content."
80. May 2011. Invited Speaker. MIT (Sloan Marketing), Boston. Title: "Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content."
81. April 2011. Invited Speaker. Columbia University (GSB Marketing), New York. Title: "Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content."
82. April 2011. Invited Speaker. Seoul National University, Seoul. Title: "Designing Ranking Systems For Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content."
83. January 2011. Invited Speaker. MSI Young Scholar's Conference, Utah. Title: "Search and Social Media in the Digital Economy: A Research Agenda."
84. December 2010. Plenary Panelist. Workshop on Information Systems and Economics, Phoenix, Arizona. Title: "Whither WISE."
85. October 2010. Invited Speaker. University of Maryland, College Park. Title: "Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content".
86. October 2010. Invited Speaker. Distinguished Speaker Series, Georgia Tech, Atlanta, October. Title: Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd- Sourced Content.
87. September 2010. Plenary Panelist. Workshop on Interdisciplinary Studies in Information Security and Privacy, Abu Dhabi. Title: "Privacy Issues in Social Media and Ecommerce."

88. September 2010. Invited Speaker. Harvard University (Economics), Boston. Title: “Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content.”
89. September 2010. Invited Speaker. George Mason University, Washington DC. Title: “Designing Ranking Systems for Hotels on Travel Search Engines By Mining User-Generated and Crowd-Sourced Content.”
90. July 2010. Invited Speaker. NBER IT Economics & Productivity Workshop, Boston. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
91. July 2010. Invited Speaker. Stanford Institute of Theoretical Economics (SITE), Stanford University. Title: “A Dynamic Structural Model of User Learning in Mobile Media Content.”
92. June 2010. Invited Speaker. Workshop on Digital Business Models, Paris. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
93. June 2010, Plenary Speech. L2 Mobile Commerce Clinic at NYU Stern. Title: “Mobile Trends, Consumers, and Social Media.”
94. April 2010. Invited Speaker. Temple University. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
95. February 2010. Invited Tutorial. Carlson School. University of Minnesota. Title: “Structural Econometric Modeling: Static and Dynamic Models”.
96. February 2010. Invited Speaker. University of Minnesota. Title: “Estimating Demand in the Hotel Industry by Mining User-Generated and Crowd-Sourced Content.”
97. September 2009. Invited Speaker. Internet Economics Conference, Stanford University. Title: “User Content Generation and Usage Behavior in Multi-Media Settings: A Dynamic Structural Model of Learning.”
98. April 2009. Invited Speaker. Columbia University. Title: “Combining Text mining with Econometrics: Monetization of User-Generated Content and Online Advertising.”
99. April 2009. Invited Speaker. Microsoft Research, Boston. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
100. November 2008. Invited Speaker. Speaker on the Square Series, NYU. Title: “User Generated Content, Panel on Technology in the Digital Age.”
101. October 2008. Invited Speaker. McGill University. Title: “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
102. May 2008. Invited Speaker. University of Washington, Seattle. Title “Search Engine Advertising: Sponsored Search, Organic Search, and User-Generated Content in Electronic Markets.”
103. March 2008. Invited Speaker. IBM Research. Mining User-Generated Content Using Econometrics: A Case Study on Reputation Systems.
104. February 2008. Invited Speaker. Yahoo Research. Mining User-Generated Content Using Econometrics: A Case Study on Reputation Systems.
105. February 2008. Invited Speaker. Marketing Science Institute. Title: “An Empirical Analysis of Search Engine Advertising: Sponsored Search in Electronic Markets.”
106. November 2007. Invited Speaker. University of Minnesota, Minneapolis. Title: “The Dimensions Of Reputation in Electronic Markets.”
107. June 2007. Invited Speaker. City University of Hong Kong. Title: “The Dimensions of Reputation In Electronic Markets.”
108. June 2007. Invited Speaker. Hong Kong University of Science and Technology. Title: “The Dimensions of Reputation in Electronic Markets.”
109. June 2007. Invited Speaker. Nanyang Business School, Singapore. Title: “The Dimensions of Reputation in Electronic Markets.”
110. June 2007. Invited Speaker. Singapore Management University. Title: “The Dimensions of Reputation in Electronic Markets.”

111. June 2007. Invited Speaker. National University of Singapore. Title: "The Dimensions of Reputation in Electronic Markets."
112. June 2007. Invited Speaker. Conference on Operational Excellence in Retailing. Harvard University (HBS). Title: "Internet Exchanges for Used Books: An Empirical Analysis of Product Cannibalization and Welfare Implications."
113. June 2007. Invited Speaker. Triennial Invitational Choice Symposium, Wharton School. Personalized Pricing and Quality Design.
114. February 2007. Invited Speaker. University of Texas at Austin. Title: "Geography and Ecommerce: Measuring Convenience, Selection and Price."
115. January 2007. Invited Speaker. University of Florida. Title: "Geography and Ecommerce: Measuring Convenience, Selection and Price."
116. November 2006. Invited Speaker. Moore School of Business, University of South Carolina. Geography and Ecommerce: Measuring Convenience, Selection, and Price.
117. November 2006. Invited Speaker. Marketing Lunchtime Seminar, NYU Stern School of Business. Title: "Geography and Ecommerce: Measuring Convenience, Selection, and Price."
118. June 2006. Invited Speaker. Conference on Operational Excellence in Retailing. Wharton School. Title: "The Impact of Location on Consumer Purchases in Electronic Markets."
119. April 2006. Invited Speaker. Drexel University. Title: "Personalized Pricing and Quality Design."
120. January 2006. Invited Speaker. Ohio State University. Title: "Internet Exchanges for Used Books: An Empirical Analysis of Product Cannibalization and Welfare Implications."
121. February 2004. Invited Speaker. University of Southern California. Title: "Impact of Internet Referral Services on the Supply Chain."
122. February 2004. Invited Speaker. University of Arizona. Title: "Impact of Internet Referral Services on the Supply Chain."
123. February 2004. Invited Speaker. University of Maryland at College Park. Title: "Impact of Internet Referral Services on the Supply Chain."
124. February 2004. Invited Speaker. University of California at Irvine. Title: "Impact of Internet Referral Services on the Supply Chain."
125. February 2004. Invited Speaker. Tulane University. Title: "Impact of Internet Referral Services on the Supply Chain."
126. February 2004. Invited Speaker. University of Connecticut. Title: "Impact of Internet Referral Services on the Supply Chain."
127. February 2004. Invited Speaker. New York University. Title: "Impact of Internet Referral Services on the Supply Chain."
128. January 2004. Invited Speaker. University of Alberta. Title: "Impact of Internet Referral Services on the Supply Chain."

TEACHING

- EMBA: Social Media and Digital Marketing Analytics, NYU Spring 2015. (Instructor Rating: 6.4/7)
- C20:0038: Social Media and Digital Marketing Analytics, NYU Fall 2014. (Instructor Rating: 6.8/7)
- TRIUM Global MBA course: Social Media and Digital Marketing Analytics, NYU Fall 2014. (Instructor Rating: 4.5/5)
- MSBA course: Social Media and Digital Marketing Analytics, NYU Summer 2014. (Instructor Rating: 6.9/7)
- MBA course B20:3310: Social Media and Digital Marketing Analytics, NYU Summer 2014. (Instructor Rating: 6.3/7)
- Executive Education: Leveraging Social Media and Digital Marketing, Spring 2014. (Instructor Rating: 6.9/7)
- Executive Education: Leveraging Social Media and Digital Marketing, Fall 2013. (Instructor Rating:

6.7/7)

- EMBA: Social Media and Digital Marketing Analytics, NYU Spring 2014. (Instructor Rating: 6.85/7)
- C20:0038: Social Media and Digital Marketing Analytics, NYU Fall 2013. (Instructor Rating: 6.7/7)
- MSBA course: Social Media and Digital Marketing Analytics, NYU Fall 2013. (Instructor Rating: 6.8/7)
- TRIUM Global MBA course: Social Media and Digital Marketing Analytics, NYU Fall 2013. (Instructor Rating: 3.9/5)
- MBA course B20:3310: Social Media and Digital Marketing Analytics, NYU Summer 2013. (Instructor Rating: 6.5/7)
- Executive Education: Leveraging Social Media and Digital Marketing, Spring 2013. (Instructor Rating: 6.0/7)
- MBA course B20:3310: Social Media and Digital Marketing Analytics, NYU Fall 2012. (Instructor Rating: 6.0/7)
- C20:0038: Social Media and Digital Marketing Analytics, NYU Fall 2012. (Instructor Rating: 6.2/7)
- C20:0001: IT in Business & Society: UG Core, NYU Fall 2010. (Instructor Ratings: 6.5/7, 6.6/7)
- C20:0038: Electronic Commerce and Social Media: UG Elective, NYU Fall 2009. (Instructor Rating: 6.0/7)
- C20:0001: IT in Business & Society: UG Core, NYU Fall 2008. (Instructor Ratings: 6.6/7, 6.7/7)
- C20:0038: Electronic Commerce: UG Elective, NYU Fall 2008. (Instructor Rating: 6.6/7)
- C20:0001: IT in Business & Society: UG Core, NYU Fall 2007. (Instructor Ratings: 6.6/7, 6.7/7)
- C20:0038: Electronic Commerce: UG Elective, NYU Fall 2007. (Instructor Rating: 6.8/7)
- C20:0001: IT in Business & Society: UG Core, NYU Fall 2006. (Instructor Ratings: 6.8/7, 7/7)
- C20:0038: Electronic Commerce: UG Elective, NYU Fall 2006. (Instructor Rating: 6.7/7)
- C20:0001: IT in Business & Society: UG Core, NYU Fall 2005. (Instructor Ratings: 6.6/7, 6.8/7, 6.6/7)
- C20:0001: IT in Business & Society: UG Core, NYU, Fall 2004. (Instructor Ratings: 6.2/7, 6.3/7)
- 70-451: MIS: UG Course, CMU, Summer 2003. (Instructor Rating: 5/5).

PROFESSIONAL SERVICE (JOURNALS)

- **Senior Editor** – *Information Systems Research* (September 2012 –)
- **Associate Editor** – *Management Science* (Jan 2009 – Present)
- **Associate Editor** – *Management Science* Special Issue on Business Analytics (August 2012 – Present)
- **Associate Editor (Ad Hoc)** – *Management Science* (2008 – 2009)
- **Associate Editor** – *Information Systems Research* (Jan 2009 – December 2012)
- **Associate Editor (Ad Hoc)** – *MIS Quarterly* (2010 – Present)
- **Associate Editor** – *MIS Quarterly*, Special Issue on “Perspectives on Trust in Information Systems,” 2009.
- **Editorial Board** – *Information Systems Research*, Special Issue on “Digital Systems & Competition”, 2008.
- **Reviewer** – *American Economic Review*, *Decision Support Systems*, *Economic Theory*, *Electronic Commerce Research and Applications*, *IEEE Transactions on Knowledge and Data Engineering*, *International Journal of Electronic Commerce*, *Information Systems Research*, *International Journal of Industrial Organization*, *Journal of Economics and Management Strategy*, *Journal of Industrial Economics*, *Journal of Management Information Systems*, *Management Science (Information Systems)*, *Management Science (Marketing)*, *Marketing Science*, *Journal of Marketing Research*, *MIS Quarterly*, *Operations Research Letters*, *Production and Operations Management*.
- **Panel Member** – *Hong Kong Research Grants Council*. (2014 –)

PROFESSIONAL SERVICE (CONFERENCES & WORKSHOPS)

- **Conference Co-Chair** – Workshop on Information Systems and Economics (WISE), 2014, Auckland, December.
- **Track co-Chair** – Economics of Information Systems, International Conference on Information Systems (ICIS) 2012, Orlando.
- **Senior Program Committee** – ACM Electronic Commerce Conference 2012, Spain, June.
- **Senior Program Committee** – ACM Electronic Commerce Conference 2011, San Jose, June.
- **Program Committee** – INFORMS Conference on Information Systems and Technology (CIST) 2012, October.
- **Program Committee** – INFORMS Conference on Information Systems and Technology (CIST) 2010, Austin, November.
- **Program Committee** - The First International Workshop on Opinion Mining for Business Intelligence (OMBI 2010), Toronto, August.
- **Program Committee** - Workshop on Social Media Analytics (SOMA 2010), Washington DC, July
- **Program Committee** – ACM Electronic Commerce Conference 2010, Boston, June
- **Conference Co-Chair** – INFORMS Conference on Information Systems and Technology (CIST), 2009, San Diego, October.
- **Conference Co-Chair** – Workshop on Information Systems and Economics (WISE), 2008, Paris, December.
- **Conference Co-Organizer** – First New York Computer Science and Economics Day (NYCE Day), 2008, September.
- **Steering Committee Member** - Second New York Computer Science and Economics Day (NYCE Day), 2009, November.
- **Conference Co-Chair** – Fourth Symposium on Statistical Challenges in Ecommerce Research (SCECR) 2008, NY, May.
- **Track Chair** – Pacific Asia Conference on Information Systems (PACIS) 2009, India, July (Ecommerce Track).
- **Track Chair** – Pacific Asia Conference on Information Systems (PACIS) 2008, China, July (Economics of Information Systems Track).
- **Associate Editor** – International Conference on Information Systems (ICIS) 2009, Phoenix, December (Economics of Information Systems Track).
- **Associate Editor** – International Conference on Information Systems (ICIS) 2008, Paris, December (Economics of Information Systems Track).
- **Associate Editor**–International Conference on Information Systems (ICIS) 2007, Montreal, December (*Web-Based Information Systems Track*).
- **Associate Editor**–International Conference on Information Systems (ICIS) 2007, Montreal, December (*Economics and Business Value of Information Systems Track*).
- **Program Committee** – ACM Electronic Commerce Conference 2009, Stanford, June.
- **Program Committee** – World Wide Web Conference 2009 (WWW), Spain, May.
- **Program Committee** – World Wide Web Conference 2008 (WWW), Beijing, May (*Social Networks and Web 2.0 Track and Internet Monetization Track*)
- **Program Committee** – International Conference on Web Search and Data Mining (WSDM) 2008, Stanford University, February.
- **Program Committee**–Workshop on Interdisciplinary Studies in Security and Privacy, 2008 (WISSP), NYU-Polytechnic, September.
- **Program Committee**–International Conference on Electronic Commerce 2007 (ICEC), Minnesota, August.
- **Program Committee**–Workshop on Economics of Information Security 2007 (WEIS), Pittsburgh, June.

- **Program Committee** – INFORMS Conference on Information Systems and Technology (CIST) 2007, Seattle, November.
- **Program Committee** – ACM Electronic Commerce Conference 2007, San Diego, June.
- **Program Committee**–International Conference on Decision Support Systems 2007, Kolkata, January
- **Program Committee**–International Symposium of Information Systems 2006, Hyderabad, December
- **Associate Editor**–International Conference on Information Systems 2006 (ICIS), Milwaukee, December (*Economics of Information Systems Track*).
- **Associate Editor**–International Conference on Information Systems 2006 (ICIS), Milwaukee, December (*General Track*).
- **Program Committee**–INFORMS Conference on Information Systems and Technology 2006 (CIST), Pittsburgh, November 2006.
- **Program Committee**–INFORMS Conference on Information Systems and Technology 2005 (CIST), San Francisco, November 2005.
- **Session Chair** – CIST 2008, WEIS 2007, June, Pittsburgh, ICDSS 2007, Kolkata, January, INFORMS 2006, (*ISR Sponsored Cluster*), Pittsburgh, November, INFORMS (*IS Economics Cluster*) 2005, San Francisco, November, INFORMS CIST 2005, San Francisco, November.
- **Discussant** – Workshop in Information Systems and Economics 2011 (Shanghai), Workshop in Information Systems and Economics 2010 (St. Louis), Workshop in Information Systems and Economics 2009 (Phoenix), International Industrial Organization Conference 2008 (Washington DC), International Conference on Information Systems 2007(Montreal), ZEW Workshop on ICT 2006 (Germany), Workshop in Information Systems and Economics 2006 (Evanston), Statistical Challenges in Electronic Commerce 2006 (Minneapolis), International Industrial Organization Conference 2006 (Boston), International Industrial Organization Conference 2005 (Atlanta), Workshop in Information Systems and Economics 2005 (Irvine).

UNIVERSITY SERVICE

- External Review Committee, OPIM Department, Wharton School, 2015.
- IOMS Executive Committee, 2013 – Present
- Stern Dean’s Faculty Advisory Committee, 2012 – Present
- Stern MBA Launch Committee, 2011– Present
- NYU Stern-Poly Collaboration Taskforce Committee, 2011
- Stern Doctoral Program Review Committee, 2010
- Stern Research Resources Committee, New York University, 2010 –
- Track Director for Interactive Marketing, CeDER, NYU Stern, 2009–2010.
- Panel Judge in India Leadership Exchange Program Competition, 2009.
- AACSB Review Junior Faculty Team, Stern School, 2009.
- IS faculty member, Stern Undergraduate Honors Program, 2006 – Present.
- Ph.D. Committee, IOMS Department, Stern School, 2005 – 2006, 2009–.
- Coordinator, Information Systems Research Seminar series, Stern School, 2005 – 2007.
- Stern School Team India Committee under Dean Kim Corfman, 2008 –2009.
- Panelist on “Life and Lifestyle for Untenured Faculty Members,” New Faculty Orientation at Stern School, New York University 2006, 2007, 2008.
- Promotion & Tenure Review Committee, IOMS Department, Stern School, 2006.
- Strategic Planning Meeting, Stern School, 2006.
- Faculty Recruitment Committee, IOMS Department, Stern School, 2005 – 2006.
- Panelist on “Effective Teaching Strategies”, New Faculty Orientation at NYU Stern, 2005.
- Doctoral Student Committee, Carnegie Mellon University, 2002–2004.

POST-DOCTORAL STUDENT SUPERVISION

1. Dr. Sang-Pil Han (Post Doctoral Advisor, NYU, 2008–2011 (Now Assistant Professor at City University of Hong Kong)
2. Dr. Sung-Hyuk Park (Post Doctoral Advisor, NYU, 2012–)

DOCTORAL STUDENT SUPERVISION

1. Jason Chan – Stern School, IOMS Department (Chair), (Assistant Professor at Carlson School, University of Minnesota from Fall 2014)
2. Beibei Li – Stern School, IOMS Department (co-Chair), (Assistant Professor at Carnegie Mellon University since Fall 2012)
3. Gordon Burtch – Fox School of Business, Temple University (co-Advisor), (Assistant Professor at Carlson School, University of Minnesota from Fall 2013)
4. Yan Huang – Heinz College, Carnegie Mellon University (Thesis Committee member), (Assistant Professor at Ross School, University of Michigan from Fall 2013)
5. Ke-Wei Huang – Stern School, IOMS Department (Thesis Committee member), Graduated 2007 (now Assistant Professor at National University of Singapore)
6. Zheyin (Jane) Gu – Stern School, Marketing Department (Thesis Committee member), Graduated 2008 (now Assistant Professor at SUNY Albany)
7. Rong Zheng – Stern School, IOMS Department (Thesis Committee member), Graduated 2009 (now Assistant Professor at Hong Kong University of Science and Technology)
8. Manuel Arriaga – Stern School, IOMS Department (Thesis Committee member), Graduated 2011 (now Assistant Professor at Cambridge University)
9. Nikolay Archak –Stern School, IOMS Department (Thesis Committee member), Graduated 2012 (Six Sigma)
10. Sanghee Bae – 6th year Student, Stern School, Marketing Department (Thesis Committee member)
11. Mingdi Xin – Stern School, IOMS Department (Proposal Committee member), Graduated 2009 (now Assistant Professor at University of California at Irvine)
12. Akhmed Umyarov – Stern School, IOMS Department (Proposal Committee member), Graduated 2010 (now Assistant Professor at University of Minnesota)
13. Vilma Todri – 4th year Student, Stern School, IOMS Department (Chair)
14. Xuan Ye – 4th year Student, Stern School, IOMS Department (Thesis Committee Member)
15. Zubin Jelveh – 4th year Student, NYU Poly
16. Wally Wang – 2nd year Student, Stern School, IOMS Department

UNDERGRADUATE STUDENT SUPERVISION

1. Prita Kumar – Stern School (Undergraduate Honors Thesis Advisor)
2. Rohan Deshpande – Stern School (Undergraduate Project Advisor)
3. Pratik Mehta – Stern School (Undergraduate Honors Thesis Advisor)
4. Aileen Chua – Stern School (Undergraduate Honors Thesis Advisor)
5. Elliott Finch – Stern School (Undergraduate Honors Thesis Advisor)

PROFESSIONAL MEMBERSHIPS

- **Expert Affiliate:** Cornerstone Research (2015 – Present)
- **Research Council Member:** Wharton Customer Analytics Institute (2011 – Present).
- **Advisory Board Member:** Big Data and Mobile Analytics Center, Fox School of Business, Temple University.

- **Faculty Affiliate:** Marketing Science Institute (2008 – Present)
- **Member:** Association of Information Systems (AIS), Information Systems Society (ISS), INFORMS, Marketing Science Society, American Economic Association (AEA).

INDUSTRY POSITIONS

2013 - Present	Chief Data Scientist, 3TI China
2014 - Present	Scientific Advisor, OneVest
1999-2000	Senior Consultant, E-Business Division, IBM.
1998-1999	Business Development Manager, HCL-Hewlett Packard.
1997	Management Trainee, Glaxo SmithKline Beecham.

SELECTED PRESS COVERAGE & OPINION PIECES

- Economist Group, May 2015
- *BBC World News*, March 2015
- *The Financial Times*, March 2015
- *USA Today*, February 2015
- *Washington Post*, February 2015
- *The Economist*, January 2015.
- *National Public Radio*, January 2015.
- *Newsweek*, January 2015.
- *The Guardian* January 2015.
- *The Toronto Sun*, January 2015.
- *Bloomberg Media*, January 2015.
- *The Economic Times* January 2015.
- *The Business Standard*, January 2015.
- *The Economic Times* December 2014.
- *USA Today*, December 2014.
- *OZ*, December 2014.
- *Bloomberg Media*, October 2014.
- *LA Times*, October 2014.
- *Business Week*, September 2014.
- *The Wall Street Journal*, September 2014.
- “Marketing in the Facebook Age: B-Schools Tackle Social Media with Innovative New Courses”,
- *MBAPrograms*, June 2014
- “Professor Big Data”, *The Programmatic Mind*, June 2014.
- “Hulu Lets You Order Pizza Without Leaving The Website,” *USA Today*, May 2014.
- “Yahoo Plugs Yelp Reviews Into Search”, *Ecommerce Times*, March 2014.
- “Kickstarter Backlash Over Oculus” *Market Makers, Bloomberg TV*, March 2014.
- “When Crowdfunding Goes Corporate: Kickstarter Backers Vent Over Facebook’s Oculus Buy,”
- *Time*, March 2014.
- “The Lessons of Oculus, or Why We Need a Capitalism for the Masses”, *National Review Online*, March 2014.
- “Data + Consumer Preference = The Future of Marketing”, *Business2Community*, March 2014.
- “Best 40-Under-40 Professor Anindya Ghose”, *Business Week Poets and Quants*, February 2014.

- “Push Ads Across Devices to Drive Click-throughs, Conversions: NYU professor,” *Mobile Marketer*, November 2013.
- “Topsy Buy Gives Apple Mountains of Twitter Data,” *Ecommerce Times*, November 2013
- “Top Reviewers On Amazon Get Tons Of Free Stuff,” *National Public Radio*. October 2013.
- “Investors Give Yahoo Benefit of Doubt,” *Ecommerce Times*, October 2013
- “SEC’s New Crowdfunding Rule Innovative, But With Risk”, *Xinhua*. October 2013.
- “The Crowdfunding Economy is About to Pop”, *Time*, September 2013
- “The Crowdfunding Caveat: Most Campaigns Fail”, *PC World*, September 2013.
- “B-Schools Are Putting Consumers Under the Social Media Microscope”, *BusinessWeek*, July 2013.
- “Wanelo, Next Verb in Digital Dictionary?,” *Fox Business*, July 2013.
- “Business Grads to Wall Street: Drop Dead”, *Wired*, June 2013.
- “Three Professors Share Crowdfunding Research - Tune In To Learn How To Make Your Campaign A Success.”, *Forbes*, June 2013.
- “Web Ads That Know Too Much”, *MIT Technology Review*, April 2013.
- “Facebook Gets Too Much in Your Face”, *LA Times*, April 2013.
- “Yahoo’s Mayer Revives Debate Over Flexible-Work Arrangements”. *Washington Post*, February 2013.
- “Apple Makes Play for Even Higher-End Tablet Niche”, *TechNewsWorld*, January 2013.
- “Opentable Buys Photo Food App”, *National Public Radio*, January 2013.
- “Business Schools Divided on How to Approach Analytics Training”. *US News*, November 2012.
- “Revising an Outdated Business Model? Try Predictive Analytics.” *CNBC*, October 2012.
- “Microsoft Take a Stab at News Gathering.” *Ecommerce Times*, October 2012.
- “MoneyGram Goes Mobile with Digital Wallet Money Transfer App.” *Daily Finance*, September 2012.
- “What Guided Google to Frommer’s?” *Knowledge @ Wharton*, September 2012.
- “Digital is for Real.” *SmartMoney*, August 2012.
- “Songza Music Service Streams for Business Success.” *NewYork DailyNews*, July 2012.
- “Craigslist Linked to Rise in STDs.” *NBC*, May 2012.
- “Facebook’s Dream IPO is Starting to Look Like a Nightmare.” *MSNBC*, May 2012.
- “Facebook is an Overvalued Bust.” *Ignites, Financial Times*, May 2012.
- “RIM to Post Loss, Plans ‘Significant’ Job Cuts.” *MSNBC*, May 2012.
- “The Travel Search Engine That Thinks the Way You Do?” *Knowledge @ Wharton*, May 2012.
- “Facebook closes at 38.37 dollars in market debut.” *Xinhua, China Daily*, May 2012.
- “As Headphones Invade The Office, Are We Lonelier?” *National Public Radio*, May 2012.
- “Does Craigslist Help Spread STDs?” *Washington Post*, April 2012.
- “Not So Secret Service: 5 Reasons Prostitution Could Soon Go Mainstream.” *Forbes*, April 2012.
- “The Crowd-funding Opportunity.” *Wall Street Journal - Mint*, April 2012.
- “Google’s New Privacy Policy: When Consumers’ Worlds Collide, the Company Stands to Profit.” *Forbes*, February 2012.
- “Africa Calling: Listen Up”. *NYU Stern Op-Ed*, February 2012
- “Drinking from a Fire Hose: Has Consumer Data Mining Gone Too Far?” *Knowledge @ Wharton*, November 2011.
- “Walmart’s Use of Social Media.” *BBC News*, November 2011.
- “Crowd-Funding (Finally) Goes to Washington.” *NYU Stern Op-Ed*, October 2011.
- “Something For the Weekend.” *Financial Times*, October 2011.
- “Awsom Shoes: Is it Ethical to Fix Grammatical and Spelling Errors in Internet Reviews.” *Slate*, May 2011.
- “The Value of Teaching Your Customers How to Spell.” *Harvard Business Review*, May 2011.
- “Does Reviewer Quality Matter.” Steven D. Levitt, *Freakonomics*, April 2011.
- “Personal Blogging at Work Increases Productivity.” *Forbes*, March 2011

- “Personal Blogging at Work Increases Productivity.” *Bloomberg Business Week*, March 2011.
- “This Week in Small Business: Start-Ups Surge.” *The New York Times*, March 2011.
- “Professors Strike Back.” *MTV*, August 2010.
- “Does an Organic Search Presence Help Paid Result Performance?” *Webpronews*, December 2009.
- “Top Positions in Paid Search May Not be The Most Profitable.” *Forbes*, May 2009.
- “Reading Between the Lines of Used Books.” *The New York Times*, September 2005.
- “Internet Grows as a Factor in Used-Book Business.” *The New York Times*, July 2005.

Documents Relied Upon

<u>Document Title, Bates Numbers</u>	<u>Document Date</u>
Motions and Legal Pleadings	
Amazon Digital Services LLC's Initial Disclosures and Initial Proposed Rates and Terms, <i>In re</i> RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)	July 15, 2016
Apple Inc. Proposed Rates and Terms, <i>In the Matter of Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)</i>	November 1, 2016
RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)	July 15, 2016
)	
RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)	July 15, 2016
)	
Final Determination of Rates and Terms, <i>In the Matter of Mechanical and Digital Phonorecord Delivery Rate Determination Proceeding</i>	November 24, 2008
George Johnson's (GEO) Preliminary Disclosures, <i>In the Matter of Determination of Royalty Rates for Making and Distributing Phonorecords (Phonorecords III)</i>	July 17, 2016
RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)	July 15, 2016
Motion to Adopt Settlement Industry-Wide, <i>In re Determination of Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)</i> .	October 28, 2016
RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) (Phonorecords III)	July 15, 2016
RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) RESTRICTED — Subject to Protective Order in Docket No. 16-CRB-0001-PR (2018-2022) i D k t N 16 CRB 0001 PR (2018 2022)	July 15, 2016
Testimony of David Dorn, <i>In re Determination of Royalty Rates and Terms for Making and Distributing Phonorecords (Phonorecords III)</i>	November 1, 2016
Expert Report	
Expert Report of Jui Ramaprasad	November 1, 2016
Academic Articles	
Adam J. Lonsdale and Adrian C. North, "Why Do We Listen to Music? A Uses and Gratification Analysis," <i>British Journal of Psychology</i> 102, pp. 108–134	2011
Erik Brynjolfsson and Xiaoquan (Michael) Zhang, "Innovation Incentives for Information Goods," <i>Innovation Policy and the Economy</i> 7, pp. 99–123	2006
Gérard Cachon and Martin Lariviere, "Supply Chain Coordination with Revenue Sharing Contracts: Strengths and Limitations," <i>Management Science</i> 51, no. 1, pp. 30–44	2005
Hannes Datta et al., "Changing Their Tune: How Consumers' Adoption of Online Streaming Affects Music Consumption and Discovery," Working Paper, pp. 1–50	2016
James D. Dana, Jr. and Kathryn E. Spier, "Revenue Sharing and Vertical Control in the Video Rental Market," <i>The Journal of Industrial Economics</i> 49, no. 3, pp. 223–245	2001
James Hess and Eitan Gerstner, "Loss Leader Pricing and Rain Check Policy," <i>Marketing Science</i> 6, no. 4, pp. 358–374	1987
Joeri M. Mol et al., "Value Chain Envy: Explaining New Entry and Vertical Integration in Popular Music," <i>Journal of Management Studies</i> 42, no. 2, pp. 251–276	2005

Document Title, Bates Numbers

Luis Aguiar and Bertin Martens, "Digital Music Consumption on the Internet: Evidence from Clickstream Data," *Information Economics and Policy* 34, pp. 27–43 2016

Luis Aguiar and Joel Waldfogel, "Streaming Reaches Flood Stage: Does Spotify Stimulate or Depress Music Sales?," Institute for Prospective Technological Studies Digital Economy Working Paper 2015/05, pp. 1–37 2015

Michael Walker Jr., "A Better Public Performance Analysis for Digital Music Locker Storage," *St. John's Law Review* 87, no. 2, pp. 629–667 2013

Thomas M. Jorde and David J. Teece, "Innovation and Cooperation: Implications for Competition and Antitrust," *Journal of Economic Perspectives* 4, no. 3, pp. 75–96 1990

V.G. Narayanan and Ananth Raman, "Aligning Incentives in Supply Chains," *Harvard Business Review* 82, no. 11, pp. 94–102 2004

Books

Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston, MA: Harvard Business School Press) 1999

Jean Tirole, *The Theory of Industrial Organization* (Cambridge, MA: The MIT Press) 1988

Philip Kotler and Kevin Lane Keller, *Marketing Management*, 15th edition (New York: Pearson) 2016

Richard E. Caves, "Organizing to Collect Rents: Music Copyrights" in *Creative Industries: Contracts between Art and Commerce* (Cambridge, MA: Harvard University Press) 2002

Robert Atkinson and Stephen J. Ezell, "What is Innovation Policy?" in *Innovation Economics: The Race For Global Advantage* (New Haven, CT: Yale University Press) 2012

Publicly Available Documents

"Amazon Music is Even Better with More Imported Songs in Your Library," *Amazon*, <https://www.amazon.com/gp/feature.html?ie=UTF8&docId=1001432841>

"Amazon Music Unlimited," *Amazon*, <https://www.amazon.com/gp/dmusic/promotions/AmazonMusicUnlimited?tag=timecom-20>

"Amazon Prime One Year Membership," *Amazon*, <https://www.amazon.com/Amazon-Prime-One-Year-Membership/dp/B00DBYBNEE>

"Amplify Your Music Collection: Member Plans," *eMusic*, <http://www.emusic.com/info/plans-pricing/>

"Apple Introduces iTunes – World's Best and Easiest to Use Jukebox Software," *Apple Press Info*, <http://www.apple.com/pr/library/2001/01/09Apple-Introduces-iTunes-Worlds-Best-and-Easiest-To-Use-Jukebox-Software.html> January 9, 2001

"Apple Launches the iTunes Music Store," *Apple Press Info*, <https://www.apple.com/pr/library/2003/04/28Apple-Launches-the-iTunes-Music-Store.html> April 28, 2003

"Browsing Featured Ringtones," *Zedge*, <http://www.zedge.net/ringtones/>

"Copyright Royalty Board Establishes First-Time Mechanical Rates for Ringtones and Ad-Supported Streaming Music," Hughes Hubbard eAlert, http://www.hugheshubbard.com/PublicationDocuments/schnapp_Copyright%20Royalty%20Board%20Establishes_nov2008.pdf November 2008

"Deals," *Amazon*, <https://www.amazon.com/MP3-Deals/b?node=678551011>

"Digital Definitions," *Harry Fox Agency*, <https://secure.harryfox.com/public/DigitalDefinitions.jsp#20>

"Digital Music: \$0.69-\$1.29," *Amazon*, https://www.amazon.com/s/ref=sr_st?rh=n%3A163856011%2Cp_36%3A69-129%2Cp_n_feature_browse-bin%3A625151011&qid=1477349398&bbn=163856011&sort=price-desc-rank

"Download Your Past Purchases," *Apple*, <https://support.apple.com/en-us/HT201272> July 1, 2016

Document Title, Bates Numbers

“Free Ringtones,” <i>MyTinyPhone</i> , http://www.mytinyphone.com/ringtones/?ord=views	
“Free, Freemium and Premium: What Do the 2014 US Music Sales Figures Tell Us?” <i>Musically</i> , March 20, 2015, http://musically.com/2015/03/20/free-freemium-premium-us-music-sales-figures/	
“How the Money Flows Back to Songwriters, Artists, Publishers, and Labels,” <i>Future of Music Coalition</i> , http://futureofmusic.org/sites/default/files/moneyflow.streams.png	
“iTunes,” <i>Apple</i> , http://www.apple.com/itunes/music/	
“iTunes. Your Music, Movies, and TV Shows Take Center Stage.,” <i>Apple</i> , http://www.apple.com/itunes/	
“Music on Google Play,” <i>Google Play</i> , https://play.google.com/store/music?hl=en	
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