Before the
UNITED STATES COPYRIGHT ROYALTY JUDGES
THE LIBRARY OF CONGRESS
Washington, D.C.

In re)	
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DETERMINATION OF ROYALTY RATES)	**Docket No. 14-CRB-0001-WR**
AND TERMS FOR EPHEMERAL)	
RECORDING AND DIGITAL)	
PERFORMANCE OF SOUND RECORDINGS)	
(*WEB IV*))	

WRITTEN DIRECT TESTIMONY OF CARL SHAPIRO

(On behalf of Pandora Media, Inc.)

1. Qualifications and Assignment

A. Qualifications

My name is Carl Shapiro. I am the Transamerica Professor of Business Strategy at the Haas School of Business at the University of California at Berkeley, where I have taught since 1990. I also hold an appointment as Professor in the Department of Economics at UC Berkeley.

I am an economist who has been studying antitrust economics, the economics of innovation and intellectual property rights, competitive strategy, and government policies to promote competition and innovation for over thirty years. I have published extensively on these topics. My curriculum vitae is attached as Appendix A.

I was recently honored by being advanced to the rank of "Above Scale" Professor, the highest rank in the professoriate at the University of California. This rank is "reserved for the most highly distinguished faculty … whose work of sustained and continuing excellence has attained national and international recognition and broad acclaim reflective of its significant impact."[1]

I served as the Director of the Institute of Business and Economic Research at UC Berkeley from 1998 to 2008. I also have served as Co-Editor and then Editor of the *Journal of Economic Perspectives*, a leading economics journal published by the American Economic Association.

During 2011-2012 I had the great honor of serving as a Senate-confirmed Member of the President's Council of Economic Advisers. The Council of Economic Advisers, an agency within the Executive Office of the President, is charged with offering the President of the United States objective economic advice on the formulation of economic policy. The Council bases its recommendations and analysis on economic research and empirical evidence, using the best data available to support the President in setting our nation's economic policy.

I served during 1995-1996 and again during 2009-2011 as the Deputy Assistant Attorney General for Economics in the Antitrust Division of the U.S. Department of Justice. In this position I was the highest-ranking economist in the Department of Justice. As the chief economist in the Antitrust Division, I advised the Assistant Attorney General for Antitrust on a

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[1] University of California Academic Personnel Manual Section 220-18(b)(4), available at
http://www.ucop.edu/academic-personnel-programs/_files/apm/apm-220.pdf.

wide range of enforcement matters and competition policy issues. I supervised more than 50 Ph.D. economists in conducting investigations of mergers, civil non-merger cases, and price-fixing cases. I also played a leading role in formulating the Antitrust Division's position on a wide range of competition policy issues, including numerous issues related to intellectual property. I led the Department of Justice work that led to the updated Horizontal Merger Guidelines released in August 2010.[2] These Guidelines are highly influential in a range of settings well beyond horizontal mergers where government agencies seek to assess competitive conditions, define relevant markets, and determine whether or not those markets are workably competitive.

I have served on numerous occasions as an expert witness or consultant to the Antitrust Division or the U.S. Federal Trade Commission. I have also consulted or served as an expert witness on numerous antitrust matters for private companies in a wide range of industries, including the music industry, the telecommunications sector, and the high-tech sector, including companies that provide content, hardware, software, services, and infrastructure.

An important strand of my research involves the information technology sector of the economy. For example, my book with Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy,* examines competitive strategy in high-tech industries and includes chapters on the pricing of information and the management of digital rights. This book received critical acclaim and was widely adopted for classroom use.

A list of the matters in which I have provided testimony during the past five years is provided in Appendix B.

I am being compensated for my work on this case at a rate of $1000 per hour. This compensation is not dependent in any way on the opinions I express or the outcome of this matter. My work in this case has been supported by Charles River Associates (CRA), a consulting firm at which I am a Senior Consultant. I also receive compensation from CRA based on CRA's staff billings on this case.

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[2] Department of Justice and Federal Trade Commission, "Horizontal Merger Guidelines," August 2010, available at http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf.

B. Assignment

I have been asked by Pandora to undertake an economic analysis to estimate a reasonable royalty rate for its digital performances of sound recordings in the United States made after February 15, 1972, and for its making of ephemeral recordings of those sound recordings, for the 2016-2020 time period. For simplicity, when I refer below to reasonable royalty rates, unless otherwise noted, I will be referring to these rights and this time period.

In undertaking this analysis, I have read the decisions by the Copyright Royalty Judges ("Judges") in the prior webcaster proceedings ("*Web I*," "*Web II*," "*Web III*," and "*Web III Remand*") and in the most recent Satellite Digital Audio Radio Services proceeding ("*SDARS II*"). I also have paid close attention to the questions raised by the Judges in announcing the commencement of this proceeding, "Determination of Royalty Rates for Digital Performance in Sound Recordings and Ephemeral Recordings," ("*Web IV* Notice"). I have interviewed several Pandora employees and read the written direct testimony of the following Pandora witnesses: Tim Westergren (Founder), Simon Fleming-Wood (Chief Marketing Officer), Mike Herring (Chief Financial Officer), and Stephan McBride (Senior Scientist, Economics). I also have reviewed a number of internal Pandora documents as well as a variety of public materials relevant to my analysis. The list of materials that I considered in preparing this written direct testimony is attached as Appendix C.

2. Economic Framework for Determining a Reasonable Royalty Rate

My assignment and goal is to use my expertise as an economist to provide the Judges with my best estimate of a reasonable royalty rate under the Section 114 and 112 statutory licenses. As explained in further detail below, for a royalty rate to be "reasonable," it must be one that would be negotiated between willing buyers and willing sellers in a workably competitive market. It is my understanding that this conception of a reasonable royalty is consistent with that adopted previously by the Judges (and in other similar settings). In this section, I discuss how to interpret and apply this willing buyer/willing seller ("WB/WS") concept in the relevant market in this proceeding, namely the market for recorded music used by statutory webcasters.

The sellers in the relevant market for recorded music are the record companies with the authority to enter into licenses conveying the rights at issue in this proceeding. The buyers in the

relevant market for recorded music are the statutory webcasting services, including Pandora. The product being offered is a blanket license for a record company's complete repertoire of sound recordings.[3]

A. *Record Companies are Suppliers of Differentiated Products*

Two attributes of recorded music are fundamental to any analysis of negotiations between record companies and webcasters.

First, sound recordings are differentiated products. Every song is distinct, and listeners value variety. Right away, this tells us that textbook models of perfect competition cannot be used in the recorded music industry. Those models are not applicable because they assume that many suppliers offer a homogeneous product. In these textbook models of perfect competition, if one seller demands a price that is too high, a buyer can turn to another seller to secure exactly the same product. In such circumstances, competition among the sellers of identical goods is predicted to drive price down to marginal cost – the economic cost of producing and selling one more unit of the product at issue. As a general matter, while substitutes may be available for a particular sound recording, it will not be the case, as is required in perfect competition, that those substitutes will be perfect substitutes (i.e., identical products).

Second, the creation and distribution of sound recordings has a very particular cost structure: high fixed costs and very low marginal costs. Put in less abstract terms: the creation of a piece of recorded music involves significant "first-copy" costs, but the record company has very low additional costs associated with increased listening, especially for digital distribution.

These two attributes are not unique to recorded music. They apply as well to musical compositions, video programming, video games, and books, among other information goods. My book with Hal Varian, *Information Rules: A Strategy Guide to the Network Economy*, Harvard Business School Press, 1999, contains an extensive discussion of the pricing of differentiated products with high first-copy costs. (See especially Chapter 2, "Pricing Information," Chapter 3, "Versioning Information," and Chapter 4, "Rights Management.")

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[3] It is my understanding that this is the approach taken by the Judges in *Web III Remand*; see *Web III Remand* at 23110. There exist other markets for recorded music, which are distinct from the relevant market in this proceeding. These other markets involve the same sellers but different categories of buyers. I am referring here to satellite radio, interactive services, and terrestrial radio. The rates set in those markets may enter into the analysis here (a) because statutory webcasters may compete against those other buyers to attract listeners, and (b) because the terms and conditions of licenses in these other markets may be informative regarding the reasonable rate at issue in this proceeding.

B. *Pricing of Differentiated Products*

Suppliers of differentiated products generally set prices above marginal cost. Indeed, for information goods, prices *must* be greater than marginal cost for the industry to be sustainable. Pricing at marginal cost would fail to generate sufficient revenues to cover the first-copy costs.

The most fundamental pricing rule in the field of industrial organization economics is the Lerner Equation. The Lerner Equation provides a simple formula for the price set by a profit-maximizing firm selling a differentiated product. The Lerner Equation can be found in most if not all intermediate microeconomics and industrial organization textbooks. The Lerner Equation typically appears in textbooks under the heading of "monopoly pricing," but it applies to any seller of a unique, differentiated product, so long as that seller is pricing independently of its rivals. The Lerner Equation states that there is an inverse relationship between the firm's margin (the gap between price and marginal cost) and the firm's elasticity of demand.[4]

In the current proceeding, the product being offered is a blanket license for a record company's complete repertoire of sound recordings. For now, it is easiest to think of the record company's price as the per-performance royalty rate it charges to webcasters.[5] In this context, the Lerner Equation tells us that a record company not subject to any compulsory license will set a lower per-performance royalty rate to a webcaster, the more sensitive is the webcaster's use of that record company's music to the royalty rate charged by the record company for its music. That sensitivity is measured by economists as the *elasticity of demand*.[6] A webcaster that can easily substitute toward or away from the music of any one record company will have a high firm-specific elasticity of demand. In particular, a webcaster that can easily control the songs it

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[4] Call P the firm's price, C the firm's marginal cost, and E the (absolute value of) the elasticity of demand for the firm's product. The Lerner Equation states that $(P-C)/P=1/E$. The Lerner Equation applies for an elasticity greater than one. If the elasticity is less than one, i.e., if demand is inelastic, the firm should raise its price until the elasticity is greater than one, i.e., until demand becomes elastic. Throughout my testimony, when referring to any price elasticity of demand I mean the absolute value of that elasticity, so a larger price elasticity corresponds to greater price sensitivity.

[5] Below, I consider a percentage-of-revenue royalty structure. The general principle I am enunciating here – the inverse relationship between price/cost margin and elasticity of demand – also applies with that royalty structure.

[6] More precisely, this is a *firm-specific* elasticity of demand. In general, the firm-specific elasticity of demand measures a buyer's sensitivity to the price set by a single supplier, such as Safeway's elasticity of demand for Coke. An example in the current case would be Pandora's elasticity of demand for the recorded music from a specific record company, such as Warner Music Group. Pandora's elasticity of demand for Warner's music will be greater than Pandora's elasticity of demand for all recorded music, precisely because Pandora can substitute music from other record companies for music from Warner in response to a Warner-specific price increase. Likewise, Safeway's elasticity of demand for Coke is higher than Safeway's elasticity of demand for all soft drinks.

streams to its users, with little impact on their patronage, will have a high firm-specific elasticity of demand. Applying the Lerner Equation, this webcaster will face a relatively low price. In contrast, a music service with very limited ability to control the songs it streams to its listeners will have a low elasticity of demand for any one record company's repertoire of sound recordings and will face a relatively high price. In particular, an *interactive* service, which gives the listener the ability to select what song to stream, will tend to have a very low firm-specific elasticity of demand, and thus face a relatively high price.[7]

The Lerner Equation also tells us that a record company not subject to any compulsory license will charge a higher price to music users that are more costly for the record company to serve, including the *opportunity cost* to the record company of a performance by the music user. Importantly here, the opportunity cost includes the impact of performances by the music user on other record company revenue streams. For performances that have no impact on other revenues earned by the record company, the economic cost is simply the marginal production and distribution cost to the record company, which I understand to be zero or nearly zero for streaming services. For performances that *substitute* for other sales by the record company, the economic cost includes the lost price/cost margins on those other sales, and hence is positive. By precisely the same logic, for performances that *promote* other sales by the record company, the extra price/cost margins on those other sales are an economic *benefit*, causing the economic cost to be negative.

In this manner, the Lerner Equation automatically accounts for the important principle that a service that substitutes for other profitable sales by the record company will pay a higher price in a workably competitive market (based on the higher economic cost to the record company of performances on this service), while a service that promotes other profitable sales by the record company will pay a lower price in a workably competitive market (based on the lower economic cost to the record company of performances by this service). This discussion reflects the power and generality of the Lerner Equation: the marginal cost term in the Lerner Equation

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[7] If a subscription interactive service has very little or no ability to affect the mix of songs played on its service, for that service the repertoires of different record companies are economic *complements* rather than economic *substitutes*. (Two products are economic complements if the demand for one of these products goes down when the price for the other rises; the opposite relationship holds for economic substitutes.) If one record company unilaterally raises its price to the interactive service, the costs of that service rise, pushing up its subscription price. The higher subscription price will reduce the number of subscribers to this service and thus reduce this service's demand for music from other record companies. The distinction between substitutes and complements is fundamental in the field of industrial organization. Hence, I make a sharp distinction between interactive and non-interactive services.

captures the key factors on the supply side (here, the opportunity cost to the record company) and the elasticity of demand term in the Lerner Equation captures the key factors on the demand side (here, the flexibility of the webcaster in the mix of music it plays).

The Lerner Equation gives a formula for the profit-maximizing price set by the supplier of a differentiated product. The analysis underlying the Lerner Equation assumes that the supplier is in the driver's seat in the sense of dictating the price, which buyers must then take as given when making their purchase decisions. This is indeed how many prices are set in our economy. An alternative formulation would have the *buyer* set the price, which sellers must then take as given when making their supply decisions. While this is a less common way for prices to be set in our economy, some would say that Wal-Mart operates this way, making take-it-or-leave-it offers to many of its suppliers. If the buyer is in the driver's seat, a lower price results than if the seller is in the driver's seat. Neither of these approaches is precisely on point for the task at hand. Here, we are attempting to approximate a *negotiated* price – one that is determined following a back-and-forth process, with neither side dictating the price.

In a negotiation, because neither the buyer nor the seller dictates the price, the resulting price will be below that which the seller would dictate and above that which the buyer would dictate.[8] While the ultimate price resulting from a negotiation will be lower than the seller's profit-maximizing price calculated pursuant to the Lerner Equation, the seller's marginal cost and the buyer's elasticity of demand for the seller's product remain the key factors that determine negotiated prices. So, for example, if the marginal cost to a record company of a performance on a non-interactive service is lower than the marginal cost of a performance on an interactive service (because, for example, the non-interactive service is more promotional), the non-interactive service will negotiate a lower per-play royalty rate. Likewise, the more easily a music service can steer listeners toward or away from specific sound recordings, the lower will be the price that music service will be able to negotiate. These basic economic principles are central to the benchmarking exercise below.

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[8] The negotiated price will be closer to the price the seller would dictate if the seller has more bargaining skill or bargaining power than the buyer, and vice versa.

C. Webcasters are Aggregators of Recorded Music

We are now ready to discuss the factors that determine a webcaster's elasticity of demand for the music in the repertoire of a single record company. This requires that we look more closely at how webcasters use music and their ability to control that usage.

Webcasters are *aggregators*: they combine recorded music from a number of record companies to create a valuable service for their listeners. This basic observation applies whether the webcaster earns revenues from subscribers, from advertisers, or from both.

Aggregators are intermediaries that create value by choosing which products to carry and by combining and presenting those products in a way that is appealing to customers. For example, most retailers are aggregators that combine products from a number of manufacturers and offer them to shoppers in an attractive or convenient manner. Likewise, Pandora adds value to listeners by aggregating music from multiple record companies, selecting music that its listeners enjoy, and by making that music available to them in a convenient manner.

Based on the general principles regarding the pricing of differentiated products discussed above, we know that a supplier negotiating with an aggregator will price closer to marginal cost, the more easily that aggregator can shift its demand to products from other suppliers without losing the patronage of its own customers.

What does this mean in practice? Consider the negotiations between Macy's, the department store, and Rockport, a brand of men's shoes. Imagine that Rockport is in the process of deciding what wholesale prices to quote to Macy's for its line of men's shoes. All other things equal, the higher are these wholesale prices, the greater is Macy's incentive to steer its customers toward other brands of men's shoes that Macy's carries, such as ECCO, Crocs, Florsheim, or Polo Ralph Lauren, since the higher are Rockport's wholesale prices, the lower the margin that Macy's makes from the sale of Rockport shoes. Macy's might steer its customers by displaying the other brands more prominently or by having its sales staff promote other brands more actively than Rockport. If many of Macy's customers will purchase Rockport shoes but not these other brands regardless of the actions taken by Macy's, then Macy's has little ability to steer its customers away from Rockport. In that case, Macy's will have a relatively low elasticity of demand for Rockport shoes. Alternatively, if Macy's can quite easily steer its customers to other brands, Macy's will have a relatively high elasticity of demand for Rockport shoes. In the latter case, Rockport has a strong incentive to offer Macy's a discount either to prevent Macy's

from steering its customers away from Rockport or to encourage Macy's to steer its customers toward Rockport.[9]

This example illustrates a general economic principle: aggregators that can easily steer their customers toward or away from the products offered by a supplier will have a high elasticity of demand for that supplier's products and will pay prices relatively closer to marginal cost. The net result in a workably competitive market may well be relatively little actual steering, yet lower prices to aggregators with the capability to steer. Macy's credible threat to steer enables Macy's to negotiate discounts from suppliers of men's shoes, but in the end Macy's may well carry many brands of men's shoes and not favor any one brand over other brands. All of this reflects the workings of a competitive market, ultimately providing consumers with a variety of choices at competitive prices.

The forces present in my example with Macy's and Rockport are ubiquitous when suppliers negotiate with aggregators. Negotiations between suppliers of differentiated products and aggregators invariably follow a certain dynamic.[10]

- The supplier undertakes efforts to differentiate its product and build up its brand with final customers to convince aggregators that they will lose significant sales if their package does not include that supplier or if they try to steer customers to other suppliers.

- The aggregator looks for ways to reduce the reliance of its overall package on any one supplier, both by building up its own brand and by enhancing its ability to use its direct relationship with the customer to influence the customer's choice.

I consider this dynamic fundamental for the task at hand, i.e., to determine the rate that would arise in negotiations between a record company and a webcaster in a workably competitive market. More specifically, the ability or inability of a webcaster to steer listeners toward or away from the music of a given record company is fundamental to the licensing negotiations that would take place in the absence of a compulsory license. A record company facing a webcaster with considerable ability to steer customers away from its music has a strong

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[9] The distinction between Macy's demand for Rockport men's shoes, which may be highly elastic, and Macy's demand for men's shoes as a category, which will be far less elastic, is fundamental to this analysis. Macy's demand for Rockport men's shoes is another example of a firm-specific elasticity of demand.

[10] I have studied many industries in which this dynamic has played out, including appliances sold to retailers, credit card networks negotiating for merchant acceptance, physicians and hospitals negotiating with health insurance companies, and video programming licensed to cable television companies.

incentive to discount its music to increase the number of performances of its music made by that webcaster.

D. Workable Competition in the Markets for Recorded Music

So far, I have explained the fundamental forces that would drive negotiations between record companies and webcasters in the absence of a compulsory license. This is the starting point for understanding the hypothetical negotiation between a willing seller (record company) and a willing buyer (webcaster). I now add in the concept of a workably competitive market.[11]

In markets for recorded music, competition among record companies would take the form of price reductions (discounted royalty rates) in exchange for greater market share (more plays by music services).[12] If a music service plays more of a particular record company's music because that music is less expensive than the music from other record companies, I will say that the music service "steers" listening toward the less expensive record company. Likewise, a music service can steer *away* from a record company whose music is more expensive than the music of other record companies.

1. Workably Competitive Markets: General Principles

A workably competitive market is one not subject to the exercise of significant market power.

A market is workably competitive if two conditions hold: (1) there are multiple suppliers who are capable of offering buyers meaningful alternatives, so that no single supplier has substantial unilateral market power; and (2) these suppliers do not engage in coordinated interaction.[13] When both of these conditions are met, competition among the sellers in the market generates substantial benefits for buyers in the market.

The hallmark of a workably competitive market is regular, significant competition among suppliers for the patronage of buyers. In practice, to assess whether a market is workably

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[11] My approach here is consistent with the one taken by the Judges in the *Web III Remand*; see *Web III Remand* at 23114.

[12] This is precisely the type of competition that emerged in a related marketplace – that for musical works performed by the background music supplier DMX, Inc. In that marketplace, a substantial number of music publishers, including one "major" music publisher, agreed to accept lower royalty rates based, at least in part, on the expectation that DMX would rely more heavily on their works in creating its playlists. *In re Application of THP Capstar Acquisition Corp.*, 756 F. Supp. 2d. 516, 550 (S.D.N.Y. 2010).

[13] These two conditions are reflected in the Horizontal Merger Guidelines, which consider two general types of competitive effects of mergers: unilateral effects (Section 6) and coordinated effects (Section 7).

competitive, economists look at market concentration, entry conditions, profits and price/cost margins, and especially more direct evidence regarding how suppliers compete, or refrain from competing, for the patronage of buyers.

A market can be workably competitive even when the products or services offered by different sellers are differentiated, so long as no single supplier has significant unilateral market power. Indeed, this is the norm for information products such as books, video programming, or software applications. Workable competition does not require marginal cost pricing or anything approaching the textbook model of perfect competition.

A market can also be workably competitive even if it is quite concentrated, so long as the suppliers compete regularly and energetically to win business from each other. For example, the market for airline service between two cities might be dominated by three airlines yet still be workably competitive, so long as we observe those carriers engaging in regular and significant price competition.

In contrast, a market that is monopolized or controlled by a cartel is *not* workably competitive. If such markets were considered workably competitive, the concept of workable competition would lose all meaning. Likewise, a moderately or highly concentrated market in which the leading suppliers tacitly collude is not workably competitive. For example, if the leading suppliers have settled into some form of coordinated interaction, e.g., by refraining from competing actively to poach each other's customers, the market will fail to be workably competitive. More generally, if the leading suppliers are colluding – either expressly or tacitly – the market is not workably competitive.

2. Workable Competition in Markets Where Buyers are Aggregators

We can refine these general principles somewhat when looking at markets where the buyers are aggregators. In markets of this type, it is especially important to assess the extent to which these aggregators can offer attractive packages without the products of particular suppliers and the extent to which these aggregators can steer their customers toward or away from particular suppliers. If the aggregators have little or no ability to influence which products their own customers use, competition among the suppliers may not function effectively. In such situations, the market can fail to be workably competitive, even if it is only moderately concentrated.

To see how this can happen, consider the market for hospital services sold to health insurance companies in a given locale. Suppose there are three hospitals who negotiate rates with several health insurance companies who in turn offer health insurance policies to local employers. Suppose that the employers feel it is necessary that the health insurance coverage they offer to their employees provide reimbursement for treatment at all three hospitals because different employees prefer different hospitals. Suppose also that the insurance companies have little or no ability to steer patients toward or away from particular hospitals because individual employees have a strong desire to select a particular doctor or hospital. In this case, all three hospitals are "must-have" for the insurance companies, and the insurance companies have a very inelastic demand for the services of each hospital. Despite the presence of three hospitals, this market is not workably competitive.

For very similar reasons, the market for recorded music used by *interactive* streaming services appears not to be workably competitive. When the Federal Trade Commission ("FTC") closed its investigation of the merger between Universal Music Group and EMI Recorded Music, the closing statement issued by the Director of the Bureau of Competition stated: "Commission staff found considerable evidence that each leading interactive streaming service must carry the music of each Major to be competitive. Because each Major currently controls recorded music necessary for these streaming services, the music is more complementary than substitutable in this context, leading to limited direct competition between Universal and EMI."[14] If interactive streaming services indeed "must carry" the music from each of several major record companies to be competitive, and if these services have a limited ability to control the mix of music played by their customers because customers pick which songs to listen to, the market for recorded music licensed to interactive streaming services is *not* workably competitive.[15] The FTC effectively concluded that the market for recorded music licensed to interactive services was not

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[14] Statement of Bureau of Competition Director Richard Feinstein, September 21, 2012, available at http://www.ftc.gov/sites/default/files/documents/closing_letters/proposed-acquisition-vivendi-s.a.emi-recorded-music/120921emifeinsteinstatement.pdf. Below, I present evidence that, for Pandora, the recorded music from one record company is very much a substitute for the recorded music from another record company. This is in sharp contrast to the FTC's findings for interactive streaming services. Here we are seeing an example of the fundamental distinction between complements and substitutes that was introduced above.

[15] This being the case, one might ask why the Federal Trade Commission did not challenge the Universal/EMI merger. Based on the closing statement just cited, it is clear to me that the FTC saw the repertoires of Universal and EMI as complements, not substitutes, for interactive streaming services. Therefore, for this group of buyers, the Universal/EMI merger was not a horizontal merger, and the normal loss of direct competition that occurs in a horizontal merger was not present.

workably competitive. Nonetheless, the FTC did not challenge the Universal/EMI merger because, ironically, it concluded that the merger would not *worsen* the lack of competition.[16] The FTC's closing statement did not address the market for recorded music licensed to non-interactive services.[17]

Below, I present evidence that Pandora has considerable ability to steer its listeners toward or away from music licensed by the major record companies. In this respect, there appears to be a very substantial difference between Pandora and the interactive streaming services studied by the FTC. My observation that the market for recorded music used by interactive services appears not to be workably competitive warns strongly against using royalty rates from that market as benchmarks for the current proceeding, unless a market power adjustment (among other adjustments) is made.

3. The Dearth of Historical Competition in the Relevant Market

Based on the information available to me at this point in the proceeding, I suspect that the relevant market in this proceeding, namely, the market for recorded music licensed to the statutory webcasters, also is not workably competitive.[18]

This tentative conclusion is not based simply on the level of concentration in the relevant market, which is moderate to high.[19] Nor is it based on the fact that the record companies offer

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[16] The operative question in a merger investigation is whether the merger will *lessen* competition, not whether the pre-merger market is workably competitive.

[17] Based on my experience with merger analysis, and my study of the relevant market in this proceeding, I believe that the FTC was not able to establish that the merger would lessen competition in the market for recorded music licensed to non-interactive services because of a lack of evidence of pre-merger competition between Universal and EMI to have their music played by webcasters. Just below, I explain the more general lack of competition among the major record companies to have their music played by webcasters. This dearth of competition suggests rather strongly that the market for recorded music licensed to statutory webcasters also is not workably competitive.

[18] I focus here on the relevant market for the current proceeding, in which the buyers are statutory webcasters. The *SDARS II* record indicates that a number of independent labels did compete in the closely related market involving the same sellers and the same rights but a different buyer, namely, Sirius XM. However, the *SDARS II* record does not support the conclusion that this related market was workably competitive either, since there is no indication in the record that the three largest record companies engaged in price competition to gain market share in that market and evidence that, to the contrary, suggests that record companies banded together to avoid such competition.

[19] The three major record companies account for about 65 percent of all performance on Pandora. Their shares on Pandora imply a Herfindahl-Hirschman Index ("HHI") of concentration of at least 1650. The Horizontal Merger Guidelines classify markets with this level of HHI as "moderately concentrated." The share of performances at Pandora attributable to music from the major record companies is less than their share on terrestrial radio, and thus also less than their share for simulcasters. Therefore, the HHI figure based on Pandora performances almost certainly underestimates the true HHI including all of the statutory webcasters. At the time of the Universal/EMI merger, based on Nielsen and Billboard data for digital album sales, the American Antitrust Institute estimated that

differentiated products that are subject to first-copy costs. Rather, I reach this tentative conclusion because, to the best of my knowledge, the three largest record companies, Universal Music Group, Sony Music, and Warner Music Group, only rarely offer discounted royalty rates to statutory webcasters to gain more plays from those webcasters. I may revisit this tentative conclusion later in this proceeding if and when I see additional information about such competition, or the lack thereof.

One reason for this dearth of competition is that SoundExchange is able to negotiate on behalf of the record labels as a group. When SoundExchange is negotiating with a music user on behalf of a group of record companies, those negotiations by definition do not include any element of price competition among those record companies.[20] In the language of oligopoly theory, if SoundExchange can achieve collusive rates, those rates can provide a convenient and attractive focal point for the record companies, which discourages individual record companies from breaking ranks by initiating price competition. In the language of antitrust economists, SoundExchange can facilitate coordinated interaction among the record companies.[21]

Basic oligopoly theory teaches us that the suppliers with the largest market shares are the least likely to "defect" from a coordinated outcome by offering discounts to gain market share. The larger a firm's market share, the more that firm has to lose from disrupting the status quo. Plus, when a firm with a larger market share engages in discounting to win more business, it is more likely that its rivals will detect that discounting and respond in kind. Anticipating these responses, the firm with the large market share will be less inclined to initiate discounting in the first place. For all of these reasons, coordinated interaction is a greater risk to competition in more concentrated markets, as emphasized by the Horizontal Merger Guidelines.[22]

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the merger would raise the HHI from 2340 to 2917, well into the "highly concentrated" range. See Flavia T. Fortes, "Music Industry Consolidation: The Likely Anticompetitive Effects of the Universal/EMI Merger, August 30, 2012, available at http://www.antitrustinstitute.org/sites/default/files/White%20paperEMI%20Universal.pdf, at 6-7.

[20] For precisely this reason, the use by rivals of a common bidding agent is normally treated as a *per se* antitrust violation. The common agent has an incentive to set the cartel price and then divide the resulting profits among the members of the bidding ring.

[21] I understand that SoundExchange has certain antitrust immunity. As stated in the Horizontal Merger Guidelines, coordinated interaction includes a range of conduct, including conduct that would not itself violate the antitrust laws. Effective tacit coordination prevents a market from being workably competitive even if it does not violate the antitrust laws.

[22] The Horizontal Merger Guidelines have relied on this core principle from oligopoly theory since 1982. The seminal paper working out these elements of oligopoly theory is George Stigler, "A Theory of Oligopoly," *Journal*

The presence of the statutory license also can create an impediment to competition. In general, when one supplier is considering initiating a price discount to gain market share, it must consider how those discounts will affect the overall level of prices in the market. A supplier will be discouraged from offering a discount if it expects that discount to be widely matched, because this would lead to little or no change in market shares but a lower price level in the market overall. This tendency can create an anticompetitive dynamic when prices are negotiated in the shadow of a statutory license: record companies, especially the larger ones, will be discouraged from offering discounts if they expect that those discounted royalty rates will pull down the statutory rate in the future. Unfortunately, this dynamic can be especially powerful if the statutory rate is set well above the rate that would result from effective competition. In that case, the statutory rate serves as an anchor, keeping negotiated rates above the level that would result from effective competition.

Putting the pieces together, it appears that several features of the market for recorded music used by webcasters have combined to discourage record companies from competing royalty rates down to competitive levels: the presence of SoundExchange with its antitrust immunity to negotiate on behalf of the record companies collectively; the significant share of the market accounted for by the three major record companies; and the shadow of the statutory licensing regime. The net result is a dearth of historical evidence of discounting by record companies to gain market share. Yet that is the single most important category of evidence an economist looks for to determine whether a market is workably competitive.

4. Emerging Competition in the Relevant Market

Fortunately, at least for Pandora, we are now seeing some glimmers of competition. Workable competition does seem possible in the relevant market, so long as webcasters such as Pandora are able to significantly influence the mix of music they play. As discussed below in some detail, Pandora has now tested and proven its ability to modify its playlist-selecting algorithms to rely more or less heavily on the music of particular record companies. Pandora also has invested in the creation of a database that lists the label associated with most of the songs it plays, a necessary step for Pandora to engage in widespread steering. Pandora also has

signed a direct licensing agreement that involves discounted royalties in exchange for steering. Below, I discuss that agreement in considerable detail.

Technological change is also spurring greater competition in the relevant market. As I have emphasized, in markets where the sellers provide differentiated products, competition leads to lower prices, the greater flexibility the buyers have to substitute the products or services from one supplier for those from another. As discussed in some detail below, Pandora has considerable flexibility to steer its listeners toward or away from the music from any one record company. Pandora's flexibility is directly related to its use of an optimizing algorithm to select playlists. The key point is that Pandora can selectively increase or decrease performances of recorded music in a manner that is highly attuned to the preferences of its listeners. This may involve little or no steering for listeners who are very picky about their music, or on stations seeded with particular artists, along with a great deal of steering for listeners who are relatively indifferent to the music they hear, or on stations seeded by certain other artists.

I do not believe that the Judges in the *Web II* or *Web III* proceedings were presented with evidence of webcaster flexibility that was nearly as strong as the evidence provided below regarding Pandora's flexibility in the music it plays. The relevant market appears to be experiencing a form of technological progress that is giving today's buyers much more flexibility, and thus a much higher elasticity of demand, than yesterday's buyers. In a workably competitive market, this type of technological progress puts pressure on suppliers to compete harder for market share, causing prices to fall.

E. Price Discrimination

We are now ready to discuss whether reasonable royalty rates should embody some form of economic price discrimination to reflect the statutory hypothetical marketplace. Recognizing that record companies would seek to charge more to webcasters with less elastic demand, the Judges stated in their *Web IV* Notice: "The Judges invite the Participants to include in their proffered evidence, testimony, and/or arguments a consideration of the potential applicability of price discrimination *within* the commercial webcaster segment as well."[23]

The Lerner Equation described above has strong implications for price discrimination: the seller of a differentiated product has an incentive to set higher prices for customers with less

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[23] *Web IV* Notice at 411.

elastic demand, other things equal. Put differently, when the seller of a differentiated product faces different types of buyers, the seller will charge a higher price to a buyer with a lower elasticity of demand for that seller's product. This fundamental economic principle underlies Section 3 in the Horizontal Merger Guidelines, "Targeted Customers and Price Discrimination."

Two conditions must be met for the seller to be able to successfully price discriminate in this manner. First, the seller must be able to identify different customers (or types of customers) with different elasticities of demand. As a classic example, many movie theatres offer student discounts, believing that students are especially sensitive to price. Second, the seller must be able to prevent customers from engaging in arbitrage. In the movie theatre example, the theatre must be able to prevent regular customers from posing as students when they buy tickets or having students buy tickets for them.

In the absence of any compulsory license, I would indeed expect to see some degree of price discrimination within the relevant market for recorded music licensed to webcasters. Price discrimination is common throughout our economy, especially in markets for differentiated information products. The ability of record companies to price discriminate would be limited to some degree by competition among the various webcasters: any one webcaster paying higher rates for recorded music than others would be at a competitive disadvantage relative to those other webcasters, which would depress its share of the webcasting market. This dynamic makes price discrimination less profitable for the record company, as consumers shift away from the target webcaster to other webcasters.[24] That being said, I see no reason why the hypothetical statutory market would be entirely free of price discrimination, since different webcasters may have significantly different abilities to steer listeners toward or away from the repertoires of individual record companies.

At this point in the proceeding, I do not have access to a sufficient number of licensing agreements between record companies and webcasters to determine directly, i.e., based on price differences, whether price discrimination is a significant feature of this market. If significant price discrimination is occurring, or could occur based on differences in elasticities of demand across different types of buyers, it does not follow that the statutory royalty rates should reflect such discrimination. Before reaching that conclusion, one would want to be confident that the

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[24] In terms of the Lerner Equation, if competition among webcasters is strong, any one webcaster will have a relatively elastic demand for recorded music, because that webcaster will lose customers if it faces a higher price for recorded music than do its rivals.

segmented markets to serve even the less-elastic buyers were workably competitive. For the reasons given above, that does not currently appear to be the case.[25]

3. The Benchmark Approach to Setting Reasonable Royalty Rates

Now that I have discussed the economic framework for determining a reasonable royalty rate, we are ready to move forward with the work of actually calculating the reasonable royalty rate.

In principle, one could estimate a reasonable royalty rate for webcasters by building an economic model that describes how negotiations between a record company and a webcaster in a workably competitive market would be expected to unfold, fitting that model to the data, and then using the resulting calibrated model, together with bargaining theory, to generate a prediction of the negotiated royalty rate. This type of structural modeling approach is commonly used to predict the price effects of mergers; in that context, this methodology is known as merger simulation. I considered a structural modeling approach here and concluded it was not feasible and sufficiently reliable and robust given the data that are currently available to me.[26]

I instead employ a conventional benchmark approach to calculating reasonable royalty rates. Benchmarking has been the primary method used to estimate reasonable royalty rates in prior proceedings.

The basic idea behind benchmarking is intuitive and very sensible: to estimate the royalty rate that would be hypothetically negotiated between certain buyers and sellers, start from the royalty rates that have *actually* been negotiated between very similar or identical buyers and sellers for very similar or identical rights under workably competitive conditions. Benchmarking approaches are commonly employed to estimate reasonable royalty rates in a variety of other

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[25] The Horizontal Merger Guidelines pay close attention to such segmented markets, which are generally known as "price discrimination markets," precisely because competition is least likely to be effective in serving buyers with the least ability to substitute one seller's products or services for another. See the *Horizontal Merger Guidelines*, Section 4.1.4, "Product Market Definition with Targeted Customers."

[26] This approach would involve estimating the elasticity of demand for the sound recording repertoires of various record companies, which, to be done precisely, would require data on how webcasters have responded to variations in the royalty rates charged for the music of individual record companies. I am not aware of any systematic data of this sort. This approach also would require estimating the marginal cost to the record company of an incremental webcasting performance. The marginal cost to a record company of an incremental performance by a webcaster should include (a) any profit margins from other customers that would be lost as a result of this performance (substitution), *less* (b) any profit margins from other customers that would be generated as a result of this performance (promotion).

settings, particularly when setting royalties for other intellectual property rights, such as in rate proceedings before the ASCAP and BMI rate courts and in patent infringement cases, where a very similar willing buyer/willing seller construct applies.[27]

The accuracy and reliability of any benchmarking exercise depend on how comparable the benchmark transactions truly are to the hypothetical negotiation under study. Benchmark transactions can vary in several respects from the hypothetical transaction: the rights, the buyer, the seller, the market conditions, and the time period. The closer the benchmark transaction is to the hypothetical transaction in all these respects, the better. To the extent that there are differences in any of these respects, the analyst attempts to make one or more adjustments to account for such differences. The reliability of these adjustments affects the reliability of the resulting reasonable royalty rate.

Determining appropriate adjustment factors can be an intricate task. Often, there are a number of nuances that must be addressed. For example, in the case at hand, consider a candidate benchmark in which the seller is a record label, but the buyer is an interactive music service rather than a statutory (non-interactive) webcaster. In making adjustments to this candidate benchmark, it is not sufficient to identify the difference in the revenue per play between interactive and non-interactive services. One must also consider any differences in the elasticity of demand for the record company's music and in the marginal cost to the record company. [28] As noted above, the elasticity of demand is determined by the service's ability (or lack thereof) to modify its playlists to rely more heavily on lower cost performances and less heavily on higher priced performances. This ability to steer is likely far greater for a non-interactive service – one that selects the performances – than it is for an interactive service – one that has little control over the selected performances. In such circumstances, the elasticity of demand of the non-interactive service would be far greater than the elasticity of demand of the interactive service. Thus, were one to use the sound recording performance royalties paid by an interactive service as a benchmark for setting the royalties to be paid by a non-interactive

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[27] Patent damages often come in the form of "reasonable royalties," which are defined as the royalties that would have been negotiated between the patent holder and the infringing party prior to the infringement, under the assumption that the patent was valid and infringed.

[28] In the *Web II* proceeding, the elasticity of end-user demand for webcasting services is discussed. That is very different from the elasticity discussed here, namely a webcaster's elasticity of demand for the repertoire of recorded music from a single record company.

service, a downward adjustment must be made, the magnitude of which depends on the difference in the elasticities of demand.

Likewise, in making adjustments to a candidate benchmark, one also must consider differences in marginal cost between the seller in the benchmark agreement and the seller for whom one is trying to determine the reasonable royalty rate. Differences in marginal cost include differences in opportunity cost, one element of which is the (net) diversion of other profitable sales. To see how this works, suppose the record label seller expects that listening on an interactive service will largely substitute for listening through other distribution channels (such as digital downloads) that generate revenue, while listening on a non-interactive service will largely be incremental or substitute for listening on terrestrial radio, and thus cannibalize fewer of the record company's revenues (or even generate additional revenues). With this fact pattern, the record company's marginal cost of selling to the interactive service would be larger than its marginal cost of selling to the non-interactive webcaster. This calls for a downward adjustment from the benchmark rate, the magnitude of which depends on that difference in marginal cost.[29]

Quantifying differences in the elasticity of demand and in marginal cost can be quite tricky. In some cases, there is insufficient information available to come up with a reliable adjustment factor. Avoiding these oftentimes messy and complex adjustments is precisely why one prefers a benchmark agreement that is as similar as possible along the dimensions noted above to the hypothetical negotiation. Fortunately, as discussed in greater detail below, in this case we have a benchmark agreement that is identical or nearly identical along nearly all of the relevant dimensions to the hypothetical transaction at issue in this proceeding.

4. Reasonable Royalty Rate and Structure

For the reasons discussed in greater detail below, it is my view that a reasonable royalty rate for the statutory license at issue in this proceeding for the years 2016-2020 should be set at the greater of (a) 25 percent of the revenue attributable to the licensed music,[30] and (b) the following per-play rates.

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[29] Other adjustments may also be necessary in this example, including a market power adjustment (as noted above).

[30] This concept is defined in the regulations proposed by Pandora.

Table 1
Reasonable Per-Play Royalty Rates After Adjustments
2016 Through 2020
(¢)

	Advertising-Supported	Subscription	Blended
30% Steering			
2016	0.1105	0.2146	0.1225
2017	0.1124	0.2183	0.1246
2018	0.1144	0.2221	0.1268
2019	0.1164	0.2260	0.1290
2020	0.1185	0.2300	0.1313
12.5% Steering			
2016	0.1205	0.2238	0.1324
2017	0.1226	0.2276	0.1347
2018	0.1247	0.2316	0.1370
2019	0.1269	0.2357	0.1394
2020	0.1291	0.2399	0.1419

The "blended" rate reported for each year in Table 1 is the single rate that would generate the same total royalty payments that year as the ad-supported and subscription rates.

These per-play rates would apply to all performances that are compensable under the current statutory framework, namely all non-directly licensed performances (whether partial or complete) of sound recordings that were "fixed" after February 15, 1972. These royalty rates – both the percentage-of-revenue and per-play rates – include payment for the rights conveyed by both the Section 114 and the Section 112 licenses at issue in this proceeding.

The primary benchmark agreement on which I rely, the agreement reached in June 2014 between the Music and Entertainment Rights Licensing Independent Network ("Merlin") and Pandora (the "Merlin Agreement"), which is discussed in greater detail below, has this same "greater-of" rate structure, along with different per-play rates for ad-supported and subscription performances. This rate structure has the property of assuring that rights holders receive at least the specified per-play rate for each compensable performance of their sound recordings while also allowing the rights holders to benefit in the event that the non-interactive service is able to monetize its service sufficiently that the percent-of-revenue prong becomes operative.

As detailed in the Herring Testimony, while per-play rates at these levels would be likely to govern Pandora's payments during at least the early part of the statutory license term, as

Pandora develops into a more mature company that is able to more fully monetize its product, it is quite possible that the ██████████████ prong ultimately will be the binding prong, allowing the record labels to share in Pandora's success at not less than that revenue percentage as it continues to improve its monetization.[31] Put differently, the per-play rates are effectively transitional rates on the way to Pandora and the webcasting industry becoming more mature, at which point Pandora will pay under the percent-of-revenue prong.[32] Until Pandora reaches this point and is able to sufficiently monetize its service such that the ██████████████ prong becomes binding, the record companies are protected with the proposed per-play rates.

As the webcasting market continues to develop, it may eventually become the case that a "greater-of" royalty structure is no longer appropriate. As with the *level* of royalty rates, the appropriate rate *structure* can change as market conditions develop. Furthermore, the determination of whether a particular rate structure is reasonable requires an analysis of the underlying rates; the two pieces go hand-in-hand. Should either the per-play rates or the percentage-of-revenue rates differ meaningfully from those proposed above, my view as to the appropriateness of the structure may change as well.

In the *Web IV* Notice, the Judges asked specifically about the advantages and disadvantages of establishing a statutory royalty rate not based on a per-play royalty rate. The Judges asked (a) whether it is prohibitively difficult to identify webcaster revenues for the purpose of calculating a percent-of-revenue based royalty rate, (b) whether there is an "intrinsic" value to a performance of a sound recording that is omitted if a percent-of-revenue royalty rate were to be adopted, and (c) whether a royalty rate calculated as a percentage of webcasters' revenues would be "disproportionate" to webcasters' use of sound recordings.

As this point in the proceeding, I lack sufficient information to fully answer these questions for all webcasters. However, I can give some answers as they apply to Pandora and to the rate structure I am proposing.

As regards question (a), it is not prohibitively difficult to identify Pandora's webcaster revenues for the purpose of calculating a percentage-of-royalty rate. To the contrary, Pandora

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[31] Herring Testimony at ¶ 33.

[32] Pandora has been a pioneer in the sale of targeted advertising on a non-interactive music service. Pandora has made a number of investments to attract advertisers and convince them of the value of Pandora's targeted advertising. The broader field of online advertising has followed this path over the past ten years or so; Pandora is far from unique in this respect. Pandora is still in the middle of this process, as explained in the Herring Testimony. Herring Testimony at ¶¶ 12-21.

has been operating for several years under a licensing agreement with SoundExchange that references Pandora's revenues. Moreover, the Merlin Agreement (described in detail below) specifies that Pandora's royalty payments to the participating Merlin Labels (as that term is defined in the Merlin Agreement) will be at least ▮▮▮▮▮▮ of its revenue attributable to the music of those labels. These agreements show that, as a practical matter, royalties for recorded music can indeed be based on webcaster revenues, at least in the case of Pandora. Furthermore, webcasters and many other types of music users pay royalties to music publishers and composers, through ASCAP and BMI, that are set as a percentage of revenue. For example, the ASCAP rate court recently established a royalty rate for Pandora of 1.85 percent of revenue for the period 2011-2015 for its performance of musical compositions in the ASCAP repertoire. This indicates to me that webcasting revenues can serve as a practical basis for royalty payments.

As regards questions (b) and (c), the royalty structure I have proposed, with a specified minimum per-play payment, directly addresses and alleviates any concern that a pure percentage-of-revenue based royalty rate might fail to capture the "intrinsic" value of a performance of a sound recording. This royalty structure also directly addresses and alleviates any concern that a pure percentage-of-revenue based royalty rate might cause a "disproportionality" to arise if some webcasters attempt to maximize market share rather than profits, or more generally if some webcasters choose to sacrifice revenues and/or profits during the rate-setting period in order to grow their installed base of users or their listening hours. Of course, this rate structure works to the advantage of the record labels, since they benefit from the security of per-play rates together with an upside in the event that the services improve their monetization. While it is my view that this structure is currently reasonable, given the state of development of the non-interactive webcasting industry, it is quite possible that as this marketplace develops, this manner of allocating risk will no longer be appropriate.

5. The Merlin Agreement

On June 16, 2014 Pandora and Merlin entered into the Merlin Agreement, which establishes the terms and conditions under which the certain record companies will license to Pandora certain rights in sound recordings.[33] (Attached as Exhibit 12 to the Herring Testimony.)

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[33] On July 11, 2014 Merlin and Pandora entered into the First Amendment to the Merlin Agreement, which called for Pandora to pay certain administrative fees to Merlin. (Attached as Exhibit 13 to the Herring Testimony.)

The Merlin Agreement is binding on both parties for ███████ ████. I refer to the labels who are choosing to participate in the Merlin Agreement as the "Merlin Labels."

A. The Merlin Agreement Provides an Excellent Benchmark

The Merlin Agreement provides an excellent benchmark for several reasons. First, the Merlin Agreement involves the very rights that are at issue in this proceeding – both sound recording performance rights for a non-interactive service and the right to make ephemeral copies. Second, the Merlin Agreement involves the same sellers, record companies that are the "willing sellers" in the statutory hypothetical market. Third, the Merlin Agreement involves the same buyer, a non-interactive service (in this case Pandora), which is a "willing buyer" in the hypothetical market. Lastly, the agreement was negotiated under workably competitive conditions in which neither party had undue market power.

This last point warrants further elaboration, since Pandora is the largest non-interactive webcaster. I have considered specifically whether Pandora had undue market power in its negotiations with Merlin. In the language of antitrust economists, I have considered whether Pandora has monopsony power over Merlin. Pandora's share of listening among non-interactive webcasters is *not* the key variable for determining whether or not Pandora has monopsony power over Merlin. Rather, the correct variable upon which to focus is the share of the Merlin Labels' revenues that comes from Pandora. If a very large share of the Merlin Labels' revenues came from any single music user, then that music user could well have monopsony power over Merlin. But this is demonstrably not the case for Pandora. The Merlin Labels generate revenues from many different users of their sound recordings, including other non-interactive webcasters, interactive services, and from the sale of physical albums and digital downloads. In fact, I estimate, based on data for the recorded music industry overall, that Pandora accounted for roughly 5 percent of the revenues received by the Merlin Labels in 2013 for the licensing of their music in the United States.[35] Thus, Pandora's share of the Merlin Labels' revenues is far short of

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[35] In 2013, overall recording industry revenues were $6.657 billion, while Pandora's payments to SoundExchange were $318.5 million. Pandora's payments (including payments to artists as well as record companies) thus comprised 4.8 percent of record company revenues. In contrast, physical sales of music generated revenues of $2.445 billion, or 36.7 percent of the total record company revenues, and music downloads generated revenues of $2.923 billion, or 43.9 percent of the total. Pandora's share of the Merlin Labels' revenues would be greater than 4.8 percent to the extent that Merlin's share of performances on Pandora exceeded Merlin's overall share of industry

the level that would be necessary for Pandora to have undue market power in its negotiations with Merlin.

Moreover, as discussed in greater detail in the Herring Testimony, the Merlin agreement is the result of months of negotiations and reflects substantial give and take from both sides.[36] Indeed, the Merlin agreement contains a number of provisions that Merlin insisted upon, without which Mr. Herring believes an agreement very likely would not have been reached.[37] In addition, and importantly for the purposes at hand, the Merlin Agreement explicitly embraces the workings of a competitive market. As discussed in greater detail below, the Merlin agreement is structured such that the effective per-play rate paid by Pandora to Merlin declines as Pandora relies more heavily on works in the catalogs of the Merlin labels. Put differently, the Merlin Labels have agreed to a lower per-play rate than they otherwise would receive, in exchange for increased plays on Pandora. This is competition at work.

For all of these reasons, I use the Merlin Agreement as my primary benchmark for setting the reasonable royalties at issue in this proceeding.

B. Key Provisions of the Merlin Agreement

I summarize here the key provisions in the Merlin Agreement that are most relevant for my use of the Merlin Agreement as a benchmark.[38] Additional details regarding my analysis of the Merlin Agreement are provided in Appendix D.

1. Merlin and the Merlin Labels

Merlin is a global music rights agency for the independent label sector.

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revenues, but my conclusion here would still hold even if Pandora's share of Merlin's revenues were far higher than 4.8 percent. Data on recording industry revenues are from the RIAA; see http://www.riaa.com/chartindex.php. Data on Pandora's payments to SoundExchange are from Pandora.

[36] Herring Testimony at ¶ 24.

[37] Herring Testimony at ¶ 24.

[38]

Under the terms of the Merlin Agreement, each label that is a member of Merlin can decide whether or not to accept the terms of the Merlin Agreement. So far, there are approximately ▮ participating Merlin Labels, but the process by which members of Merlin accept the Merlin Agreement is ongoing, so the number of Merlin Labels may well grow over the coming months.[39] The Merlin Labels currently account for ▮ of the performances on Pandora; this percentage is expected to increase as the number of Merlin Labels grows.[40] The Merlin Agreement grants Pandora the right to perform and create necessary ephemeral copies of all of the recordings in the catalogs of the Merlin labels.

My understanding is that the Merlin Agreement covers recordings by some of the most popular and prominent artists played by Pandora, including winners of Grammys and other major record-industry awards. A sampling of some of the awards won by artists for recordings covered by the Merlin Agreement is set forth in the Herring Testimony.[41]

2. Headline Rate Structure

The structure of the royalty payments called for in the Merlin Agreement consists of the greater of a per-play prong and a percent-of-revenue prong.[42] The percent-of-revenue prong specifies ▮ of Pandora's Revenue, prorated based on the share of Performances on Pandora accounted for by the Merlin Labels.

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▮.[43] As discussed in greater detail immediately below, these headline per-play rates are subject to downward adjustment based on how much music from the Merlin Labels Pandora plays.

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[39] Interview with Mike Fink and Michael Addicot, from Pandora's curation team, September 22, 2014.

[40] Herring Testimony at ¶ 34.

[41] Herring Testimony at ¶ 35.

[42] Merlin Agreement, Section 3(a).

[43] Merlin Agreement, Sections 1(a), 1(c), 1(d), and 1(q).

3. Steering Provisions

The Merlin Agreement obligates Pandora to engage in a minimum amount of "steering" toward music licensed by the Merlin Labels: ██████████████████████

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██████████████████████████████████████[44] The Natural Performance Rate ("NPR") is the rate at which music is played using Pandora's then-current playlist-selecting algorithms.[45]

In exchange for these increased performances, Pandora receives a discount off the "headline" per-play rate as Pandora relies more heavily on Merlin recordings, i.e., as it steers towards Merlin recordings. ██████████████████████████

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This reduced per-play rate in exchange for increased plays is the central piece of the Merlin Agreement. This feature plainly demonstrates that the Merlin Agreement is embracing the workings of a competitive market. These competitive forces – whereby a label offers a discounted rate in exchange for greater performances – are precisely the forces that should be at work in the hypothetical marketplace that we are trying to approximate in the instant setting.

In addition, it is notable that, under the Merlin Agreement, ██████████████████

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███ This strongly indicates that the Merlin Labels see considerable promotional value when Pandora plays their music.

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[44] Merlin Agreement, Section 4(a).

[45] Merlin Agreement, Section 1(k). The NPR will be established for a control group of listeners for which Pandora does not engage in any steering.

[46] Merlin Agreement, Section 4(b).

4. Compensable Performances

Under the Merlin Agreement, ███████████████████████████

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While the performances that are compensable differ between the statutory license at issue and the Merlin Agreement, these differences can easily be accounted for with a straightforward adjustment. Appendix D provides the necessary calculations.

5. Additional Terms

Bullets: ███████████████████████████████████████

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[47] Merlin Agreement, Section 1(c).

[48] Merlin Agreement, Section 3(c). To ensure that Pandora can perform Bullets with the required increased frequency, the Merlin Labels have agreed to waive the performance complement as it relates to these recordings.

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Revenue Sharing: ████████████████████████████████

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       Additional Terms and Conditions:[52] The Merlin Agreement also contains a number of additional provisions related to the promotion of the Merlin Labels' artists and music.

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[50] Herring Testimony at ¶ 29.

[51] Merlin Agreement, Section 3(e).

[52] ██
██ First Amendment, Section 17.

6. The 2014-2015 Effective Per-Play Rates Implied by the Merlin Agreement

As just discussed, there are certain aspects of the Merlin Agreement that differ from the statutory license at issue in this proceeding. In this section I discuss the adjustments necessary to account for the differences of greatest economic significance. I also explain here how I derive the corresponding rate for the statutory license.[53] Certain additional adjustments that I make to account for the differences of lesser economic significance are briefly mentioned below and are discussed more thoroughly in Appendix D.

The two principal aspects of the Merlin Agreement requiring adjustment are: (1) the steering provision in the Merlin Agreement, and (2) differences in the determination of which performances are compensable as compared to the statutory license. Fortunately, it is relatively simple to account for these aspects of the Merlin Agreement through a single straightforward adjustment. To make this adjustment, I simply calculate the total payment Pandora expects to make to the Merlin Labels and then divide that payment by the number of performances of Merlin Label recordings that would be compensable under the statutory license (as currently defined).

This adjustment accounts for the key differences between the Merlin Agreement and the statutory license at issue while holding the economics of the Merlin Agreement constant. Put differently, this adjustment can be used to tell us what per-play rate the Merlin Agreement would call for if Pandora and Merlin had negotiated an agreement with a fixed per-play rate that treated

To illustrate how this arithmetic works, I now provide a numerical example.

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[53] Appendix D provides a detailed description of the adjustments I make to the per-play rates found in the Merlin Agreement to derive the corresponding per-play rate for the statutory license.

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██████████████████████████████████████ The calculations just below follow precisely this arithmetic, albeit with less round numbers.

Applying this arithmetic to the Merlin Agreement yields a corresponding statutory rate of between 0.1081¢ and 0.1177¢ for each Ad-Supported Performance and between 0.2099¢ and 0.2187¢ for each Subscription Performance. The "blended" rate for all performances is between 0.1198¢ and 0.1293¢ per performance. The Merlin Agreement, and thus these rates, applies to the ██.[54] The lower end of these rates is based on the assumption that Pandora steers 30 percent towards the Merlin labels, consistent with the high end of Pandora's expectations.[55] The upper end of these rates is based on the assumption that Pandora steers ████████████████████████████████████ ███████████████████.

As noted above, there are several additional terms in the Merlin Agreement that also differ from the terms of the statutory license. My analysis in Appendix D indicates that these differences are of little economic consequence: they have only a very minor impact on the overall economics of the Merlin Agreement. Nonetheless, I have analyzed these differences and, where appropriate, I have made additional adjustments to address them. These adjustments increase the per-play rate for the statutory license implied by the Merlin Agreement by 0.0002¢ per performance.

Adding this figure to the corresponding statutory rates reported above yields my best estimate of the statutory rates derived from the Merlin Agreement. These rates are between ████████ and ████████ for each Ad-Supported Performance, and between ████████ and ████████ for each Subscription Performance, and a blended rate for all performances of between ████████ and ████████ per performance. As noted above, these rates apply to the ████████████████████ █████████████████████████████.

[55] Herring Testimony at ¶ 32.

7. The 2016-2020 Statutory Rates Implied by the Merlin Agreement

The statutory license covers the 2016-2020 time period. Therefore, I must make one more adjustment to bring the rates implied by the Merlin Agreement forward into the statutory period.

In determining an appropriate adjustment factor to bring forward the rates from the period covering the ███████████████████████████, the central question is whether something significant is expected to change in the relevant market, in a predictable manner, from the ████████ time period to the 2016-2020 time period.

The first expected change is that the value of the dollar will very likely decline over time due to inflation. Accordingly, it is appropriate to increase the per-play rates over the 2016-2020 period so they rise with inflation. This adjustment serves to ensure that the per-play rates provide the record labels with the same real value over time. To make this adjustment, I use the estimate of inflation provided by the Federal Reserve Bank of Cleveland. The Cleveland Fed's inflation forecasts are derived from a model that uses monthly data on U.S. Treasury yields, surveys of inflation forecasts, rates of actual inflation published by the Bureau of Labor Statistics, and inflation swap rates, a form of financial derivative.[56]

An adjustment for inflation need only be applied to the per-play rate prong of my proposed royalty structure. The percent-of-revenue rate automatically accounts for inflation.

The second anticipated shift from the ████████ time period to the 2016-2020 time period was noted above: Pandora expects to significantly improve its ability to monetize its service with advertisers.[57] While this shift may cause the percent-of-revenue prong of the Merlin Agreement to become operative rather than the per-play prong, it does not require any adjustment from the Merlin Agreement to the statutory license.

The third anticipated shift in the next several years is that Pandora and perhaps other statutory webcasters will likely demonstrate to record companies their ability and incentive to steer. As I have emphasized, when buyers are aggregators, their ability to steer is the key to activating competition among their suppliers.

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[56] Federal Reserve Bank of Cleveland, "Cleveland Fed Estimates of Inflation Expectations," at http://www.clevelandfed.org/research/data/inflation_expectations/.

[57] Herring Testimony at ¶ 20. See also Pandora Investor Presentation, Q2 CY2014, at pages 15, 21-27, and 33-35.

During the past six months, Pandora has demonstrated its ability to steer through controlled experiments (discussed below) and through the Merlin Agreement itself. Pandora has further demonstrated its ability to steer as regards music *publishers*. ████████████

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██████████████████████[59] Over time, as Pandora demonstrates its ability to steer, Pandora would be able to negotiate lower rates from record companies in a workably competitive market. This process could take some time, depending on the frequency with which licensing agreements are negotiated and how long it takes for Pandora to establish with the record companies its ability to steer toward or away from them. In a workably competitive market, this would cause royalty rates to decline into the 2016-2020 statutory time period. My proposed rates do not include a downward adjustment during the 2016-2020 time period to reflect this process.

The fourth anticipated shift from the ████████ time period into the 2016-2020 time period is that statutory webcasters are expected to increasingly compete with terrestrial radio for listening in vehicles. The percent of cell phone owners who have ever listened to online radio in a car by listening to a stream from a cell phone connected a car audio system has already grown from 6 percent in 2010 to 26 percent in 2014.[60]

Pandora fully expects that it will be competing with terrestrial radio more strongly in vehicles over the statutory time period. Mr. Simon Fleming-Wood, Pandora's Chief Marketing Officer, states:[61]

> Pandora anticipates that mobile usage will continue to thrive and expand into the 2016-2020 licensing period, particularly in the automobile, where it will compete for listening side-by-side with terrestrial and satellite radio. Nearly half of all radio listening takes place in the car, where

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[59] ███

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[60] "The Infinite Dial 2014," Edison Research and Triton Digital ("Edison/Triton Report"). This study also reports that 59 percent of online radio listeners say the sound quality of online radio is better than over-the-air AM/FM radio.

[61] Testimony of Simon Fleming-Wood ("Fleming-Wood Testimony"), at ¶¶24-25.

> listener attention has been dominated by terrestrial and satellite radio. Thus, integrating Pandora into car stereos in a safe and easy-to-use way is by far our greatest opportunity to grow and effectively vie for listenership with our closest competitors.
>
> Pandora's pre-installed integrations in the car allow for in-dash control of the Pandora application on the listener's mobile device. This means, in short, that listeners can control Pandora through the same interface on their car's dashboard that is used to control their AM/FM or satellite radio, although the smartphone is the conduit through which the Internet signal and music stream is delivered. … We have also begun to focus on the next generation of "connected car," in which the vehicle will have a modem installed directly, making it unnecessary to use your smartphone to connect with Pandora.

As a result of these efforts by Pandora, the percentage of vehicles on the road that will be integrated with Pandora will continue to increase over the 2016-2020 period.[62] As Pandora becomes more commonplace in cars and trucks, it will almost certainly displace more terrestrial radio listening, which currently comprises the bulk of listening time in vehicles.[63] This displacement will *benefit* the record industry, as terrestrial radio performances that currently command zero sound recording royalties will be replaced with performances on Pandora that generate sound recording royalties. As noted earlier, "willing sellers" would consider this type of displacement when negotiating in a workably competitive marketplace and, as a result would be willing to accept, all else equal, a lower royalty rate.[64] Therefore, the predictable move of Pandora more into vehicles implies that there should be a growing downward adjustment to the royalty rates over time to reflect increased displacement by Pandora of royalty-free performances on terrestrial radio.

I do not have, at least at this point in time, sufficient information to allow me to make a reliable downward adjustment to account for this predictable trend. Therefore, I have only made the upward adjustment over time for inflation already discussed. As a result, the royalty rates

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[62] The stock of vehicles in the United States turns over rather slowly, so Pandora's recent successes in working with automobile manufacturers will very likely bear fruit for years to come, as new Pandora-enabled vehicles replace older vehicles that lack any embedded Pandora capability. This will predictably cause Pandora's use in vehicles to grow over the 2016-2020 statutory time period. See Pandora Auto Update, August 2014 and Pandora FY15 Strategic Planning Overview, Business Development, September 29, 2014 for further discussion of in-car listening as a business driver and key growth opportunity.

[63] According to the Edison/Triton Report, AM/FM radio has far more frequent usage than other in-car audio options. See also Pandora FY15 Strategic Planning Overview, Business Development, September 29, 2014, pp.16-17, showing that Pandora's lowest share of US radio listening across all dayparts occurs during the morning commute, which is the strongest daypart for terrestrial radio.

[64] In terms of the Lerner Equation, the economic cost to a record label of an additional performance on Pandora is lower, the larger is the share of those performances that come at the expense of terrestrial radio listening, and a lower marginal cost leads to a lower price. The fact that Congress has made the policy choice not to subject terrestrial radio to sound recording performance royalties does not alter this economic reality; to the contrary, it is the necessary backdrop against which negotiations between paying services and record companies occur.

that I propose, which rise slightly over the 2016-2020 time period, likely overstate the true royalty rates that would emerge from negotiations in a workably competitive marketplace.

Table 2 reports the proposed statutory per-play rates for the 2016-2020 period resulting from my analysis, along with the inflation adjustment factor I have used. These rates are anchored on the ████████████████████████ statutory per-play rates implied by the Merlin Agreement, as reported above.

Table 2
Inflation Rates and Effective Per-Play Royalty Rates After Adjustments
2016 Through 2020
(¢)

	Inflation Rate*	Advertising-Supported	Subscription	Blended
30% Steering				
2016	2.20%	0.1105	0.2146	0.1225
2017	1.73%	0.1124	0.2183	0.1246
2018	1.74%	0.1144	0.2221	0.1268
2019	1.76%	0.1164	0.2260	0.1290
2020	1.78%	0.1185	0.2300	0.1313
12.5% Steering				
2016	2.20%	0.1205	0.2238	0.1324
2017	1.73%	0.1226	0.2276	0.1347
2018	1.74%	0.1247	0.2316	0.1370
2019	1.76%	0.1269	0.2357	0.1394
2020	1.78%	0.1291	0.2399	0.1419

Note:
 * The inflation rate reported for 2016 accounts for expected inflation from the mid-point
 of the period Q4 2014 through 2015 (May 2015) to the midpoint of 2016 (August 2016).
 The other inflation rates account for annual expected inflation to the mid-point (August)
 of each calendar year listed.

8. Additional Considerations Related to the Merlin Agreement

As I have explained, the Merlin Agreement is an excellent benchmark for the purpose of determining the appropriate royalty rate for the statutory license at issue in this proceeding. Nonetheless, there are two additional considerations relating to the Merlin Agreement that warrant discussion: (1) the impact that the royalty rates that Pandora was otherwise obligated to pay had on the royalty rates in the Merlin Agreement; and (2) whether the royalty rate implied by

the Merlin Agreement should be adjusted to account for the fact that it does not cover the music from any of the three major record companies.

A. *Existing Statutory Rates Did Not Artificially Depress Negotiated Royalty Rates*

I am aware that in prior proceedings before the Judges it has been argued that because a service like Pandora is entitled to a statutory license, direct license agreements negotiated in the "shadow" of that statutory license tell us little about the rates that would emerge in a workably competitive market. I disagree.

While the Merlin Agreement unquestionably was negotiated with knowledge of the statutory rates to which Pandora was subject, this fact alone does not take away from its value as benchmark. Those rates provide a *ceiling* on what any eligible user will pay. But, when this ceiling is above the competitive level, record companies acting unilaterally will have an incentive to undercut this price to secure increased performances. This is precisely what we see with the Merlin Agreement: competition has caused rights holders (the Merlin Labels) to agree to a *lower* rate in exchange for additional plays of their music. The fact that the injection of competition into the marketplace has caused rates to decline strongly suggests that the prevailing rates are above competitive levels, not that the prevailing rates are artificially depressing the negotiated royalty rates.

Let me put this differently. Suppose the current statutory rate applicable to Pandora is *below* the competitive rate, i.e., the rate that would be negotiated between willing buyers and willing sellers in a workably competitive market, in the absence of any statutory license. In that case, competition would not cause record companies to discount *below* that rate. After all, the competitive rate, by definition, is the rate that would result from voluntary negotiations. If a seller is forced to deal at a lower rate than the seller would negotiate voluntarily, then competition would certainly not cause the seller to offer a yet lower rate. That is like saying that someone who wants to drive at 70 miles per hour, but is told they cannot drive faster than 50 miles per hour, will then choose to drive at 40 miles per hour. In fact, observing that competition leads to rates below the statutory rate tells us that rate is *above* the competitive rate.

Furthermore, if the prevailing rates in the market are above competitive levels, and one supplier then breaks ranks to undercut those prevailing rates, that supplier's discounted rates are

likely to be *above* the rates that would result from workable competition.[65] This point is worthy of emphasis. Suppose that, for whatever reason, the price for a compulsory license has been established. For the reasons discussed above in the section on workable competition, the sellers' incentives to offer discounts are weakened by the presence of this established price, especially if those discounted rates would be precedential. The established price thus served as an *anchor* preventing prices negotiated in its shadow from falling all the way to the competitive level. So, to the extent that the shadow of the current statutory rate applicable to Pandora has influenced the rates in the Merlin Agreement, it has likely served as an anchor on the high side, keeping the Merlin rates above competitive levels.

Summarizing, the effective rates under the Merlin Agreement are properly viewed as an upper bound for reasonable rates under the willing buyer/willing seller standard.

B. Applying the Merlin Agreement Rates to the Major Record Companies

As noted above, the Merlin Labels are all independent record labels that collectively account for ▮▮▮▮▮▮ of the performances on Pandora, prior to any steering. By way of comparison, the three major record companies, Universal, Sony, and Warner, currently account for approximately ▮▮▮▮▮▮▮▮▮▮▮▮▮▮ respectively of the performances on Pandora.[66] Given this difference in size, it is reasonable to consider whether a major record label might negotiate a rate above that negotiated by Merlin in a workably competitive environment.

In a workably competitive market with differentiated products, there is normally a range of prices, usually based on differences in quality. However, there is no general reason to expect more popular products to command premium prices; indeed, the opposite is true in many markets. Here, the music from the major record companies is more popular in the sense that Pandora plays their music more than the music of smaller labels. Naturally, the major record companies receive more royalty income, since their songs are played more often. That occurs

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[65] While this is not an ironclad economic law, it is the normal situation, both in theory and in practice. The standard assumption in oligopoly theory with differentiated products is that one firm's unilateral profit-maximizing price is higher, the higher are the prices set by its rivals. (Technically, in a price-setting game, each firm's best-response function is upward sloping.) In practice, based on my experience studying a wide range of industries with differentiated products, one often sees a dynamic whereby one firm disrupts collusion (tacit or express) by initiating discounts, others follow, and these price cuts feed on each other, causing prices to decline over time towards competitive levels. The initial discounted price may be much closer to the tacitly collusive price than to the competitive price.

[66] These NPRs were measured over a 13-week period during the Summer of 2014, as explained in Appendix F.

automatically under a per-play rate structure or a percent-of-revenue structure with payments prorated according to label share. The question here is whether the repertoires of the major record companies would command a higher rate *per play* or a higher percent-of-revenue than the Merlin Labels in a workably competitive market.

Empirical evidence that addressed this question directly would show whether, in a workably competitive market, the major record companies typically receive a greater per-play royalty rate from statutory webcasters than do independent labels. I am skeptical that such evidence exists, since the relevant market in this proceeding does not appear to be workably competitive, as explained above in the section on workable competition. In part this results from the shadow of the statutory license, as noted just above.

Accordingly, to study whether the major record companies would command higher per-play rates than do independent labels in a workably competitive market, I consider two different questions. First, does Pandora have a different impact on the sale of songs from major record companies than it does on the sale of songs from independent labels?[67] Second, does Pandora have the ability to sufficiently steer toward or away from the repertoires of each of the major record companies without harming the listener experience such that Pandora can credibly state in a negotiation with a major record company that it will meaningfully respond to changes in that record company's per-play rates?[68] I now address each of these questions in turn.

1. Testing Pandora's Promotional Impact: Majors vs. Indies

As detailed in the testimony of Stephan McBride ("McBride Testimony"), Pandora has performed a number of experiments to assess whether Pandora promotes the sale of sound recordings or is a substitute for the sale of sound recordings. As part of those experiments, Pandora has analyzed whether there is a statistically significant difference between the impact that performances on Pandora have on the sale of sound recordings from the major record companies versus the sale of sound recordings from independent labels. This experimental evidence is directly relevant to the task at hand. As emphasized above, the impact that Pandora has on other revenue streams of record companies is something that would be considered in

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[67] In terms of the Lerner Equation, this question asks whether the marginal cost of a performance on Pandora is different for a major record company than for an independent label.

[68] In terms of the Lerner Equation, the second question asks whether Pandora's elasticity of demand for the repertoire of each major record company is sufficiently high to make it profitable for that record company to discount as did the Merlin Labels to gain a greater share of the performances on Pandora.

willing buyer/willing seller negotiations in a competitive market. The greater the promotional impact of Pandora performances on record company sales, the lower is the economic cost to the record company of a performance on Pandora. Thus, if there is a meaningful difference in the promotional impact that performances on Pandora have on the sale of sound recordings from a major record company versus the sale of sound recordings from an independent label, some adjustment to the rate implied by the Merlin Agreement would be appropriate.

In Appendix E, I describe the net promotional experiments run by Mr. McBride in further detail. The conclusion from these experiments is that the net promotional effect from performances on Pandora is larger for the Majors than for independent record companies , although the difference is not statistically significant. That finding implies that, if anything, the reasonable royalty rate for performances of the Majors' sound recordings should be less than the rate for performances of independent record companies' sound recordings. Appendix E explains how these experimental results could be used to calculate a downward adjustment to the effective royalty rate from the Merlin Agreement to apply to the Majors, to account for differences in net promotional effects. However, I am not proposing any such downward adjustment. Accordingly, for this reason (among others), the per-play rates I propose tend to overstate the true competitive per-play royalty rates.

2. Steering Experiments

In theory, Pandora might find it easy to steer 15 percent toward the Merlin Labels, but not toward (or away from) a major record company. If this were the case, then Pandora's elasticity of demand for the sound recordings from a Major would be less than its elasticity of demand for the sound recordings from the Merlin Labels. That would in turn imply that, all else equal, Pandora would negotiate a higher rate with a major record company than with Merlin.

To study this question, I directed Pandora to run a series of experiments. These experiments were designed to measure the response of Pandora's listeners when Pandora steers toward or away from each of the Majors. More specifically, these experiments involved Pandora increasing or decreasing the performances of the overall repertoire of each major record company by 15 percent and by 30 percent, as compared to the natural performance rate of those repertoires.

The results of these experiments demonstrate that Pandora is able to increase or decrease the performances of each of the major record companies by more than 15 percent without

causing any meaningful drop in Pandora's aggregate listening hours. Since listening hours drive advertising revenue at Pandora, and advertising revenue is about 80 percent of Pandora's overall revenues, this indicates that Pandora would face no meaningful adverse commercial consequences from such steering. The same result applies at the 30 percent level for two of the three major record companies, and the effect for the third major record company, while statistically significant, is still quite small.

Using these experimental results, Appendix F demonstrates that it would be profitable for Pandora to enter into an agreement with any one of the three major record companies on the same terms that Pandora did with Merlin, including the requirement that Pandora steer at least ███████ toward that Major. This finding is robust in the sense that it holds even if the steering experiments described in Appendix F substantially understate the costs to Pandora associated with steering.

What does this imply for a hypothetical negotiation between Pandora and a major record company? These findings establish that Pandora can credibly claim in negotiating with a major record company that it has the ability and incentive to modify its playlists to respond to differences in the royalties charged by different record companies, at steering levels at or above the ███████ level specified in the Merlin Agreement.

3. Implications for Reasonable Royalty Rates

Putting these two pieces together, for reasons I now explain, I conclude that no further adjustment to the effective per-play rate implied by the Merlin Agreement is warranted for a statutory license that applies to the major record companies.

As emphasized above, the two key factors that determine reasonable per-play rates are (a) the economic cost to the seller of additional performances, and (b) the buyer's elasticity of demand for performances from the seller's repertoire.

The net promotion experiments imply that the economic cost to a Major of additional performances on Pandora is no higher than the economic cost to an independent label of additional performances on Pandora. Therefore, the cost element in the Lerner Equation does not call for adjusting the effective rate implied by the Merlin Agreement upward for a statutory license that applies to the major record companies.

The steering experiments imply that Pandora's elasticity of demand is even higher than necessary for Pandora to credibly claim in negotiating with a major record company that it will

steer at least ▮▮▮▮▮▮ toward that Major in response to the same discount that Merlin offered to Pandora. Therefore, the buyer flexibility element in the Lerner Equation also does not call for adjusting the effective rate implied by the Merlin Agreement upward for a statutory license that applies to the major record companies.

This analysis indicates that Pandora and a major record company, as a willing buyer and willing seller, would both benefit from doing a deal on the same terms as the Merlin Agreement, under current market conditions. So, the effective per-play rates from the Merlin Agreement can be used as a basis for reasonable royalty rates for the major record companies. Indeed, the rates that the major record companies would negotiate in a workably competitive market, competing via discounts to gain market share, could, and likely would be lower than the effective rates in the Merlin Agreement. The Merlin Agreement can be seen as one modest step in the movement towards a workably competitive market; as that process plays out over time, per-play royalty rates may well fall further.

Summarizing, the preceding analysis establishes that there is no need to make an adjustment to the rates implied by the Merlin Agreement to account for the fact that it does not include any of the three major record companies.

9. *SDARS II* Benchmark

To provide a check on the reasonableness of the rates I have proposed based on the Merlin Agreement benchmark, I have examined the relevant information available to me in an attempt to find other alternative benchmarks for the statutory license at issue in this proceeding. Of course, without sufficient information, it is impossible to determine, with any degree of confidence, whether a particular benchmark is suitable for estimating the rates that would emerge in a workably competitive market and what adjustments would need to be made. To date, the only candidate benchmark that I have been able to identify for which I have sufficient information to approximate the rates for the license at issue in this proceeding is the rate set by the Judges in the *SDARS II* proceeding.

While not as probative as the Merlin Agreement, the SDARS rate does have a number of aspects that recommend it as a benchmark. First, while not identical, the buyer is similar. Sirius XM is a competitor of Pandora's and, as noted above, that competition is likely to increase as Pandora becomes more commonplace in cars. Second, the seller in both instances – record

companies – is the same. Third, the rights at issue are the same, namely, the right to perform sound recordings on a non-interactive basis and make the necessary ephemeral copies to facilitate those performances. Lastly, while the SDARS rate was established in a judicial setting, not under competitive circumstances, the rate-setting standard used by the Judges to determine the SDARS rate was quite similar in application to that called for in this proceeding. Moreover, the rate set by the Judges was influenced, at least in part, by licenses that were negotiated under what appears to be workably competitive conditions, in which numerous record labels agreed to reduced royalties in exchange for the likelihood of increased plays on the Sirius XM service.

There are a number of differences between Sirius XM and Pandora that must be accounted for to translate the rate set by the Judges in the *SDARS II* proceeding into one that is appropriate in the instant setting. Those adjustments are set forth in what follows.

The CRB's April 2013 decision in *SDARS II* specified royalties as a percentage of gross revenue, rising from 9 percent in 2013 to 11 percent in 2017. The *SDARS II* decision found that "the most appropriate rate for SDARS for the 2013 to 2017 licensing period is 11% of Gross Revenues."

In *SDARS II*, evidence was put forward by SoundExchange's economic expert, Professor Janusz Ordover, that approximately half of the value of Sirius XM's content was derived from non-music programming.[69] This is not the case for Pandora, which offers almost exclusively music content. Accordingly, an adjustment is necessary.

Using Professor Ordover's 50 percent figure, we can interpret the *SDARS II* decision as concluding that the reasonable royalty rate for Sirius XM to pay was 22 percent of the revenues attributable to music programming. This 22 percent figure can thus serve as a benchmark for the percentage of revenue that Pandora should pay, subject to a possible adjustment to reflect other differences between SiriusXM and Pandora, or more generally between Sirius XM and the services in *Web IV*.

Unlike with the Merlin benchmark, there is no need to make an adjustment to this 22 percent figure to account for the passage of time. First, because the *SDARS II* rate is a percent-of-revenue rate, it automatically accounts for inflation. Second, absent some major anticipated change in the marketplace, there is no reason to make an adjustment to a rate that was

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[69] *SDARS II* at 23063. Professor Ordover did this "principally based on his observation of the identical $9.99 retail prices offered by SiriusXM for non-music and mostly music stand-alone subscriber packages." *SDARS II* at 23063.

determined to be reasonable for the five-year period 2013-2017, a period that overlaps with the 2016-2020 period at issue in this proceeding. As noted above, the only relevant anticipated significant change over the next several years is Pandora's expected increased use in vehicles. As Pandora becomes more commonplace in vehicles, it is reasonable to assume that it will compete more directly with Sirius XM as well as terrestrial radio. Indeed, Sirius XM stated as much in the *SDARS II* proceeding.[70] All in all, this observation supports the conclusion that the rates negotiated by Sirius XM and Pandora in a workably competitive market would be similar.

As discussed above, there are additional considerations that would be taken into account in negotiations in a workably competitive market, such as the impact that the service has on other revenue streams of the record label seller and the ability of the service to steer towards or away from the a label's repertoire. Ideally, one would adjust the *SDARS II* benchmark, for any differences between Pandora and Sirius XM in these respects. At this point, I do not have sufficient information to ascertain whether any further adjustment is necessary to account for these differences; nor do I know in which direction such an adjustment might run. Put differently, for purposes of evaluating this secondary benchmark, I have assumed that Pandora and Sirius XM, as non-interactive statutory licensees, are the same or similar in these regards.

To fully evaluate the *SDARS II* benchmark, one needs to consider whether other adjustments are appropriate to reflect differences between Sirius XM and Pandora as music services. Perhaps of greatest significance is the difference in investments that have been made by the two services.

In *SDARS II*, the Board recognized that the need to make substantial investments in satellite technology may warrant some downward adjustment from benchmark rates that were derived from direct licensing agreements by interactive services that did not make investments of a similar magnitude.[71] In *SDARS II* the Judges found that Sirius XM makes substantial financial outlays that are unique to the satellite radio business that are not shared by interactive webcasters. The Judges stated:

> [i]n light of the substantial evidence in the record of the unique and substantial financial costs that Sirius XM has incurred and anticipates incurring over the license period to maintain and upgrade its distribution system, … the most appropriate rate for the current license period will be somewhat below the 12%-13%, which the Judges are reasonably confident represents the top of

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[70] *SDARS II* at 23069-71.

[71] *SDARS II* at 23068.

the zone of reasonableness. Therefore [the final rates] reflect a downward adjustment from the 12%-13% range based upon the third Section 801(b) factor.[72]

Pandora's infrastructure costs are closer to those of an interactive service than to Sirius XM's unique satellite distribution costs. However, Pandora has made significant investments in, among other things, the Music Genome Project, the development of advertising markets, and the development of highly sophisticated playlist-creating algorithms.[73] The popularity that Pandora has gained with a music library that is substantially smaller than the libraries of interactive services is testimony to the unique investment that Pandora makes in the knowledge of music and in optimization programs that play music that listeners are likely to want to hear *without* them asking for it.[74] Pandora makes these investments with the goal of offering a compelling non-interactive music service. Nevertheless, because I am not able to fully quantify the differences between the investments made by Pandora and those made by the interactive services, I will assume, for purposes of evaluating the *SDARS II* benchmark, that these differences are not material. By ignoring these differences, which may in fact be quite significant, I will tend to overstate the appropriate royalty rate for Pandora that is derived from the *SDARS II* benchmark.

In making an adjustment to account for Sirius XM's investments in satellite technology, the Judges selected a royalty rate, 11 percent, that is somewhat below the 12 to 13 percent which they saw as the top of the zone of reasonableness.[75] Since the Board in *SDARS II* applied a modest downward adjustment in the rate for Sirius XM based on its infrastructure investments, it seems reasonable to reverse this downward adjustment in the rate for Pandora.[76] This suggests a

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[72] *SDARS II* at 23069.

[73] Herring Testimony at ¶¶ 15-19; Westergren Testimony at ¶¶ 27, 30.

[74] In the case between Pandora and ASCAP, the Court stated: "Pandora has a catalog of between approximately 1,000,000 to 2,000,000 songs, somewhat less than half of which are licensed through ASCAP. This number is considerably lower than the catalog size of an on-demand service like Spotify, which must have the ability to play virtually any composition any customer might select. Successful on-demand services have catalogs in the range of 20 million songs." *In re Petition of Pandora Media, Inc.*, 2014 WL 1088101, at *7 (S.D.N.Y. Mar. 14, 2014).

[75] *SDARS II* at 23069.

[76] In discussing the downward adjustment for Sirius XM, from 12% or 13% down to 11%, the Judges were comparing SiriusXM to the "internet streaming services that are the buyers in the proposed Ordover benchmark market," *SDARS II* at 23069, the interactive services. As noted above, because Pandora's investments are almost certainly more significant than those of the interactive services, the resulting rate that I derive from the *SDARS II* benchmark likely overstates that rate that should be paid by Pandora.

rate somewhat higher than the 22 percent of revenue rate obtained by adjusting the *SDARS II* rate only for non-music programming. Applying a ratio of 13/11 to the 22 percent figure yields a rate of 26 percent. As this is very close to the 25 percent-of-revenue prong in the Merlin Agreement, it serves to reinforce my conclusion that the rates derived from the Merlin Agreement are reasonable.

The *SDARS II* benchmark also supports the conclusion that the appropriate royalty rate for a mature webcaster is approximately 25 percent of revenue. Unlike Pandora, Sirius XM now appears to be a mature service that is able to successfully monetize its product. Pandora, while moving in this direction, is not there yet. As discussed above and more completely in the Herring Testimony, Pandora, while making significant progress, is still improving its ability to monetize its service. As a result, the sound recording royalty payments Pandora makes have been declining over recent years as a percentage of Pandora's revenue. If the royalty rates implied by the Merlin Agreement are adopted, Pandora's royalty payments are expected to decline during the coming license term as a percent of Pandora's revenues, in the direction of the 25 percent-of-revenue rate contained as one prong in the Merlin Agreement. This anticipated royalty rate for a mature service is very close to what we see in the *SDARS II* benchmark.

Before the
UNITED STATES COPYRIGHT ROYALTY JUDGES
THE LIBRARY OF CONGRESS
Washington, D.C.

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

DECLARATION OF CARL SHAPIRO

I, Carl Shapiro, declare under penalty of perjury that the statements contained in my

Written Direct Testimony in the above-captioned proceeding are true and correct to the best of

my knowledge, information, and belief. Executed this 6th day of October 2014 in Oakland,

California.

_____
Carl Shapiro

Appendix A

CARL SHAPIRO

Curriculum Vitae

Haas School of Business
University of California
Berkeley, CA 94720

510-642-5905

E-Mail: shapiro@haas.berkeley.edu
Home Page: http://faculty.haas.berkeley.edu/shapiro

Professional Positions

Transamerica Professor of Business Strategy
Haas School of Business
University of California at Berkeley, 1994 - present

Professor of Business and Economics
Haas School of Business and Department of Economics
University of California at Berkeley, 1990 - present

Member of the President's Council of Economic Advisers
Executive Office of the President, The White House, 2011-12

Deputy Assistant Attorney General for Economics
Antitrust Division, U.S. Department of Justice, 2009 - 2011

Director of the Institute of Business and Economic Research
University of California at Berkeley, 1998 - 2008

Deputy Assistant Attorney General for Economics
Antitrust Division, U.S. Department of Justice, 1995 - 1996

Chair, Economic Analysis and Policy Group
Haas School of Business
University of California at Berkeley, 1991 - 1993

Professor of Economics and Public Affairs
Woodrow Wilson School of Public and International Affairs and
Department of Economics, Princeton University, 1987 - 1990

Research Fellow
Center for Advanced Study in the Behavioral Sciences
Stanford University, 1989 - 1990

Visiting Scholar
Stanford Law School, Stanford University, 1989 - 1990

Assistant Professor of Economics and Public Affairs
Woodrow Wilson School of Public and International Affairs and
Department of Economics, Princeton University, 1980 - 1987

Visiting Fellow
Institute for International Economic Studies, University of Stockholm, 1986

Visiting Assistant Professor of Economics and Public Policy
Graduate School of Business, Stanford University, 1982 - 1983.

Economist
Bureau of Economics, Federal Trade Commission, Summer 1980

Education

Ph.D.   Economics, M.I.T., 1981

M.A.   Mathematics, University of California at Berkeley, 1977

B.S.   Economics, M.I.T., 1976

B.S.   Mathematics, M.I.T., 1976

Publications

Strategic Patent Acquisitions, with Fiona Scott Morton, *Antitrust Law Journal*.

A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents, with Mark
Lemley, *Berkeley Technology Law Journal*.

Activating *Actavis*, with Aaron Edlin, Scott Hemphill, and Herbert Hovenkamp, *Antitrust*.

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Economic Research, University of Chicago Press, 2012.

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Journal*, 2010.

Injunctions, Hold-Up, and Patent Royalties, *American Law and Economics Review*, 2010.

The Year in Review: Economics at the Antitrust Division: 2009-2010, with Ken Heyer, *Review
of Industrial Organization,* 2010.

Recapture, Pass-Through, and Market Definition, with Joseph Farrell, *Antitrust Law Journal*,
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Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition, with
Joseph Farrell, *BE Journal of Theoretical Economics: Policies and Perspectives*, 2010.

Upward Pricing Pressure in Horizontal Merger Analysis: Reply to Epstein and Rubinfeld,
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Upward Pricing Pressure and Critical Loss Analysis, with Joseph Farrell, *Global Competition Review*, 2010.

Competition Policy in Distressed Industries, in *Competition as Public Policy,* American Bar Association, 2010.

The Year in Review: Economics at the Antitrust Division: 2008-2009, with Ken Heyer, *Review of Industrial Organization,* 2010.

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Detecting and Reversing the Decline in Horizontal Merger Enforcement, with Jonathan Baker, *Antitrust*, Summer 2008.

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Advances in Supervision Technology and Economic Welfare: A General Equilibrium Analysis, with Janusz Ordover, *Journal of Public Economics*, December 1984.

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Consumer Protection in the United States, *Zeitscrift für die gesamte Staatswissenschaft*, *Journal of Institutional and Theoretical Economics*, October 1983.

A Theory of Factor Mobility, with Gene M. Grossman, *Journal of Political Economy*, October 1982.

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Consumer Information, Product Quality, and Seller Reputation, *Bell Journal of Economics*, Spring 1982.

Advertising and Welfare: Comment, *Bell Journal of Economics*, Autumn 1980.

Working Papers, Research Memoranda, Work in Progress

Unilateral Effects Analysis After *Oracle,* Roundtable Discussion (multiple participants), *Antitrust Magazine,* Spring 2005.

The Role of Innovation in Competitive Analysis, Chair's Showcase Program (multiple participants), *Antitrust Source,* July 2005.

Linux Adoption in the Public Sector: An Economic Analysis, 2003, with Hal R. Varian.

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Economic Models of Counterfeiting, with Gene M. Grossman, Report to the U.S. Department of Labor, International Labor Affairs Bureau, January 1988.

Book Reviews

Review of *Bandwagon Effects in High-Technology Industries* by Jeffrey H. Rohlfs, in the Journal of Economics, 2003.

Review of *Will E-Commerce Erode Liberty? Review of Code and Other Laws of Cyberspace*, by Lawrence Lessig, in the Harvard Business Review, May/June 2000.

Review of *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*, by John Sutton, in the Journal of Economic Literature, 1993.

Review of *Controlling Industrial Pollution: The Economics and Politics of Clean Air*, by Robert W. Crandall, in the Journal of Economic Literature, June 1984, pp. 625-627.

Other Professional Activities

Member, Foreign Investment, Sectoral Review, and Trade Policy Task Force, Antitrust Section, American Bar Association, 2013- present.

Member, Academic Research Council, Housing Finance Center, Urban Institute, 2013 - present

Member, Budget and Interdepartmental Relations Committee, Berkeley Division of the Academic Senate, University of California, 2004-2007.

Member, University of California, Committee on Academic Personnel, 2006-2008.

Member, Economic Evidence Task Force, Antitrust Section, American Bar Association, 2005-2006.

Member, Program Committee, American Economic Association Annual Meetings, 2006.

Member, Market Surveillance Committee, California Independent System Operator, 1997-2000, see http://www.caiso.com/.

Member, Advisory Board, *Journal of Economic Perspectives*, 1999-2002.

Member, Advisory Board, *Antitrust and Regulation Abstracts*, 1998-2002.

Member, Advisory Board, *Journal of Network Industries*, 1999-2001.

Vice-Chair, Economics Committee, Antitrust Section, American Bar Association, 1995 - 1998.

Editor, *Journal of Economic Perspectives*, 1993 - 1995.

President, Industrial Organization Society, 1995 - 1996.

Member, Defense Science Board Task Force on Antitrust Aspects of Defense Industry Consolidation, U.S. Department of Defense, 1993 - 1994.

Co-Editor, *Journal of Economic Perspectives*, 1986 - 1993.

Associate Editor, *Quarterly Journal of Economics*, 1984 - 1987.

Associate Editor *Rand Journal of Economics*, 1984 - 1986.

Director, John M. Olin Program for the Study of Economic Organization and Public Policy, Princeton University, 1988 - 1989

Associate Director, John M. Olin Program for the Study of Economic Organization and Public Policy, Princeton University, 1987 - 1988.

Honors, Fellowships, and Research Grants

Distinguished Fellow, Industrial Organization Society, 2013.

National Science Foundation Graduate Research Fellowship Program, 60th Anniversary Awardee (one of 60 Awardees selected from over 45,000 Fellows)

Runner-Up, Teaching Prize, MBA Program, Haas School of Business, U.C. Berkeley, 1999-2000.

National Science Foundation Research Grant #SES-9209509, Technology Transitions with Network Externalities, 1992-1994, (with Joseph Farrell).

National Science Foundation Research Grant #SES-8821529, The Evolution of Network Industries, 1989-1991, (with Joseph Farrell).

Center for Advanced Study in the Behavioral Sciences, Stanford California, Research Fellowship, 1989-1990.

National Science Foundation Research Grant #SES-8606336, Issues of Industrial Organization in International Trade, 1986-1988, (with Gene M. Grossman).

Alfred P. Sloan Foundation Research Fellowship, 1985-1987.

National Science Foundation Research Grant #SES-8408622, Technological Competition and International Trade, 1984-1986, (with Gene M. Grossman).

National Science Foundation Research Grant #SES-8207337, Signals of Product Quality, 1982-1984.

National Science Foundation Graduate Fellowship, 1977-1980.

University of California Fellowship, 1976-1977.

Phi Beta Kappa and Sigma Xi, M.I.T., 1976.

Affiliations

American Economic Association

American Bar Association

Consulting Activities

Senior Consultant, Charles River Associates, 1998 – 2009 and 2012 – present

Principal and Co-Founder, The Tilden Group, LLC, 1996 - 1998.

Extensive experience working with private parties and government agencies on matters involving antitrust, regulation, intellectual property, measurement of damages, and general business litigation.   Additional information and references available upon request.

Appendix B: Testimony of Carl Shapiro During the Past 5 Years

1. Intellectual Ventures I LLC et al. v. Altera Corporation et al.

   Civil Action No. 10-1065-LPS
   District of Delaware

   Testified in deposition on behalf of Altera Corporation and Xilinx, Inc., 2013

2. United States of America v. Bazaarvoice Inc.

   Case No. 13-cv-00133-WHO
   Northern District of California

   Testified in deposition and at trial on behalf of the United States of America, 2013.

Appendix C: Documents Considered

CRB Hearing Documents
Determination of Royalty Rates for Digital Performance in Sound Recordings and Ephemeral Recordings.
Joint Motion for Issuance of Discovery Schedule and Alteration of Case Schedule.
NAB WSA Agreement.
Notice of Participants, Commencement of Voluntary Negotiation Period, and Case Scheduling Order.
Order Establishing Revised Case Schedules.
SDARS II Decision Modification.
SDARS II Decision.
SDARS II, Noll Direct Testimony.
SDARS II, Noll Rebuttal Testimony.
SDARS II, Ordover Direct Testimony.
SDARS II, Ordover Rebuttal Testimony.
SDARS II, Rosenblatt Direct Testimony.
SDARS II, Salinger Rebuttal Testimony.
Sirius XM WSA Agreement.
Web I CARP Decision.
Web I Library of Congress Decision.
Web II Decision.
Web II, Jaffe Rebuttal Testimony.
Web II, Pelcovits Rebuttal Testimony.
Web III Decision.
Web III Remand Decision.
Web III, Salinger Rebuttal Testimony.
Web III, Sound Exchange Witness Statements.
Web IV, Testimony of Mike Herring.
Web IV, Testimony of Simon Fleming-Wood.
Web IV, Testimony of Stephan McBride.
Web IV, Testimony of Tim Westergren.
News Articles & Blogs
Andy Gensler, "SoundExchange's Michael Huppe's Keynote Screed Against FM Radio Kicks off New Music Seminar," *Billboard*, June 9, 2014.
Anthony Bruno, "Fording the Stream: The Divergent Fortunes of On-Demand and Noninteractive Services," *Billboard*, March 27, 2010.
Brad Hill, "SoundExchange CEO: Radio Ruins Record Sales," *Rain News*, June 10, 2014.
Eliot Van Buskirk, "Of Course On-Demand Music Replaces Sales – It's Supposed To," *Wired*, February 25, 2010.
Federal Reserve Bank of Cleveland, "Cleveland Fed Estimates of Inflation Expectations", September 17, 2014.
Greg Sandoval, "Pandora Spurs Music Sales; Spotify Not So Much," *CNet*, February 25, 2010.
Husain Sumra, "Apple Asking Music Labels to Cut Prices on Music Streaming Subscriptions," *Mac Rumors*, October 2, 2014.
Janko Roettgers, "This is Why Apple Wants to Launch iRadio," *Gigaom*, April 16, 2013.
Joseph Williams, "For Apple, the Beats May Soon Come from Within," *SNL*, September 23, 2014.
Maxwell Murphy, "Pandora CFO: Repair Frayed Relationships with Key Stakeholders," *Wall Street Journal*, September 19, 2014.
Michael Hickins, "Pandora's Improved Algorithms Yield More Listening Hours," *Wall Street Journal*, April 1, 2014.
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Neal Ungerleider, "How Pandora Helps Musicians Plan Tours," *Fast Company & Inc*, September 25, 2014.
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Appendix C: Documents Considered

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Carl Shapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy* , Harvard Business School Press (eds.), 1999.
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Flavia T. Fortes, "Music Industry Consolidation: The Likely Anticompetitive Effects on the Universal/EMI Merger," *American Antitrust Institute* , August 30, 2012.
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Jeffrey Eisenach, "Understanding Webcaster Royalties," Navigant Economics, June 2013.
Joel Waldfogel, "Digitization and the Quality of New Media Products: The Case of Music," Working Paper, August 29, 2013.
Joseph R. Matson, and Anne Shelley, "In Search of Music: A Study of Music Consumption and Search Behaviors in Undergraduate Students," *Music Reference Services Quarterly,* 16:4, pp. 218-231 (2013).
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Morgan Joel, "Music Discovery and Consumption in a Rapidly Changing Industry," Thesis, May 2014.
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Preston Paschal and Jim Rogers, "Convergence, Crisis, and the Digital Music Economy," in *Media and Convergence Management* , Springer-Verlag Berlin Heidelberg (eds.), 2013.
R. Scott Hiller and Jin-Hyuk Kim, "Online Music, Sales Displacement, and Internet Search: Evidence from YouTube," *Center for the Analysis of Property Rights and Innovation* , Working Paper, 2013.
Ramnath K. Chellappa and Conny Chen, "MySpace Killed the Radio Star? The Impact of Online Sampling on Song Sales," *ICIS 2009 Proceedings* , Paper 157, 2009.
Sanjeev Dewan and Jui Ramaprasad, "Social Media, Traditional Media, and Music Sales: A Panel VAR Approach," Working Paper, Undated.
Stan J. Liebowitz, "Don't Play it Again Sam: Radio Play, Record Sales, and Property Rights," Working Paper, January 5, 2007.
Stan J. Liebowitz, "The Elusive Symbiosis: The Impact of Radio on the Record Industry," *Review of Economic Research on Copyright Issues* , 1:1, pp. 93-118 (2004).
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Pandora Documents
140930 Merlin Label Spend.xlsx
Agreement between Pandora Media Inc. ("Pandora") and Music and Entertainment Rights Licensing Independent Network B.V. ("Merlin").
BMG - catalogue_depleted_artist_seedhours_072514.xlsx.
BMG - takedown_tracks_20140702.xlsx.

Appendix C: Documents Considered

CelinDion_MediaPlan_revised.xlsx.
Copy of Train Added Value_Pandora IO_7 8 13.xls.
eMarketer, "Net US Mobile Ad Revenues, by Company, 2013-2016," Undated.
First Amendment of Agreement Between Pandora Media Inc. ("Pandora") and Music and Entertainment Rights Licensing Independent Network B.V. ("Merlin").
LindseyStirling_Revlon_Barter_MediaPlan.xlsx.
Matisyahu_Barter_MediaPlan.xlsx.
MobbDeep_MediaPlan.xlsx.
MobileAdShare_2014_PieChart.xlsx.
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Appendix D: Analysis of the Merlin Agreement

In this Appendix I discuss in detail my derivation of the per-play royalty rate for statutorily compensable performances of sound recordings from the Merlin Agreement benchmark, which I refer to as the "effective per-play rate." I also discuss my evaluation of the non-pecuniary terms in the Merlin Agreement and the implication of those terms for adjustments to the effective per-play royalty rate.

1. Calculation of Pandora's Effective Royalty Rate for ▮▮▮▮▮▮▮ Under the Merlin Agreement

My calculation of the effective per-play rate from the Merlin Agreement is based on a careful reading and analysis of the agreement itself, on information provided to me by Pandora, and on information I have learned through interviews with Pandora employees. In this section I set out the calculations I perform to derive Pandora's aggregate royalty payments to the Merlin Labels under the Merlin Agreement using Pandora's ▮▮▮▮▮▮ projections of its business. I calculate Pandora's royalty payments to the Merlin Labels then derive effective per-play rates.

A. Inputs for the Calculation of the Effective Royalty Rate

Pandora provided me with the following data for the 2013-2015 period that it maintains in the normal course of business, separately for its advertising-supported and subscription services:

- the actual and projected number of tracks performed

- the actual and projected number of listener hours

- actual and projected revenues

- the share of Pandora performances from tracks recorded before February 15, 1972 (which I refer to as pre-72 tracks),[1] and

- the share of tracks that are performed for 30 seconds or less ("skips").[2]

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[1] Data for pre-72 tracks were based on actual data through August 2014 and forecast data thereafter, based on historical trends.

[2] Skip data were provided from measures taken over the period December 5, 2013 through February 22, 2014. Pandora does not monitor skip rates in the normal course of business.

Pandora also provided me with an estimate of the Natural Performance Rate (NPR) of Merlin tracks as a percent of all tracks performed.[3]

Table D.1 reports these variables for 2013, 2014 and 2015 along with several other parameters used in my analysis of the Merlin Agreement. I assume that Pandora will steer the requisite ███████ toward each Merlin Label.[4] Furthermore, I assume that ████████ of the Merlin tracks performed on Pandora will be Bullets,[5] and that Pandora will play these tracks with the minimum frequency required in the Merlin Agreement, ███████████████████.

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[3] Herring Testimony at ¶34.

[4] ██
████████████████ Herring Testimony at ¶32.

[5] See "Pandora Inputs for Merlin Analysis 10.3.14.xlsx."

Table D.1
Parameters Underlying Calculated Payments to Merlin

Source:
  Pandora data.

As shown in Table D.1, I assume that the SoundExchange administrative fee was 4.5 percent of SoundExchange's collections in 2013.[6] ███████████████████████████████ ██████████████████████████. Pandora also provided me with its actual and projected quarterly non-GAAP gross operating margins. These gross margins enter into the Revenue Sharing component in the Merlin Agreement.

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[6] SoundExchange reports an Operating Administrative Rate of 4.5% for 2013. See, SoundExchange Annual Report for 2013 Provided Pursuant to 37 C.F.R. § 370.5(c), p. 4.

B. Calculating the Effective Royalty Rate

Table D.2 shows the main elements of the calculations underlying my best estimate of the effective per-play rate for ▮▮▮▮▮▮▮▮. The underlying calculations were made separately for calendar years ▮▮▮▮▮▮▮▮.[7] The final column in Table D.2 covers the portion of ▮▮▮▮ ▮▮ when Pandora expects to engage in steering toward the Merlin Labels, namely the ▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮. These calculations are made using the parameters in Table D.1.

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[7] ▮▮.

1. Pandora Payments to Merlin

To see how Table D.2 works, focus first on the 2014 column. The first three rows in Table D.2 report the number of Merlin Label performances by Pandora in 2014: ▮▮▮▮▮▮ advertising-supported performances and ▮▮▮▮▮▮ subscription performances, for a total of ▮▮▮▮▮▮▮ performances. These figures include steering, bullets, and performances of pre-72

tracks. As shown in Table D.2, the Merlin tracks would account for ████████ of all performances on Pandora. This is 14 percent greater than the Merlin NPR of ██████████.

The next several rows in Table D.2 calculate the resulting payments that Pandora would make to Merlin. ██

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[8] Under the terms of the Merlin Agreement, the greater-of comparison of royalty payments between the percent of revenue prong and the per-play prong is to be made monthly. I understand from Pandora that it expects the per-play prong would be operative in every month of ██████████, so my calculations are performed on annual data.

[9] To calculate Merlin Label and artist receipts, I relied on data Pandora reported to me for total tracks performed on advertising- and subscription-supported services separately in 2013. I multiplied each figure by the fraction of performances of sound recordings fixed on or after February 15, 1972 (separately for advertising- and subscription-supported services) and by the NPR for Merlin Labels to derive the number of compensable performances of Merlin Label tracks in 2013. I then applied the royalty rates that Pandora was otherwise paying for performances on advertising- and subscription-supported services in 2013 and summed those two figures. Finally, I deducted a 4.5% share of Pandora's total payments to recognize that Sound Exchange withheld 4.5% for administrative expenses in 2013, such that Merlin Label and artist receipts would be 95.5% of Pandora's payments. I understand that this deduction of SoundExchange's 2013 administrative expenses was the mutual intent in Section 5(a) of the Merlin Agreement.

This analysis is then repeated for 2015, yielding total expected payments in 2015 of

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2. Effective Per-Play Rates in 2014 and 2015

The lower half of Table D.2 translates these total payments into effective per-play rates. The effective per-play rate in a given year is equal to Pandora's total payments in that year divided by the number of statutorily compensable performances in that year.

The next several rows report the number of Merlin statutorily compensable tracks that Pandora expects to perform. ██

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The next step is to divide Pandora's total payments to Merlin by the projected number of Merlin Label statutorily compensable performances. In ██████ , this produces effective per-play rates of ██████ for advertising-supported performances and ██████ for subscription performances.[10] The ██████ "blended" effective per-play rate is ██████ . The blended rate is defined as the single rate that, when applied to all statutorily compensable performances, generates the necessary level of total payments.

The final three rows in Table D.2 show the percent-of-revenue associated with these effective per-play rates. For ██████ , the blended effective per-play rate of ███████ corresponds to █████████ of Pandora's revenue.

The calculation for ██████ is analogous to the calculation for ██████ . The total payment of ████████ translates into effective per-play royalty rates of ██████ for advertising-

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[10] I allocate the Guarantee shortfall according to the number of advertising-supported and subscription performances, including bullets but excluding skips.

supported performances and ████ for subscription performances. The blended effective per-play rate in ████ is ██████, which corresponds to ██████████ of revenues.

3. Combined 2014-2015 Rates

Pandora and Merlin have been working together to identify Merlin Labels' music so that steering can begin. This process has taken longer than expected. As a result, Pandora does not expect to begin steering toward Merlin Label sound recordings until sometime during October 2014. For this reason, for the purpose of calculating combined rates that apply to the Merlin Agreement as a whole, I use only the ████████████████████████████. These combined rates are shown in the final column in Table D.2. The combined blended effective per-play rate implied by the Merlin Agreement is 0.1293¢ per performance. This is composed of effective rates of 0.1177¢ for each advertising-supported performance and 0.2187¢ for each subscription performance. As shown in Table D.2, the blended effective per-play rate for the ████████ ████████████████ generates payments that equal ████████████ of Pandora's Revenue.

C. *The Effective Per-Play Royalty Rate is Lower if Pandora Steers More Toward Merlin Labels*

Under the Merlin Agreement, Pandora has an economic incentive to steer toward Merlin Labels at a rate higher than the ████████ that is required by the Merlin Agreement and indeed it plans to do so.[11] Table D.3. shows the effective per-play rates under the Merlin Agreement when Pandora increases plays of Merlin music by 30 percent above the NPR of Merlin Labels.

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[11] Pandora anticipates that starting sometime in the fourth quarter of 2014 it will steer toward Merlin Labels by 20 to 30 percent. Herring Testimony at ¶32.

As shown in Table D.3, at 30 percent steering the combined blended effective per-play rate for the ▮▮▮▮▮▮▮▮▮▮▮▮▮▮ is 0.1197¢ as compared with the 0.1293¢ rate with 12.5 percent steering shown in Table D.2.

Pandora has two economic incentives to steer toward Merlin music even more than ▮▮▮▮ ▮▮▮▮. First, greater steering lowers the per-play rate that Pandora pays under the Merlin Agreement if Pandora is making a Guarantee shortfall payment. Second, greater steering saves

Pandora money by replacing more costly music licensed from other record companies with less costly music licensed under the Merlin Agreement. The factor limiting Pandora's steering is the loss of revenue if the steering reduces listening on Pandora. These considerations are discussed in greater detail in Appendix F.

2. Non-Pecuniary Terms in the Merlin Agreement

The Merlin Agreement contains a number of additional provisions related to the promotion of the Merlin Labels' artists and music. I now consider whether the presence of these provisions in the Merlin Agreement necessitates making a further adjustment to the proposed statutory rates, since these provisions will not be present in the statutory license.

In performing this exercise, I consider the financial terms on which each additional provision would have been negotiated between Merlin and Pandora, had that provision been negotiated independently. More specifically, I look for evidence that would support a specific, quantitative adjustment to the per-play rate.

Comparable transactions between Pandora and other labels are relevant for this purpose. To illustrate, suppose that the Merlin Agreement obligates Pandora to provide a certain product or service to the Merlin Labels at $40 per unit. Suppose further that we estimate that over the ████████ time period, the Merlin Labels will purchase 1,000 units of this product or service. If Pandora normally charges comparable labels $100 per unit for this service, this provision delivers $60,000 of extra value to the Merlin Labels, in comparison with a separate, arms-length negotiation: a $60 discount on 1,000 units. This $60,000 can then be translated into an adjustment in per-play rates. If Pandora were expected to perform Merlin songs 20 billion times over the same ████████ time period, the $60,000 would correspond to 0.0003¢ per performance.

Where comparable transactions are lacking, or ambiguous, I make use of basic bargaining theory, which indicates that a willing buyer and willing seller will tend to negotiate terms that split the gains from trade, relative to each party's "threat point," which is also known as that party's Best Alternative to a Negotiated Agreement or BATNA. For example, if a provision is worth $1 million to the buyer and is costless to the seller, the gains from trade are $1 million, and basic bargaining theory suggests that the seller would charge $0.5 million for this provision.

Likewise, if a provision is worth $0.5 million to the seller and $0.5 million to the buyer, again the gains from trade are $1 million, and basic bargaining theory suggests that the two parties would agree to this provision without any payment.[12]

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Under the Merlin Agreement, ████████████████████████████████████
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[12] The Judges used this logic in *SDARS II* proceeding for the purpose of evaluating non-administrative differences between the negotiated benchmark licenses and the statutory license. The Judges determined that no adjustment was necessary under the third Section 801(b) factor because "it may well be that the benefits inure equally to both Sirius XM and the artists represented by the independent labels, many of whom may value broader exposure in lieu of statutory restrictions on the amount their works may be played." *SDARS II* at 23068-69 (footnote omitted).

[13] Merlin Agreement, Section 6. To understand how this provision will be implemented, and the associated net benefits to Pandora and to the Merlin Labels, I interviewed David Smith, Vice President for Pricing and Yield Management at Pandora, on September 22, 2014. I am relying here on information that I learned in that interview.

[14] Interview with David Smith.

[15] Interview with David Smith.

[16] See, "140930 Merlin Label Spend.xlsx."

[redacted][17]

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[17] Merlin Agreement, Section 7. I interviewed Michael Olson and John Donaldson of the Strategy Team on September 22, 2014 to understand the implementation of this term of the Merlin Agreement and the associated net benefits to Pandora and the Merlin Labels.

[18] Interview with Michael Olson and John Donaldson.

[19] Interview with Michael Olson and John Donaldson.

[20] Interview with Michael Olson and John Donaldson and Westergren Testimony at ¶38.

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████████████████████████████████.[23] In light of this, I have concluded that
no adjustment to the effective royalty rate is necessary to account for the ████████████
provision in the Merlin Agreement.

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[21] Interview with Michael Olson and John Donaldson and Herring Testimony at ¶30.

[22] Herring Testimony at ¶30.

[23] Herring Testimony at ¶30.

[24] Merlin Agreement, Section 8. On September 22, 2014, I interviewed Michael Olson and John Donaldson of the Strategy Team regarding audio bumpers.

[25] Merlin Agreement, Section 8.

[26] Interview with Michael Olson and John Donaldson.

[27] Herring Testimony at ¶30.

[REDACTED].[28] [REDACTED]

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[REDACTED].

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[28] Interview with Michael Olson and John Donaldson.

[29] Merlin Agreement, Section 9. I interviewed Mike Olson and John Donaldson of the Strategy Team and Mike Fink and Michael Addicot of Curation on September 22, 2014 regarding the metrics that Pandora will make available to Merlin Labels. See also, Herring Testimony, at ¶30.

[30] Herring Testimony at ¶30.

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[31] Merlin Agreement, Section 10. I interviewed Michael Olson and John Donaldson of the Strategy Team on September 22, 2014 about Pandora's plans for label-branded stations.

[32] Interview with Michael Olson and John Donaldson.

[33] Pandora currently has 690 genre stations. See Fleming-Wood Testimony at **¶7.** ████████████████████████ ██ See Herring Testimony at ¶30. ██ ██ (Interview with Michael Olson and John Donaldson.)

[34] Interview with Michael Olson and John Donaldson and Herring Testimony at footnote 11.

[REDACTED]

F. *Pandora Presents and Pandora Premieres Events*

[REDACTED][35]

1. Pandora Presents

Pandora Presents is a program that was launched in December 2011 through which artists perform live before an audience of fans that Pandora identifies and invites.[36] Each of these events is designed for and sponsored by an advertiser. Pandora chooses artists to feature in Pandora Presents events that will best speak to the target audience of the sponsoring advertiser.

[REDACTED][37][REDACTED][38]

Pandora Presents generates promotional benefits for the featured artists, and marketing benefits for Pandora with respect to advertisers, listeners, artists, and labels.[39] [REDACTED]

[REDACTED][40][REDACTED]

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[35] Merlin Agreement, Section 11. I interviewed Tommy Page, Vice President, Artist and Brand Partnerships, on September 24 and 25, 2014 to understand the implementation of this term of the Merlin Agreement and the associated net benefits to Pandora and the Merlin Labels.

[36] Pandora Presents events are described in the Written Direct Testimony of Simon Fleming-Wood ("Fleming-Wood Testimony") at ¶29.

[37] Fleming-Wood Testimony at ¶29.

[38] Fleming-Wood Testimony at ¶29

[39] Interview with Tommy Page and Fleming-Wood Testimony at ¶29.

[40] [REDACTED] Fleming-Wood Testimony at ¶29 and footnote 5. See also, Westergren Testimony at ¶38.

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Pandora's role in coordinating Pandora Presents events is similar to that of a concert producer and promoter.[42] Pandora identifies and matches advertisers and artists that appeal to a particular demographic, then books a location for the event and markets the event to Pandora listeners with a demonstrated interest in the featured artist. [BLACK REDACTION BAR]

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[BLACK REDACTION BAR] [43] Because Pandora's role in coordinating Pandora Presents events is very similar to that of an independent concert producer and promoter, I conclude that the enhanced opportunities for Merlin Labels to participate in Pandora Presents events do not call for an adjustment to the effective royalty rate I have calculated.

2. Pandora Premieres

Pandora Premieres, launched in May 2013, is a program through which Pandora promotes albums in the week prior to their release.[44] Pandora sends an email to listeners who are, or are similar to, fans of the artist with a featured album, inviting them to listen to the new album during the week prior to its release date.[45] Pandora provides click-to-buy functionality for listeners to Pandora Premieres.[46] When selecting albums to feature on Pandora Premieres, Pandora reviews albums that are proposed by labels and chooses artists that are considered a good fit with the program and albums that will generate a high volume of listening.[47] Pandora requires the labels to waive royalties for the one-week period that an album is on Pandora

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[41] Westergren Testimony, at ¶38.

[42] Interview with Tommy Page and Fleming-Wood Testimony at ¶29.

[43] See, for example, LindseyStirling_Revlon_Barter_MediaPlan.xlsx and Matisyahu_Barter_MediaPlan.xlsx.

[44] Fleming-Wood Testimony at ¶30.

[45] Tommy Page interview and Fleming-Wood Testimony at ¶30.

[46] Tommy Page interview.

[47] Fleming-Wood Testimony at ¶30.

Premieres.[48] ██

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Pandora Premieres features two to five albums per week, about 150 albums annually.[50] Roughly 12 percent of these albums are by artists whose labels are members of Merlin.[51]

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Pandora Premieres generates promotional benefits for the featured artists and their labels. This is evident from the fact that labels waive royalties for the one-week period that an album is on Pandora Premieres. Pandora believes that Pandora Premieres can increase an album's sales during the first week after it is released.[54]

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██████████████████████████.[55] Pandora receives significant benefits when popular artists and albums are made available for Pandora Premieres, because it offers an attractive benefit to Pandora listeners, who receive an early opportunity to listen to entire new albums from artists they like and to buy the music.[56] ████████████████████████████████

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[48] Fleming-Wood Testimony at ¶30.

[49] Tommy Page interview.

[50] Fleming-Wood Testimony at ¶30 and Tommy Page interview.

[51] Tommy Page interview.

[52] Tommy Page interview.

[53] Tommy Page interview.

[54] Tommy Page interview.

[55] Herring Testimony, at footnote 12.

[56] Tommy Page interview and Fleming-Wood Testimony at ¶30.

[57] Herring Testimony at footnote 12.

Pandora Premieres generates significant benefits to the artists and labels and to Pandora. Because the program is mutually beneficial and Pandora does not charge for it, ███████████ ██ do not call for an adjustment to the effective royalty rate I have calculated.

G. Total Adjustments to the Effective Per-Play Rate

Based on my evaluation of the miscellaneous terms in the Merlin Agreement, I have adjusted the effective per-play rate upward by 0.0002¢ per play.

Appendix E: Net Promotional Experiments

Pandora has run experiments to quantify the net promotional impact that performances on Pandora have on the sales of recorded music. Those experiments are informative about whether there is any significant difference in net promotion between major record companies and independent record companies. My understanding of these experiments is based on the testimony of Stephan McBride ("McBride Testimony").

Under the experimental design, Pandora would play an album or song in some geographic markets and not in others. The United States was divided into Nielsen "designated market areas" (DMAs), with the largest DMAs further divided into Nielsen "sub-designated market areas" (sub-DMAs). In total, there are 228 DMAs and sub-DMAs included in the study.

Each experiment involved a specific piece of music. One group of experiments involved entire albums that were new to Pandora. Another group of experiments involved popular "catalog" songs that were already playing on Pandora. The catalog songs used in the experiment were randomly drawn from the *Rolling Stone Top 500 Songs* and the *Pitchfork 500* lists. For each experiment, Pandora randomly determined whether or not Pandora would play the specific music over a period of several weeks to Pandora listeners within each DMA or sub-DMA. This process resulted in each album or song that constituted an experiment playing in roughly half the country. Any two experiments would very likely have different sets of DMAs and sub-DMAs in which the specific music was playing.

If Pandora listeners substitute listening to an album or song on Pandora for the purchase of that album or song, we would expect to see *lower* sales in geographic areas where an album or song is performed on Pandora. If, on the other hand, hearing an album or song on Pandora

promotes sales of that album or song, we would expect to see *higher* sales of an album or song in geographic areas where it is performed on Pandora. Of course, Pandora may have different substitutional or promotional effects for different types of listeners. The experiments and analysis conducted by Pandora answer the question of whether the average effect of performances on Pandora, measured across all listeners, is to substitute for or promote music sales.

My interest in these experiments was to learn whether Pandora's net promotional effects are the same or different between the major record companies (as a group) and independent record companies (as another group).

Using data from its experiments and ownership attribution, Pandora estimated the effect of Pandora performances on music sales separately for music owned by the Majors and music owned by independent record companies.[1] For newly released albums on Pandora, the estimated net promotion effect is larger for the Majors than for independent record companies by 1.2 songs sold per 1,000 spins on Pandora.[2] This difference is not statistically significantly different from zero given the precision of the estimates. For catalog songs, Pandora's net promotional impact on music owned by the Majors is also not statistically significantly different from Pandora's net promotional impact on music owned by independent record companies. Moreover, the point estimate of this difference is very small. The estimated net promotion effect is larger for independent record companies than for the Majors by 0.02 songs sold per 1,000 spins on Pandora.

These estimates of differences in net promotion effects do not translate dollar-for-dollar into differential royalty rates for the Major and independent record companies. In a bargaining situation, I would expect that Pandora and a record company would split the net promotional benefits in some fashion. If Pandora and the record label share the net promotional benefits, the differential in implied rates between major record companies and independent labels is less than the difference in the net promotional impact of Pandora on Majors versus independent labels.

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[1] McBride Report, Table 6. Note that the table converts an effect on unit sales to an effect on gross revenues by multiplying by a $1 per track price. I report the effect on *unit* sales here and, use the unit sales net promotional effect in the calculations that follow.

[2] The estimation uses the SoundScan definition of Track-Equivalent Album sales, which combines album sales and track sales by assuming there are ten tracks per album.

To illustrate the impact of these estimates of relative promotional effects on implied royalty rates, suppose that the dollar benefit to a record company from each song that it sells is approximated by the $0.70 wholesale price for track sales less a $0.09 payment per track for mechanical rights, giving a net benefit of $0.61 per track sold. As noted above, the point estimate of the net promotional effect for new music performed on Pandora is 1.2 songs per 1000 spins larger for the Majors than for independent record companies. This corresponds to a relative net promotion benefit that is $0.73 (1.2 songs at $0.61 per track) larger for the Majors than for independent record companies, per 1,000 spins on Pandora. Suppose the negotiated royalty rates reflect a 50-50 split of net promotional benefits, so half of each net promotional dollar gets passed back to Pandora in the form of lower royalty rates. With these numbers, the negotiated per-play royalty rate for a major record company would be 0.037¢ less than the per-play rate negotiated by an independent record company.

A similar exercise can be done using the point estimate for the relative net promotional benefit from catalog sales. The additional 0.02 songs per 1,000 spins for independent record companies relative to the Majors translates into an additional $0.012 of promotional benefits for the independent record companies per 1,000 performances. Again using a 50-50 split of net promotional benefits, this implies that the per-play royalty rate for the Majors would exceed the per-play rate for independent record companies by 0.0006¢.

Pandora plays a mix of new music and catalog music, so the relative overall net promotional benefit from performances on Pandora would be some weighted average of the estimated effects for new albums and for catalog songs. Since the new music effect is far larger than the catalog music effect in absolute value, it is very likely that, based on these point estimates, the overall net promotional effect from performances on Pandora is larger for the major record companies than for independent record companies. But these estimates of the difference between Majors and independents in the net promotional effect from performances on Pandora are imprecisely estimated and are not statistically significantly different from zero.

Appendix F: Steering Experiments

To learn about Pandora's incentive and ability to alter the music it plays in response to differences in royalty rates among record companies, I asked Pandora to conduct a number of experiments. These experiments were designed to measure listener sensitivity to changes in Pandora's music selection algorithms. These changes were designed to alter the rate at which Pandora plays sound recordings from the three major record companies, Universal Music Group ("UMG"), Sony Music ("Sony"), and Warner Music Group ("WMG"). In particular, each experiment involved playing the music of one major record company at a specified rate that differed from that record company's natural performance rate (NPR) on Pandora.

This Appendix describes those experiments and the measured listener responses. The results of these experiments strongly support the conclusion that Pandora can steer toward or away from each major record company's music without causing a significant negative reaction from Pandora's listeners.

Based on the results of these experiments, I find that it would be profitable for Pandora to enter into an agreement with any of the three major record companies on the same terms that Pandora did with Merlin. I also find that it would be profitable for Pandora to enter into an agreement with any of the three major record companies on the same terms that Pandora did with Merlin but with 30 percent steering rather than 15 percent steering.

1. Description of the Steering Experiments

In the ordinary course of business, Pandora conducts controlled experiments to assess listener responses to various changes in its service. I asked Pandora to use its normal experimental methods to perform controlled experiments to measure listener responses as Pandora steers listeners toward or away from music licensed by each of the three major record companies.

My instructions to Pandora are provided at the end of this Appendix. For each major record company ("Major"), I requested four experiments: one that increased performances of that Major's tracks by 15 percent above that Major's NPR; one that increased performances by 30

percent above that Major's NPR; one that decreased performances of the Major's tracks by 15 percent below that Major's NPR; and one that decreased performances by 30 percent below that Major's NPR.[1] In total, twelve experiments were run, four for each of the three Majors.

Pandora randomly assigned listeners to 13 mutually exclusive groups, twelve groups that would receive an experimental treatment, the steering toward or away from the music of a Major, and one control group. The control group consisted of 10 percent of Pandora's registered listeners. The treatment groups consisted of 5 percent of registered listeners for each UMG experiment, 7 percent of registered listeners for each Sony experiment, and 8 percent of registered listeners for each WMG experiment. The size of the treatment groups was inversely correlated with the Majors' shares of performances on Pandora at their NPRs.[2] The combined size of all of the treatment groups was selected to encompass 80 percent of Pandora's registered listener base, following Pandora's typical experimental practice.

With the treatment and control groups identified and steering targets specified, Pandora set the experiments running mid-afternoon on Wednesday, June 4, 2014. At my request, the experiments ran for 13 weeks, and were turned off at midnight between Wednesday, September 3 and Thursday, September 4. I asked Pandora to set aside data from mid-afternoon to midnight Wednesday June 4, 2014, and to report data for 13 full weeks beginning and ending at midnight between a Wednesday and a Thursday.[3]

To accomplish steering, Pandora modified its music selection algorithm for listeners in treatment groups in a manner that increased or decreased the likelihood that the specified Major's music would be played. These manipulations were done in what Mr. McBride calls a "naïve" manner; smaller listener responses, possibly much smaller, would be achieved if Pandora were to optimize its steering methods, as would be in Pandora's interest in a commercial setting. Figure F.1 reports the actual level of steering achieved in each of the twelve experiments, week-by-week. The vertical axis in Figure F.1 measures the percent difference from the specified

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[1] For example, if a Major's NPR is 20 percent, increasing performances of that Major's tracks by 15 percent would raise its share of performances to 23 percent, i.e., by three percentage points (15 percent of 20 percent).

[2] The inverse correlation between a Major's NPR and treatment group size was selected to improve the statistical properties of the experimental results while working within the constraint that 80 percent of listeners in aggregate could be assigned to treatment groups due to Pandora's structure for conducting experiments.

[3] I understand there are day-of-week effects in listening habits, so I requested that the data cover a period that started and ended at the same time on the same day of the week.

Major's NPR. Figure F.1 shows that Pandora was quite successful in steering according to the target specified for each experimental group. An exception in the steering process occurred during the week beginning August 14, when the software that runs Pandora's experimental framework malfunctioned from August 18 to 20. During those three days, steering did not occur for the treatment groups, so the average steering for the week beginning August 14 was dampened. However, my conclusions discussed below are not dependent on the inclusion or exclusion of data for the week beginning August 14.

Figure F.1
Percent Increase in Performances Above Each Major's Natural Performance Rate (for Treatment Groups)
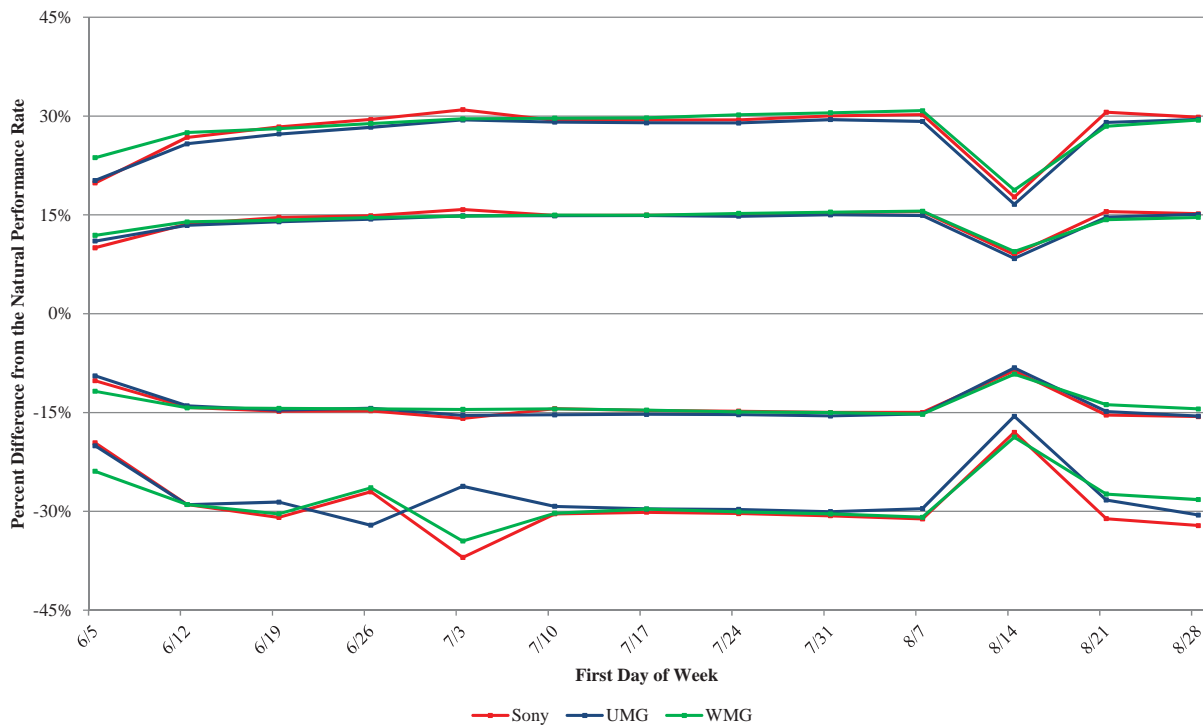
Source: Pandora Steering Experiment Data.

Naturally, steering toward one Major necessarily means steering away from other record companies. But the arithmetic of steering implies that this "counter-steering" is milder than the specified steering toward the Major. This is because the counter-steering is spread across the other two Majors and the independent record companies (in a manner determined by Pandora's

music selection algorithms).[4] The same logic applies if Pandora is steering away from a Major: the resulting counter-steering toward other record companies is milder than the steering away from that Major. Furthermore, Pandora has the flexibility to counter-steer unequally among the other record companies if that would lead to a better listener experience.

2. Experimental Results

A. *Hours Per Registered Listener*

The steering experiments were designed to measure the response of listeners, and thus the commercial impact on Pandora, of steering. Since roughly 80 percent of Pandora's revenues come from advertising, I focused my attention on the impact of steering on listener hours, which drives advertising revenue at Pandora.

Pandora routinely tracks listener hours when it runs experiments in the normal course of business. "Hours per registered listener" is the standard measure of listener response that Pandora looks at when it runs experiments.[5] This measure captures listener habits that are highly correlated with Pandora advertising revenues. I asked Pandora to pool all the weeks of data within an experiment and report average listening hour results on that basis.

B. *Impact of Steering on Average Listening Hours*

At my request, for each experiment, Pandora calculated the difference in average listening hours between the treatment group and the control group. This difference was expressed as a percentage of the control group's average listening hours. Because the reported percentage difference in listening hours is calculated using samples of listeners that comprise the

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[4] To illustrate, suppose Pandora steers 30 percent toward a Major with a 20 percent NPR, raising its share of performances from 20 percent to 26 percent. Suppose that this additional 6 percent of performances comes at the expense of all other labels proportional to their NPRs. Suppose that another Major also has an NPR of 20 percent. Then that Major's share of reduced performances is only 1.5 percent of all performances (since this Major need only absorb 25 percent of the 6 percent of all performances lost to the first Major). This corresponds to steering away from the second Major by only 7.5 percent (1.5 percent divided by 20 percent). More generally, if a Major has an NPR of S, and Pandora increases that Major's performances by a factor $(1+K)$, that will raise this Major's share of plays from S to $S(1+K)$. Therefore, the other labels together must lose a combined share of performances equal to SK. Their initial share was $(1-S)$, so as a fraction of their initial plays, they are losing $SK/(1-S)$. So long as the Major's share is less than 50 percent, $S/(1-S)$ is less than unity, so $SK/(1-S)$ is less than K. The largest Major, UMG, has an NPR of 34 percent; for UMG, $S/(1-S)$ is about one-half.

[5] Written Direct Testimony of Timothy Westergren ("Westergren Testimony") at ¶35.

treatment and control groups, this measure is an unbiased point estimate of the true value of the average listener response. Following its normal procedures, Pandora calculated confidence intervals around that point estimate, which indicate a range that, with 95% probability, encompasses the true value of the percent difference in average listening hours with versus without steering. In the discussion that follows, I focus on the point estimates of the average percentage difference in listening between treatment groups and the control group. These results are set out in Table F.1.

As one would expect, the percentage change in listening hours due to steering typically is negative.[6] A decrease in average listening hours is expected if Pandora is doing a good job of choosing music that optimizes the listener's experience. A departure from NPRs should then result in a somewhat less attractive listening experience, and listening hours would be more likely to fall than to increase, if they change at all. However, based on a very general proposition

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[6] The three exceptions out of the twelve experiments are the *positive* effects on the difference in average listening hours observed when Sony or WMG music is performed with 15 percent less frequency, and when UMG music is performed with 15 percent greater frequency.

from the mathematics of optimization, if Pandora's playlist-selecting algorithm is optimized, the impact on listening hours from a small amount of steering should be negligible.[7] The experimental results are consistent with this theoretical prediction.

C. *Interpretation of the Experimental Results*

The key finding from these experiments is that the percent change in listening hours is very small, especially for the experiments that involved 15 percent steering toward a Major, which is the most relevant for assessing an agreement like the Merlin Agreement.[8] To illustrate, consider the impact of steering 15 percent toward Sony, which generated the largest response among the three experiments involving 15 percent positive steering. Sony's NPR on Pandora is ███████, so steering 15 percent toward Sony involves playing Sony music an extra ████████ of the time (15 percent times █████████).[9] This caused a drop in listening hours of ██████████, about one listening hour out of every █████. Below, in Table F.2, I show that this drop in listening hours is far below the level that would make it unprofitable for Pandora to steer in this manner.

Listener responses to 30 percent steering are not as small, but they are all still well below ██████████████████████. To illustrate, again consider Sony. Steering 30 percent toward Sony involves playing Sony music an additional ██████████ of the time (30 percent times Sony's NPR of █████████), about one in █ songs extra. This resulted in a drop in average listening hours of ██████████, about one listening hour out of every ██. For UMG, with its NPR of █ ██████, 30 percent steering toward UMG involves playing UMG music an additional ██. This resulted in a drop in listening hours of only ██████████████████████████. Below, in Table F.3, I show that these drops in listening hours also are far below the level that would make it unprofitable for Pandora to steer in this manner.

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[7] Technically, the derivative of listening hours with respect to the amount of steering should be zero when all labels are played at their NPR. This is an application of the envelope theorem from calculus.

[8] Indeed, the listener response to steering toward or away from a Major by 15 percent is not statistically different from zero in any of the six experiments, and it is only statistically different from zero in the experiment that steers 30 percent away from UMG and the experiment that steers 30 percent toward Sony.

[9] Pandora provided me with data that reported the NPR for each Major based on Control group listening during the period of the steering experiments. See "Shapiro_spin_share.csv."

These experiments provide outstanding and convincing evidence regarding the effects of steering on listening hours over a period of several months. Given the duration of these experiments, 13 weeks, they cannot measure the effects of steering over a longer period of time. In theory, the effects of steering could build up over time, in which case the longer-term effects on listening hours would be larger than found in these experiments, or they could dissipate over time, in which case the longer-term effects on listening hours would be smaller than found in these experiments.

I did not find statistically significant evidence of either of these effects in the data for the steering experiments that involved steering 15 percent toward the Majors. Using weekly data from those steering experiments, I investigated the time trend in the responses of the treatment groups to the steering. I found that the time trend in listener responses to steering 15 percent toward Sony and WMG was statistically insignificant, consistent with the hypothesis that the effects of steering on listener satisfaction neither cumulate nor dissipate over time. For the experiments that steered 15 percent toward UMG, the time trend was statistically significant but indicated that the effects of steering were dissipating, i.e., listeners were becoming *less* displeased over time. I therefore conclude that these experimental results are unlikely to underestimate the longer-term effects of steering at the 15 percent level on listening hours.[10]

In sum, these experimental results establish that Pandora has a great deal of flexibility to alter the mix of the music it plays with little or no impact on the listening experience, as measured by average listener hours. This translates directly into a high elasticity of demand by Pandora for the repertoire of recorded music of each of the major record companies.

3. Steering Toward a Major Would Be Profitable for Pandora

I now demonstrate that it would be profitable for Pandora to enter into an agreement with any one of the three major record companies on the same terms that Pandora did with Merlin, including the requirement that Pandora steer at least ████████ toward that Major.

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[10] For the experiments where Pandora increased a Major's performances by 30 percent, statistically significant negative trends in listening hours were observed. However, the time trends diminish over time, and I estimate that beyond three months, which was the length of the experiments, the cumulative effect would not be increasing further.

Table F.2 calculates the financial impact in 2015 on Pandora's advertising-supported service of steering 15 percent toward each of UMG, Sony, and WMG.[11] The impact for each Major differs due to the different size of that Major at its NPR and the different impact on average listing hours from steering toward that Major. These factors are reported in the first two rows of Table F.2. The change in listening hours due to Pandora steering 15 percent toward each Major was already reported in Table F.1.

The largest element of the cost to Pandora of steering is the percentage change in average listening hours multiplied by Pandora's projected advertising revenues of ███████████ for 2015. This cost is reported in the row labeled "Change in Advertising Revenue Due to Change in Listening Hours." Due to the positive listener response in the experiment that steers

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[11] The impact of the steering on listening hours is the measure that links most directly to a change in Pandora's advertising revenues, and steering on advertising-supported services offers by far the largest volume of performances over which Pandora can realize savings in royalty payments. Data reported in Appendix D reflect that advertising-supported performances are expected to account for 88 percent of all performances on Pandora in 2015.

15 percent toward UMG, Pandora actually realizes a tiny *gain* in advertising revenues of
███████████. The lost advertising revenue due to steering 15 percent toward the other two
Majors is ███████████ for Sony and ███████████ for WMG. Pandora also sees a small,
offsetting, change in royalty costs associated with the change in listening hours. This is shown in
the row "Offset: Change in Royalty Payments Due to Change in Listening Hours." For UMG,
Pandora's royalty costs increase by the ███████████ due to the increased listening. Pandora's
savings from avoided royalty costs due to decreased listening are ███████████ for Sony and
███████████ for WMG. The effect of these two terms is a net benefit for Pandora of
███████████ due to steering toward UMG and a net cost for Pandora of ███████████ for
steering toward Sony, and ███████████ for steering toward WMG.

The far larger benefits to Pandora of steering result from the lower royalty rates that
Pandora pays for performances of music owned by the Major toward which Pandora is steering.
For every advertising-supported performance of music of the Major in question, Pandora saves
an amount per play that reflects the difference between the adjusted effective per-play rate under
the Merlin Agreement of ██████ and the per-play rate that Pandora would otherwise pay in
2015. The aggregate savings associated with this discount are shown in Table F.2 in the row
"Lower Royalty Payments Due to Discounted Per-Play Rate." Pandora's saving from the
discounted per-play rate is equal to ███████████ for UMG, ███████████ for Sony, and
███████████ for WMG.

Pandora's savings on royalty payments are far larger than its loss of advertising revenues
for each of the three Majors (for UMG there is actually a gain in advertising revenues). Indeed,
as shown in the final row of Table F.2, the benefits to Pandora from steering 15 percent toward
each Major is at least ██████ the cost to Pandora. These multiples are highly significant. For
example, the ████ ratio, which applies to Sony, tells us that steering 15 percent toward Sony,
under the same terms as in the Merlin Agreement, would be profitable to Pandora even if the
steering experiments have vastly underestimated the listener response to steering or otherwise
greatly underestimated the cost to Pandora of steering toward Sony. Put differently, my
conclusion that it would be profitable for Pandora to enter into an agreement with any of the
three major record companies on the same terms that Pandora did with Merlin is very robust and
thus highly reliable.

Table F.3 repeats this analysis for 30 percent steering toward each of the Majors. While this more pronounced steering causes a stronger response by listeners, it is still highly profitable for Pandora. These results are also very robust. The cost to Pandora of steering resulting from lost advertising revenues for 2015 is equal to ███████████ for UMG, ███████████ for Sony, and ███████████ for WMG. The offset from avoided royalty payments due to the decrease in listening hours equals ███████████ for UMG, ███████████ for Sony, and ███████████ for WMG. Pandora's savings in royalty payments are ███████████ for UMG, ███████████ for Sony, and ███████████ for WMG. With 30 percent steering toward any of the three Majors, Pandora's savings on royalty payments are still far larger than its net costs of steering. As the bottom line of Table F.3 shows, the benefits to Pandora of steering 30 percent toward a Major are at least ████████ the cost to Pandora. Based on the results of these experiments, I find that it would be profitable for Pandora to enter into an agreement with any of the three major record companies on the same terms that Pandora did with Merlin but with 30 percent steering rather than 15 percent steering.

Pandora Music Steering Experiments: Instructions
30 May 2014
Carl Shapiro

This memo describes the steering experiments I am requesting that Pandora run. The goal of these experiments is to measure the responses of Pandora listeners when Pandora adjusts the mix of music it plays either toward or away from the music licensed by specified recording companies. My understanding is that Pandora will adjust the overall mix of music played to listeners by modifying its algorithm, allowing flexibility to minimize the algorithmic departure from the baseline.

In running these experiments, I request that Pandora follow the procedures it uses when running experiments in the normal course of business to inform its business decisions. I also request that Pandora track and report the listener metrics that it normally tracks when running experiments. These metrics should be tracked separately for each treatment group and for the control group.

My expectation is that Pandora will run these experiments concurrently, starting as soon as Pandora is able to proceed. A randomly selected group of 10% of Pandora's registered listeners will constitute the control group, in keeping with Pandora's normal procedures for experiments. No listener will be enrolled in more than one steering experiment. The experiments will run through September 2, 2014. This date is chosen to give me sufficient time to evaluate the results and integrate them into my overall analysis.

Requested Experiments

Each experiment specifies (a) a recording company; (b) a steering objective, i.e., a change in "spins" of a recording company's music as a percentage of spins of that recording company's music at baseline listening levels; and (c) the size of the experimental group, which should be randomly assigned from among Pandora registered listeners.

I request that experiments be run for Universal Music Group (UMG), Sony Music (Sony), and Warner Music Group (WMG). For each of these three companies, I request that Pandora run experiments with the following steering objectives: +/- 15% and +/- 30%. The size of the experimental groups should be 5% of registered listeners for each UMG experiment; 7% of registered listeners for each Sony experiment; and 8% of registered listeners for each WMG experiment.

Timing of Reported Metrics

I understand that Pandora normally looks at metrics over one-week periods of time to avoid day-of-the-week effects. I ask that Pandora continue to follow this approach for the metrics reported to me. I also request that Pandora follow its normal procedures for measuring transitional impacts at the beginning of these experiments.