

EXHIBIT 4

ARISTA RECORDS LLC, ET AL. V. LIME WIRE LLC, ET AL.

Rebuttal Expert Report of Dr. Stan J. Liebowitz
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I. Qualifications

1. I am the Ashbel Smith Professor of Managerial Economics in the School of Management at the University of Texas at Dallas (UTD). I am also the director of the Center for the Economic Analysis of Property Rights (CAPRI). During 2007-2008 I was the president of the Society for Economic Research in Copyright Issues and I was the Academic Associate Dean of the School of Management at UTD from 1996-1999. Prior to my current position, I have been on the faculty at the University of Western Ontario, the University of Rochester, the University of Chicago, and North Carolina State University. My undergraduate degree is from Johns Hopkins and my doctoral degree is from UCLA.
2. My research and teaching have largely focused on the impacts of new technology on markets with an emphasis on copying, network effects, and intellectual property. My research has been the subject of articles in most leading business magazines such as Forbes, Business Week, The Financial Times and Handelsblatt as well as leading newspapers such as the New York Times, Washington Post and Wall Street Journal. My book, "Rethinking the Network Economy," which discussed the impact of the Internet on traditional business models including the impact of file-sharing on the sound recording industry, was chosen as one of the top 30 business books in 2003 by Soundview Executive Books. My book coauthored with Stephen Margolis "Winners, Losers and Microsoft" was favorably reviewed in leading publications such as the Wall Street Journal, The Economist, and Wired Magazine. I have created courses titled "The Economics of Information Goods" and "The Business of Entertainment," and have taught these classes to students at the graduate level.
3. I have served on the advisory boards of several professional organizations associated with copyright and technology. The influence of my research led to my being chosen to give the keynote address at the inaugural meeting of the Society for Economic Research on Copyright Issues. I have testified on these topics before Congressional committees and government agencies and have given numerous talks at university workshops and public forums. I am listed in Who's Who in Economics, based on the large number of citations to my research.
4. I was one of the first economists to examine the impact of unauthorized copying when in the late 1970s the Canadian government asked me to examine the impact of photocopying on publishers.¹ I am, to my knowledge, the first economist to suggest and explain the conditions under which unauthorized copying might benefit copyright owners. I was the first to suggest that there could be a potentially positive impact from

¹ Liebowitz, Stan J., (1981) The Impact of Reprography on the Copyright System. Copyright Revision Series, Consumer and Corporate Affairs, ISBN 0-622-11396-9, Canada. Available at SSRN: <http://ssrn.com/abstract=250082>. The content from that paper was later published as Liebowitz, Stan J., (1985) "Copying and Indirect Appropriability: Photocopying of Journals," *Journal of Political Economy*, 93-5 October 1985, Pp. 945-957.

‘sampling’ although I used the term ‘exposure effect’. I also introduced the ‘substitution’ effect in this literature as well as the concept of ‘indirect appropriability’ which is another possible way that copying might benefit copyright owners although it requires very special preconditions to hold. I have had a continued research focus on various forms of copying having written twelve peer reviewed articles, three book chapters, and numerous other articles on the economic implications of file-sharing and copying as listed in my curriculum vitae which can be found as Appendix B (the listings in bold text indicate articles that are related to the topics under discussion in this case).

5. I am being compensated at the rate of \$550 an hour for my work in this case. My compensation is not dependent upon or related in any manner to the outcome of the current litigation.

II. Assignment and Documents Used

6. I have been retained by the Plaintiffs to evaluate the reports submitted on behalf of the Defendants by Mr. George G. Strong and Dr. Aram Sinnreich, and the conclusions reached in those reports. A complete list of the materials upon which I have relied is found in Appendix A.

III. Summary of Conclusions

7. Mr. Strong and Dr. Sinnreich propose many alternative theories for why sound recording sales would have fallen during the last decade, including librarying, competition from alternative forms of entertainment, macroeconomic downturns, the transition to digital downloads, increased CD piracy, and competition from used CDs, among other things. In order to be economically or scientifically sound, however, any proposed explanation needs to be consistent with the timing of the decline, with the fact that the decline occurred in numerous national markets, and with the decline continuing over many years. When the numerous alternative explanations offered by Mr. Strong and Dr. Sinnreich are tested against actual data these alternative explanations are generally seen to be either unsupported or refuted by the data.²
8. Mr. Strong and Dr. Sinnreich also suggest that empirical examinations of the impact of file-sharing are either evenly balanced between those finding positive impacts and those finding negative impacts or that the overall negative effects that are found are so small as to be little different than zero. Although there are published studies concluding that file-sharing has had no impact on sales, there are far more published studies indicating that file-sharing has had a negative impact on sales. Further, many of these latter studies have results consistent with the measured size of the decline due to

² See Section VII, A-H.

file-sharing being a large percentage, if not all, of the decline in sound recording sales that had occurred.³

9. Mr. Strong and Dr. Sinnreich both claim that some changes related to file-sharing are great improvements for the record companies that significantly offset the harm from file-sharing. Mr. Strong and Dr. Sinnreich suggest that file-sharing has stimulated record label revenues derived from increased sales of iPods, videogames, concert tickets, and music licensing in movies and television, among other similar examples. Many of the examples they put forward, such as iPods, do not generate any revenue for record companies and it is difficult to understand why they are even mentioned. Other of their examples, such as the licensing of music in movies, television, or videogames, while representing some revenues to record companies, have no apparent linkage to file-sharing and thus are not file-sharing induced offsets to the harm from file-sharing.⁴ Moreover, Mr. Strong and Dr. Sinnreich do not establish how much total revenue record labels derive from sources other than the sale of sound recordings, so their claim that these alternative sources have offset losses due to file sharing is speculative and unsubstantiated.
10. Finally, I examine Mr. Strong's calculation of the expenses LimeWire avoided by not paying for the rights to the music it distributed illegally. Mr. Strong concludes that in a hypothetical negotiation between the record labels and LimeWire, the parties would have agreed to a license under which LimeWire would have paid the Plaintiffs no more than the amount of LimeWire's actual profits. Mr. Strong claims that the Plaintiffs would have accepted this amount because they essentially had no variable costs involved in providing the music rights to LimeWire. But Mr. Strong neglects the very large cost that would have been incurred by the record companies in allowing LimeWire to distribute their music, which is the loss in sales that would occur in the labels' key market—the market for sound recordings.⁵ Because Mr. Strong's analysis assumes that Plaintiffs' would have signed a license agreement with LimeWire without regard for how that license would affect other markets, it bears no relationship to how an actual negotiation between the parties would have proceeded.

IV. History of Sound Recording Sales

11. The claims being made by Mr. Strong and Dr. Sinnreich must be understood in the context of the enormous size of the recent decline in record industry sales relative to previous declines and its international scope.
12. The first major file-sharing network, Napster, came into existence in 1999 for the express purpose of trading music files and began its explosive growth during the year 2000. Within a period of less than two years, Napster had become an international

³ See Section VIII.

⁴ See Section IX.

⁵ See Section X.

sensation but it was essentially shut down by legal proceedings in early 2001.⁶ The decline in music sales began at virtually the same moment that file-sharing began to attract large number of users.⁷

Table 1: Trade Revenue Change, 1999-2009 (inc ringtn)			
	1999 Revenues (inflation adjusted 2009 Local Currency)	Nominal 2009 Revenues	% Change
USA	10,826.22	4,562.30	-57.86%
Japan	499,209.03	370,979.74	-25.69%
UK	1,464.48	928.80	-36.58%
Germany	2,036.83	1,046.40	-48.63%
France	1,379.22	622.76	-54.85%
Canada	1,165.96	430.21	-63.10%
Australia	908.72	470.23	-48.25%
Italy	604.22	162.05	-73.18%
Spain	599.83	151.06	-74.82%
Netherlands	345.42	156.11	-54.81%
Switzerland	376.45	186.07	-50.57%

13. Table 1 lists⁸ the decline in sound recording trade revenues in domestic currencies for the 10 largest music markets (ordered by size) over the period 1999 to 2009, controlling for inflation. The declines in revenues are enormous and have occurred in every leading market. The amount of the decline in the U.S. is \$6.264 billion from a starting point in 1999 of 10.826 billion. As indicated in the last column of the table, the decline in the U.S. was over 57% in 2009.⁹

⁶ For more detailed history see Liebowitz (2006).

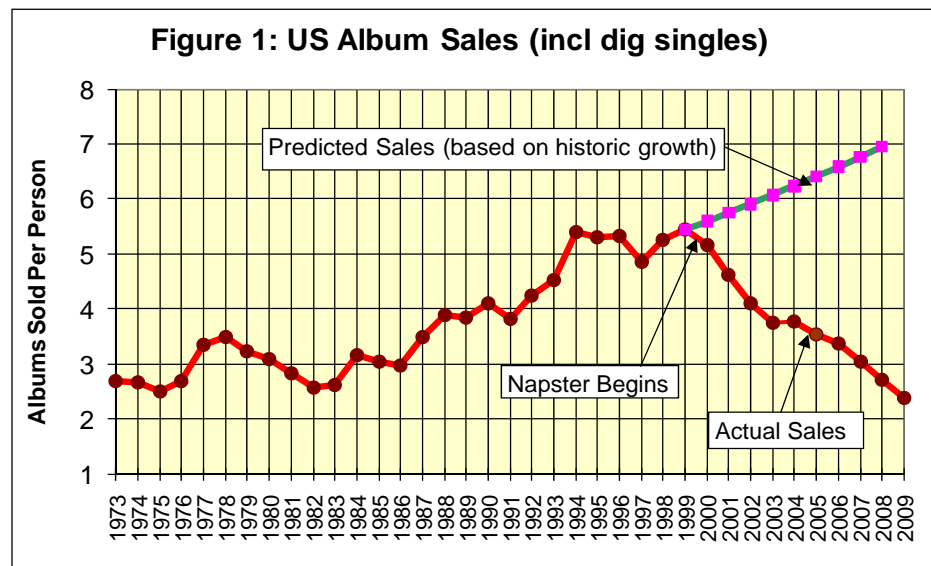
⁷ Liebowitz (2006) reports that in February of 2000 there were less than 2 million Napster users in the U.S. but that this number increased monotonically to 14 million users by February of 2001 when the preliminary injunction was granted stopping Napster's infringing behavior. That article also indicated that the decline in sound recording sales began in the second half of 2000.

⁸ This is reproduced from a presentation I made at a conference in Vienna in the summer of 2010 based on data from the IFPI. It is slide 4 from the presentation which is available here: http://musikwirtschaftsforschung.files.wordpress.com/2010/06/liebowitz_vienna-final-public2.pptx.

An earlier version of this table is also available in Liebowitz (2007).

⁹ The numbers in Table 1 actually underestimate somewhat the decline in sound recording sales that has occurred. It is an underestimate because it includes revenues from the sale of ringtones in the 2009 total revenue figures (ringtones did not exist in 1999) and ringtones do not belong in the same economic market as sound recordings. In other words, even though ringtones are derived from sound recordings, they serve an entirely different function than do sound recordings. In the case of sound recordings, individuals listen to enjoy their favorite songs or to learn about new, potential favorites. Ringtones, on the other hand, are used by individuals to allow them to identify their phones when a call is coming in. They may find the ringtone a pleasant way to identify an incoming call, but ringtones are not used for the purpose of consuming the pleasure that comes from listening to sound recordings. If we subtract "mastertone" revenues from the 2009 revenues the decline in the U.S. increases to 60% from the 57.9% shown in Table 1. It was not possible to redo Table 1 removing ringtone revenues since the IFPI document upon which Table 1 is based does not break out ringtone or mastertone revenue for every country.

14. Prior to the advent of file-sharing, sound recording sales had largely shown a robust increase in revenues and units world-wide and in the U.S. since the advent of the LP record in the 1950s.



15. For example, Figure 1 shows the unit quantity of album sales (including digital singles aggregated in album-equivalents¹⁰) per capita in the U.S.¹¹ Upon the advent of file-sharing, record sales began a precipitous decline of unprecedented scope with a 50% drop from the 1999 peak to 2009.
16. In Liebowitz (2004) I concluded that one of the drivers in the growth of album sales from the mid 1980s to the mid 1990s was the increase in portability (both handheld and automobile) brought about by cassette players and CD players. Similarly, the ubiquity of mp3 players and the great success of the Apple iPod should have led to an increase in the demand for the purchase of prerecorded music.
17. Sales in the U.S. had been going up in the 3 decades prior to file-sharing but began a prolonged decline at the exact moment that file-sharing becomes enormously popular—making file-sharing a prime suspect among potential causes of the sales decline. That timing raises the obvious question of whether file-sharing caused the sales decline or some portion of it.

¹⁰ Each ten digital singles were translated into one album.

¹¹ I have been producing and updating variations of this chart in numerous publications. This particular chart is the most up-to-date and is slide 2 from the presentation cited in footnote 8 above. Digital singles, as sold on sites such as iTunes, are converted to albums at a ratio of 10:1. Sales data come from the RIAA and population data from the U.S. Census. The “Predicted Sales” line with the square markers applies the average growth rate that occurred from 1973 to 1999 to the years after 1999, a value of 2.75%.

18. Mr. Strong and Dr. Sinnreich each state that file-sharing played virtually no role in this sharp decline. Mr. Strong (in his paragraph 38) states that file-sharing “likely had a very small impact on the revenues of the recorded music companies.”¹² Dr. Sinnreich (on his page 12) states that file-sharing is “neither the sole nor even a substantial cause of this [sales] decline.”
19. I will examine the alternative explanations of the decline in sound recording revenues provided by Mr. Strong and Dr. Sinnreich. Note, however, from Table 1 and Figure 1, there are two key criteria that must be met by any hypothesized cause(s) of the decline in sound recordings.
 - (1) The enormous decline in sound recording revenues and units sold began approximately in the year 2000. This very sharp reversal in the sound recording market implies that any factor causing it must either have sharply changed in direction or size at about the same time, or else must have originated at about that time and become very large very quickly. Unauthorized file-sharing grew very quickly and first began having an impact 2000, so it meets this criterion.
 - (2) Every major sound recording market began a very large decline at about the same time. Any cause of the decline must not be local to a single country but must be universal among all leading industrialized countries. Unauthorized file-sharing meets this criterion as well.

V. The Substitution Effect

20. There are several ways in which unauthorized file-sharing can influence the sales of records. Mr. Strong and Dr. Sinnreich talk a great deal about ‘sampling’ but there are other possible effects, such as substitution.
21. The economic logic of the substitution effect is simple—individuals who obtain copies have what is often a perfect substitute and therefore no longer need to purchase originals. When you already have a free copy of a work that is essentially the same as a purchased version, why spend the money to purchase it? Therefore, sales of originals will decline when almost perfect copies are available. The substitution effect is unambiguously harmful to copyright owners since it decreases the demand for the products they are selling.
22. There is a temptation to think about file-sharing as a variant of the free samples such as those often found in the food departments of some grocery stores or locations such as Costco. These samples consist of little bite sized pieces that cannot be used in place of the full package being sold. Typical free samples, therefore, have a sampling component but no substitution component. This is quite different from the case of

¹² Paragraph 38 in Mr. Strong’s report.

file-sharing. File-sharing provides a complete full-sized product to the consumer. If they decide they like the song or album they can just keep the free sample since it provides the full-sized package. Internet ‘sampling’ is always attached to a potentially strong substitution effect.

VI. Empirical Analyses of File-Sharing’s Impact

23. There are two methods to estimate the impact of unauthorized file-sharing on the sales of sound recordings.
24. The first approach is to use a process of elimination to see which, if any, potential candidate explanations fit the data well. The origins of file-sharing match the timing of the decline in sound recordings and the popularity of file-sharing is large enough to have a major impact on sound recording sales, so file-sharing appears to be a strong candidate explanation. Furthermore, the decline in sound recording sales is so large that whatever has caused it must also be large, so it would seem unlikely that any actual cause(s) of the decline could remain hidden from view. Mr. Strong and Dr. Sinnreich spend considerable effort listing multiple potential causes that they believe might explain the decline in sound recording sales. My discussion of their analyses takes place in Section VII.
25. The second approach one might take to examining this question, and the more common approach among academic economists, is to directly test the impact of file-sharing on sound recording sales using a statistical tool such as multiple regression analysis, a favorite of economists. Mr. Strong and Dr. Sinnreich both discuss various studies that have tried to directly examine the impact of file-sharing on sound recording revenues. In Section VIII below I examine in some detail the claims of Mr. Strong and Dr. Sinnreich regarding the results of these studies.

VII. Examining Alternative Explanations for the Decline

26. Both Mr. Strong and Dr. Sinnreich list numerous reasons why sound recording sales might have fallen in the last ten years other than due to unauthorized file-sharing. The possible alternative explanations offered by Mr. Strong and Dr. Sinnreich include the impact of individuals converting libraries of old LPs and cassettes into CDs, the growth of alternative entertainment options such as DVDs, the state of the overall economy, changes in retailer behavior, and others. In their discussions both Mr. Strong and Dr. Sinnreich tend to use quotations of industry leaders or analysts in support of their conclusions. They rarely describe tests of these hypotheses using actual data. I attempt to fill this lacuna with references to analyses using data where possible.

A. Librarying

27. Librarying is a term intended to capture the activity of consumers updating their collection of sound recordings for new formats that have arrived in the market after the consumer has purchased the music in an older format. For example, if an individual had purchased an album on a cassette in the 1980s and then wanted to listen to that music on a CD in 1998, the second purchase of the same music on the new format would be an instance of librarying.
28. Although Mr. Strong (para 81) and Dr. Sinnreich (p. 17) each conclude that a decline in librarying was responsible for some of the decline in sound recording since 1999, they adduce no hard evidence to support this claim. They have no measurement of librarying and present no evidence, other than assertion by themselves or others, that librarying had an important influence on sound recording sales in the 1990s and that librarying had ended on or about 1999. Nor do they explain why, if librarying ended in 1999, sound recording sales declined, year after year, throughout the decade of the 2000s. Nor do Mr. Strong and Dr. Sinnreich note that in order to explain a drop in sound recording sales on the order of 50%, that the share of the market devoted to librarying would have needed to be remarkably large.
29. Also neglected in the Strong and Sinnreich reports are any references to research in this area that might have attempted to measure the impact of librarying or attempted to determine whether changes in librarying might have played a role in the plunge in sound recording sales that occurred after 1999. There are two academic articles of which I am aware that attempt to gauge the impact of librarying on record sales. I am the author of both (2004 and 2007).¹³
30. In 2007 I tested the proposition that librarying was in part responsible for the post-1999 decline in sound recordings by comparing the relative share of old to new recordings before and after the 2000 break in the trend of sales of sound recordings. As I wrote:

Sales of recordings older than 18 months are called “catalogue” and sales of recordings older than 36 months are known as “deep catalogue.” If a cause of unusually high sales was the replacement of old music into the CD format, and if this replacement had stopped after 1999 or 2000...then the share of catalog and deep catalog should have declined after those years. Yet, as seen in Table 9...the evidence does not support the claim that format replacement had artificially

¹³ In Liebowitz 2004 I tried to determine if record sales appeared to be related to episodes of librarying based on the switch to cassettes and CDs. I did not find librarying to have much of an impact. Liebowitz, Stan J. (2004) “Will MP3 downloads Annihilate the Record Industry? The Evidence so Far” *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*, V. 15, pp. 229-260.

increased CD sales in the years preceding the advent of file-sharing.¹⁴
[Liebowitz, 2007 p. 17]

<i>Table 9</i>	1999	2000	2001	2002	2003	2004	2005	2006
% sales catalogue USA	34%	34%	36%	37%	35%	36%	37%	38%
% sales 'deep' catalogue USA	24%	24%	25%	26%	25%	25%	25%	27%

31. People who are replacing LPs or cassettes clearly are replacing music in the “deep catalogue” category. The data indicate that librarying does not appear to explain any part of the decline in sound recording sales since the share of old music does not decline after 1999.
32. Although neither Mr. Strong nor Dr. Sinnreich mention my papers on the subject, both are very well known in the literature on file-sharing. My 2007 paper, from which the above empirical result is taken, has been downloaded more than 2400 times from the SSRN depository of academic papers¹⁵ and has been discussed in several academic magazine articles.¹⁶ My 2004 paper is also well-known, having been downloaded more than 2100 times and having been cited in other academic work more than 140 times.¹⁷

B. Competition From Other Forms of Entertainment

33. Mr. Strong and Dr. Sinnreich suggest that competition from other forms of entertainment caused sales of sound recordings to decline. Mr. Strong refers to surveys about the impact of DVD purchases on the decline in sound recording sales and Dr. Sinnreich provides some statistics on the growth in DVDs¹⁸ and videogame sales.¹⁹ It is important to remember, however, going back to paragraph 19, the caveats involved with trying to demonstrate that the timing of a change in some other factor is consistent with the decline in sound recording sales. Just showing some growth in

¹⁴ I had a footnote in the 2007 paper stating that the data came from the National Association of Recording Merchandisers (NARM) and from Nielsen SoundScan via the IFPI, although NARM only had data for catalog but not deep catalog. The IFPI claimed that catalog consisted of albums older than 18 months whereas NARM claimed that 15 months was the cutoff, although the numbers presented were the same from both sources so that one source had the wrong definition.

¹⁵ This enormous repository can be found at www.ssrn.com.

¹⁶ For example, this paper was discussed in the Chronicle of Higher Education <http://chronicle.com/blogs/wiredcampus/dispute-over-file-sharings-harm-to-music-sales-plays-again/24881> and in the German business magazine Handelsblatt <http://www.handelsblatt.com/politik/nachrichten/no-comment-please;1446947>.

¹⁷ The number of citations is measured by Google Scholar.

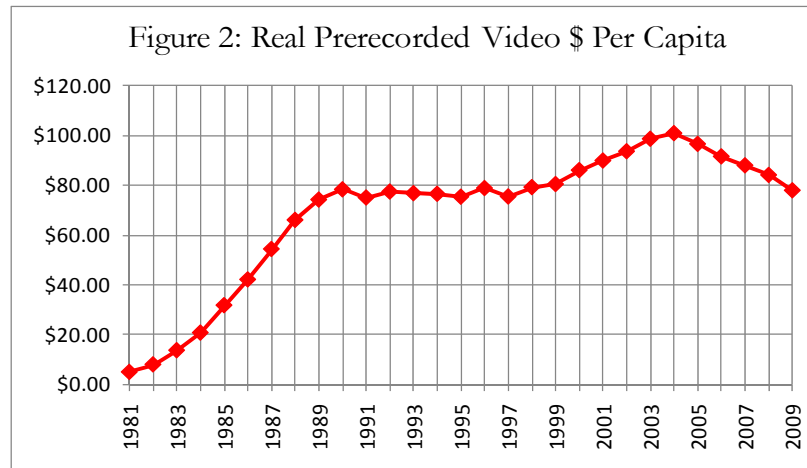
¹⁸ Dr. Sinnreich’s claim that home video sales in the U.S. doubled between 2000 and 2005 ignores a large component of the prerecorded video market—the rental of DVDs and VHS tapes. The rental market, which was 55% the size of the DVD/VHS sales market in 2000, was in decline during this period as consumers shifted their spending from renting to purchasing. By neglecting the rental market and inflation, Dr. Sinnreich seriously overstates the growth of the prerecorded video market. By stopping at 2005 he leaves off a crucial part of the story.

¹⁹ By focusing on the end points of 2000 and 2008 while ignoring the intervening years, Dr. Sinnreich casts an incomplete picture of what took place in the videogame industry.

these alternative entertainment options is insufficient to explain the decline in sound recording sales since sound recording sales were increasing prior to 2000. Instead, there needs to be an important change, perhaps an acceleration in growth or a reversal of a decline in an alternative media, year by year, after 1999 in order to explain the continuous year by year decline in sound recording sales after 1999.

34. It is particularly important to examine the data prior to 2000 since that time period shows the relationship between various forms of entertainment without the muddying impact of file-sharing's alteration of the consumer's entertainment budget. Because file-sharing lowers the cost for users who no longer purchase records, they have more money to spend on other entertainment activities. A post 1999 increase in an alternative entertainment product may be the effect of the file-sharing-induced savings in sound recording expenses, not a cause of the decline in sound recording expenditures.
35. Figure 2 illustrates the per capita inflation-adjusted expenditure on prerecorded video from 1981 through 2009.²⁰
36. It is readily apparent that prerecorded video is not capable of explaining the decline in sound recording sales. There are three strikes against it. First, the truly important increase in prerecorded video expenditures occurs in the 1980s yet sound recording revenue grew at a faster than normal clip during those years, as can be seen by looking at sound recording sales for those years in Figure 1. There is no reason to think that video sales could have a strong negative impact on sound recordings now but would not have had a strong negative impact back then. The second problem is that video revenues increase in 1998 and 1999 when sound recording sales are also increasing. And the increase in video revenues after 1999 hardly seems large enough to cause much of an impact on sound recording sales (which have seen a decline of over three albums per person per year), particularly in comparison to 1983 to 1989 when the increase in per capita video expenditure was over \$60 and sound recording sales not only did not fall but actually increased by almost 1.5 albums per person. Probably the most telling criticism, however, is that video revenues peaked in 2004 and fell thereafter back below the 1999 levels. Sound recording sales certainly have not returned to their 1999 level as would be predicted if prerecorded video was the culprit mainly responsible for the fall in sound recordings prior to 2005.

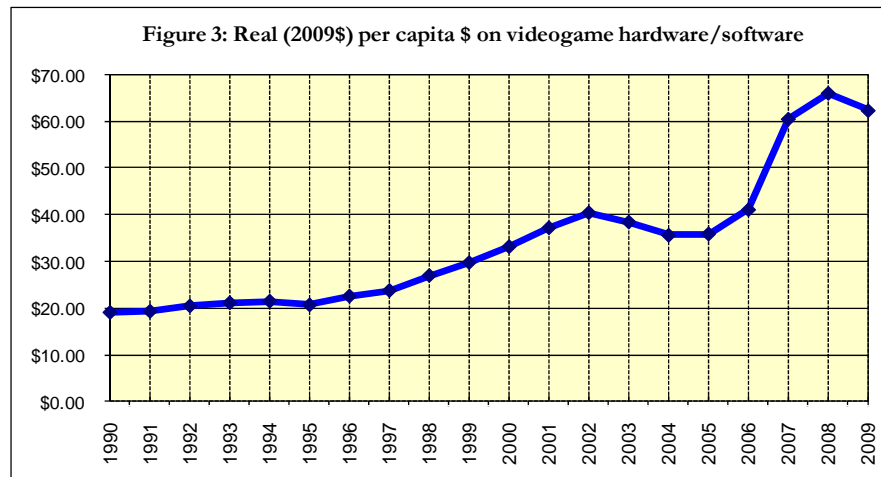
²⁰ The data from 1981 to 2003 are from Adams Media Research and are the same as reported in Liebowitz (2006) except that they are translated into 2009 dollars. The values from 2004 forward are from the Digital Entertainment Group (DEG) an industry funded non-profit that promotes the industry and collects data from the member. The data can be found here: <http://www.degonline.org/>. The two data sets were merged by applying the yearly increases in DEG data (which begin with 1999 and includes the purchase or rental of videos over cable or the Internet) to the Adams Media numbers for the years starting with 2004.



37. A similar story holds for the video game market specifically mentioned by Dr. Sinnreich (his page 16). He had pointed out a news story reporting very large increases in videogame hardware/software from 2000 through 2008. Figure 3 illustrates per capita, inflation adjusted expenditures on videogame hardware/software from 1990 through 2009.²¹
38. Figure 3 reveals that videogames are unlikely to be responsible for the decline in sound recording sales. For example, from 1996 until 2002, videogame sales were rising at a fairly constant rate whereas in 2000, sound recording sales suddenly began a very sharp decline which is inconsistent with Dr. Sinnreich's hypothesis. Then in 2002 videogame sales began a decline which was not recovered until 2006, but there is no reversal in the decline in record sales as would be predicted by Dr. Sinnreich's hypothesis. Finally, the period 2005-2009 has an enormous growth rate in videogames of more than 22.5% per year. Most of this growth occurs in one year, 2007, which grew 47% from 2006, as can be clearly seen in Figure 3. It is this type of oversized change that should best reveal whether there is a linkage between videogames and record sales. Was there an unusually large matching decline in sound recording sales in 2007? Figure 1 reveals that there was not—the 2007 decline looks pretty much like any other post 1999 year. Did sound recordings in the period 2005-2009 suffer disproportionately high declines to match the large videogame gains? No they did not. Again, Figure 1 reveals that the declines in 2005-2009 look just like the declines in other post 1999 years, particularly when the impacts of the severe 2008-9 recession, are considered. The linkage between sound recording sales and videogame sales that would be required to support Dr. Sinnreich's hypothesis, therefore, does not exist. Based on this evidence, we must reject the claim that videogame hardware/software

²¹ The data come from the Consumer Electronic Association from 1990 until 2005 and applied yearly changes in NPD data found in yearly press reports from NPD. The NPD data tells a very similar story to the CEA data for the years where there is overlap, implying that using NPD as a continuation of CEA data should be informative. In splicing the data sets together I took the yearly changes in NPD data from 2006 onward and applied them to the CEA data for the years after 2005.

sales was responsible for any serious portion the large decline in sound recording sales after 1999.



C. The Impact of Economic Downturns

39. Both Mr. Strong and Dr. Sinnreich claim that the decline in sound recording sales has been negatively affected by recessions since 1999 [Strong, para 109; Sinnreich, p 16].
40. What Mr. Strong and Dr. Sinnreich fail to mention, however, is that most decades experience one or more recessions. If recessions are to explain any portion of a decline in sound recording sales post 1999, it is necessary that the recessions in the 2000s be stronger than the recessions taking place in the prior three decades when sound recording sales were rising.
41. There is no doubt that the 2008-9 recession was unusually severe, perhaps the strongest in the last 40 years.²² To avoid conflating file-sharing's impact with that of the recent recession we can focus on the period 2000-2007 which predates the recent recession and during which revenues from the purchase of sound recordings decline by 47%.²³ This is still an extremely large decline. Does it make sense to say that this decline was due to the recession of 2001, the "tech bubble" recession? To answer this we need to know something about that recession versus recessions in other decades.
42. The tech bubble recession, which took place in 2001 is generally considered the mildest recession since modern record keeping on the macro economy began. The tech bubble recession has unemployment peaking at 6.3%, which is lower than any other recession since 1970. The GDP decline (-0.3%) was also the smallest of any

²² Although this recession is officially dated as starting in December of 2007 I refer to it as if it started in 2008 since only one month in 2007 hardly seems to qualify it as a 2007 recession.

²³ This is from the RIAA database excluding digital performance rights and ringtones and adjusted for inflation.

recession since 1970.²⁴ And every decade since 1970 has experienced at least one recession. It is impossible, therefore, to agree with either Mr. Strong or Dr. Sinnreich that stronger than usual recessions were responsible for the prolonged decline in sound recordings from 2000 through 2007. If anything, the 2000-2007 period had a more benign recession experience than other decades when sound recording sales were increasing.

D. Confusing Cause and Effect

43. The decline in sound recording sales has been documented in Table 1 and Figure 1. Declines of this magnitude cannot take place without large industry dislocations. It is to be expected that shrinking sales will have important impacts on all components of the production process, from the search for talent to the distribution of the sound recordings. It is to be expected that layoffs will occur in the industry, that specialty music based retailers will close down, that general retailers will reduce shelf space devoted to sound recordings, that distributors will shrink or close down, that labels will merge, shrink, or close down, that salaries and perks will fall, that advances to artists will tend to fall, and so forth. This is all textbook analysis when an industry has a decline in (paid) demand for its product.
44. It is an error of economic logic to examine the implications of a decrease in demand and then conclude that demand declined because the industry was shrinking. Yet Mr. Strong and Dr. Sinnreich make exactly this mistake, of confusing cause with effect, in various portions of their analyses. Mr. Strong, for example, suggests that sound recording sales fell because specialty retailers were shutting down (para 101) and because big box retailers were devoting less shelf space to music (para 104). Dr. Sinnreich makes the same points (pages 9 and 17). In this telling, record companies would merely have needed to stop selling through big box retailers and go back to specialty retailers and all would have been well with the industry. It is much more likely that as demand for sound recordings fell, retailers tried to switch to other products. After all, when VHS/DVDs sales moved away from specialty retailers to big box retailers, incurring all the same retail limitations as sound recordings, it didn't seem to do any harm to the video producers. Dr. Sinnreich, on page 20 of his report makes a similar claim in suggesting that shrinking artist rosters and fewer album releases are the cause of the sales decline when it is obvious that they are the effects of the sales decline, not the cause.

²⁴ A comparison of United States economic recessions can be found here: http://en.wikipedia.org/wiki/List_of_recessions_in_the_United_States. By way of comparison the 1990s recession had peak unemployment and GDP decline values of 7.8% and -1.4% respectively; the two recessions in the 1980s had values of 10.8%, -2.7% and 7.8%, -2.2%; and the 1973 recession had values of 9% and -3.2%. A more difficult way to get to the same conclusion is to read Jeliazkov and Liu (2010).

E. Miscellaneous Causes of Sound Recordings' Decline

45. Dr. Sinnreich apparently believes that there are yet additional reasons that record sales have fallen. First he suggests that consumer psychology has changed (page 14). Then he suggests there has been an increase in small scale CD bootlegging (p 15). Finally, he suggests (p 21) that used CDs and independently produced music have cut into record label sales. I look at these suggestions one at a time.

46. *Changes in Consumer Psychology*

The main change in consumer psychology mentioned by Dr. Sinnreich appears to be that individuals can now create “tailored listening experiences” and “move songs easily” from CDs to various devices and back (Sinnreich, p. 14-15). The problem with Dr. Sinnreich’s analysis is that the changes which he describes should increase the value of CDs, not decrease it. Because of mp3 players, the music contained on CDs is now capable of being used in new ways. Whatever the value of the songs on the CD might have been before mp3s, it would be higher after mp3s come into existence. Just as portability increased the value of cassettes and CDs relative to LP albums (as discussed in paragraph 16 above), the increased portability and usefulness allowed by mp3s also should increase the value of the underlying music, which came from a CD. You could not “rip” and “burn” if you didn’t have a CD, which is why CDs would be more valuable after the creation of mp3s. Unless, of course, mp3s become available through illegal channels such as file-sharing. In that case, CDs become *less* valuable because users do not need to rip and burn when they can instead just download mp3s directly for free. Mp3s from file-sharing networks such as LimeWire provide all the portability and playlist advantages as mp3s that are burned and ripped, but at lower cost.

47. *Bootlegging*

Dr. Sinnreich relies upon an IFPI document to claim that

By 2001, according to an IFPI publication, CD piracy was "split roughly evenly between CD audio discs made on factory production lines and those made in smaller scale CD-R operations in garages and labs," and pirate CDR sales had tripled in the course of a single year, to 450 million units. [Sinnreich, p. 15]

There is one very major problem with Dr. Sinnreich’s claim—the “I” in IFPI stands for “International” The 450 million bootlegged units in his quote above represent the entire world, not the U.S. The top ten markets for bootlegged discs are listed in the report. The U.S. is not on the list. The number 10 country in this list is Greece which has one thirtieth the population of the U.S. but is reported to have a higher absolute amount of bootlegged CDs than does the U.S. Pirate CDR sales cannot explain the 58% decline in legal music sales in the U.S. between 1999 and the present.

48. *Used CDs*

Dr. Sinnreich's concern that an increase in used CD sales might have led to the current decline in sound recordings can also be laid to rest once we realize that the size of the used CD market will grow relative to the new CD market as the size of the new CD market shrinks. According to the RIAA, there are now less than 300 million CDs sold per year, whereas in 1999 there were over 900 million sold. If the total size of the CD market drops by two thirds and the used CD market remains constant, then the used CD share of the entire CD market will tend to triple, which is the very increase mentioned in Dr. Sinnreich's report. Simple arithmetic tells us however, that this reflects the decline in new CDs, not the increase in used CDs.

49. *Independently Produced Music*

We also have Dr. Sinnreich's claim, as far as I can understand it, that independently produced music, such as that sold through TuneCore or CD Baby, is increasingly taking away sales from the majors and is not included in the statistics measuring the industry.

Dr. Sinnreich claims that sales by independents are large but unknown because such sales are not fully counted in RIAA and Nielsen SoundScan statistics measuring industry sales. In fact, SoundScan measures sales from independent musicians that are made in outlets covered by its reporting, which include sales made through sites such as iTunes. The RIAA also claims to try to estimate the sales of independent music.²⁵ Dr. Sinnreich's claim presumes that there are many music groups unwilling to pay the \$35 fee that CD Baby or TuneCore charges to put albums on virtually every digital site, such as iTunes, and which would then counted by SoundScan, or the \$20 fee that CD Baby charges for a bar code that would lead to the sale being reported to SoundScan.

Moreover, Dr. Sinnreich offers no data and would have to be speculating to say that sales of independent music *unmeasured* by SoundScan and the RIAA have grown sufficiently to have contributed meaningfully to the recent decline in record label sales. Further, the two data points he offers—sales of music through CD Baby and TuneCore—indicate a growth in independent music sales that is very recent²⁶ and would seem incapable of accounting for the rapid and significant decline in sound recording sales that started in 2000.

²⁵ The RIAA states in describing its measurement of industry sales: "It is our estimate of the size of the U.S. recorded music industry based on data collected directly from the major music companies (which create and/or distribute about 85% of the music sold in the U.S.), and estimates where possible for the remaining parts of the market." See <http://www.riaa.com/shipmentfaq.php>.

²⁶ See Sinnreich, at page 22 where he notes that 1/3 of all payments to artists by CD Baby were made in the last 18 months.

F. The Impact of the Transition to Digital Downloads

50. Both Mr. Strong and Dr. Sinnreich suggest that a decline in sound recording revenues would be expected given the transition to digital downloads. They both suggest that unbundling is an inevitable outgrowth of digital downloads and that the very act of unbundling would reduce revenues and profits. Mr. Strong also suggests that revenues would fall because digital downloads lower the cost of production for producers of sound recordings and this decrease in cost would naturally lead to a reduction in revenues.
51. The history of digital downloads precludes the digital download transition from having any impact on a major portion of the decline in record sales. The iTunes store opened in late April 2003. Digital sales were so small that they were not even included in RIAA yearly industry statistics until 2004, when they debuted with 1.5% of the total market revenue. In 2005, digital sales were still less than 5% of the market and in 2006 still slightly less than 10% of the market. The sales decline that began in 2000 could not have had anything to do with a shift to digital sales or unbundling prior to 2004 since the share of digital sales was trivial.
52. Further, digital sales, as a share of the total market are much higher in the U.S. than in other major markets and also started earlier here, so sales in other countries should be affected far less than a switch to digital sales. Table 1, however, indicates that the other large national sound recording markets experienced sales declines of about the same magnitude as that in the U.S.
53. Basic economic theory also contradicts the claim that digital distribution caused the decline in record sales, because it lowered the cost of distribution, as Mr. Strong claims. He writes:

Digital distribution has lower costs than traditional distribution, and these lower costs can ultimately result in lower prices and revenues...In most circumstances, economic models predict that all else equal a technological change like digital distribution that reduces costs will lead to lower prices, and often lower total revenues. Therefore, the decline in industry revenues that has occurred as the industry has transitioned to digital distribution is at least partially explained by declining costs. [Strong, para 93]
54. There are three problems with Mr. Strong's analysis. First it fails to account for the elasticity of demand, which measures consumer responsiveness to price changes. Innovations that lower costs of production are expected to lower prices. It is not correct, however, for Mr. Strong to say that lower prices "will often" lead to a decrease in *revenues* unless "often" means the same thing as "sometimes." In order to know whether revenues would rise or fall, the analyst would need to know whether demand was elastic or inelastic, since revenues would increase in the former case but would fall in the latter case. Mr. Strong provides no evidence on elasticity of demand. Thus, from

the purely theoretical perspective that Mr. Strong is putting forward, it is unclear whether revenues would increase or decrease as increases in digital distribution lower costs. If revenues rise as costs fall, which would happen if the demand were elastic, the decline in costs from digital distribution could not explain any of the industry decline in revenue, contrary to Mr. Strong's claim.

55. Second, in the basic economic model being used by Mr. Strong, the same movement down the demand curve that lowers price also unambiguously leads to an increase the quantity sold in the market. Just as the increase in supply is expected to lower price, the increase in supply is also expected to increase the quantity sold in a market, a point upon which Mr. Strong is silent. Figure 1, which represents the *quantity* of albums or album equivalents sold every year, clearly indicates that the quantity of music being sold has not increased since the arrival of digital distribution. The fact that the quantity of sound recordings is falling, rather than increasing, reflects the fact that all other factors are not being held constant (as assumed in the analysis of the improvement in technology above) and that some other factor is at work lowering the quantity of sound recordings being sold and lowering profits. The leading candidate for that factor is file-sharing.
56. Finally, in theory, lower costs should also increase industry profitability, at least in the short run. That is quite contrary to what has happened in the industry.
57. Beyond the improvement in technology just discussed, Mr. Strong and Dr. Sinnreich have similar views of the impact of unbundling. Mr. Strong states:

The unbundling allowed by download purchases has had a major effect on record company revenue. It allows individuals to buy one or two songs that they want for \$0.99 each rather than an entire CD for approximately \$15.

58. Dr. Sinnreich claims:

The advent of digital music...has led to the rapid unbundling of music; consumers may now pick and choose the songs they'd like to purchase, without paying extra for additional songs they may not care about. [Sinnreich, p. 19]

There are several different strands of thought in these statements and several different claims that I find difficult to reconcile with economic logic.

59. First, both Mr. Strong and Dr. Sinnreich are correct that consumers purchasing CDs might have a zero value for some of the included songs. It is a fairly common occurrence in bundles that some components of the bundle may have little or no value whether we are talking about cable television or variety packages of breakfast cereals or candies. But consumers are not forced to pay for anything in any of these examples. Before digital downloads began, consumers were given a choice of buying an album at a certain price, or not, and many of them agreed to do so. This is the same type of

choice consumers face when they have to decide to purchase a dozen or half dozen eggs, or none, or a bag of potato chips instead of being given a choice of one chip at a time.²⁷

60. Mr. Strong and Dr. Sinnreich's claim that digital music led to the "rapid unbundling" of albums is correct as a historical fact, but they seem to imply that this was an inevitable outgrowth of digitization, when it is not. Digitization might increase the share of singles since the distribution cost of singles is probably low enough to make the singles market far more profitable than it was when singles were put on physical media. But in addition to digital albums, sellers would be expected to only offer singles if doing so increased their profits. Otherwise they would be expected to just continue to offer digital albums. There is no law, legal or economic, preventing record labels from providing digital albums only.
61. The fact is that the introduction of singles, in addition to albums should have increased the profits of the industry. This is a shift from what is known as pure bundling (albums only) to mixed bundling (albums and singles). It is a fairly standard result in economics that mixed bundling is at least as profitable as pure bundling. For example, the seller can set the price for each single so that the seller makes a higher profit from the sale of a single than the profit earned by the entire album. In theory, switching to mixed bundling should not be harmful to the industry although the industry would need to experiment to find the right set of prices and mistakes might be made in the initial going. Optimal pricing is likely to be impossible, however, if consumers expect to pay nothing or next to nothing for music as a result of illegal file sharing.

G. The End of Minimum-Advertised Pricing for CDs

62. Dr. Sinnreich suggests that the elimination of an arrangement between record labels and their retailers, regarding the payment of advertising dollars to retailers by labels, has led to the decline in sound recording sales. Dr. Sinnreich writes:

Until recently, it was common practice for the major labels to collectively inflate the retail price of CDs by requiring that retailers stick to "minimum advertised pricing" (MAP) thresholds for music, in exchange for advertising support. The practice only ended in 2000...In short, the music industry's sales peak in 1999 was boosted by a potentially anti-competitive price-fixing scheme, and the onset of decline in total market value coincided with its cessation a year later... it

²⁷ I have difficulty making sense of Dr. Sinnreich's statement (page 19) that the bundle "inflated the value of the music retail industry above the level of actual demand." It sounds like he is saying that consumers were forced to pay more for albums than they were willing to pay. But in voluntary market transactions such as these, no one is forced to purchase a product whose value is less than the cost. Sellers of products always would like to generate as much revenue as possible from consumers, but they cannot generate more revenue than consumers are willing to pay.

is likely that this was a significant contributory factor to market devaluation. [Sinnreich, p. 18-19]

63. The story being told by Dr. Sinnreich is inconsistent with the way that markets actually operate when switching from a monopoly position, which Dr. Sinnreich asserts was the pre-2000 situation (which I have assumed for the purpose of my analysis is true), to a competitive position. Basic economics says that monopolies, more properly called cartels when there are multiple sellers, charge higher prices, produce smaller quantities, and earn higher profits than a similarly situated competitive industry. It is not clear whether revenues would go up or down during the switch from a monopoly to a competitive market since this is another movement along the demand curve and we do not know what the elasticity would be. What is clear as a matter of economic theory, however, is that the switch from a monopoly to a competitive market would lower the price and raise the quantity being sold. This is where Dr. Sinnreich's claim falls apart, because there is no increase in the quantity of sales after the end of MAP in 2000. Instead, sales continued to decline rapidly, and did so for a long time after the end of MAP.

H. Summary

64. Although I have examined one-by-one the alternative explanations for declines in record sales offered by Mr. Strong and Dr. Sinnreich, I am not trying to suggest that each of these hypotheses need to individually be able to explain the entire decrease in sound recording sales. In combination, it is possible that some of these factors may have had some negative impact on sales. The alternative hypotheses offered by Mr. Strong and Dr. Sinnreich do not, however, eliminate unauthorized file-sharing as the most significant cause of the decline in record sales.
65. I have summarized my analysis of the hypotheses offered by Mr. Strong and Dr. Sinnreich in Table 2. As the table reflects, we are left with one major explanation of the decline, which is file-sharing, and a few very minor reasons that sales might have fallen independently of file-sharing for some of the period of the decline. This is generally consistent with the economic studies discussed in Section VIII below.

Table 2: Summary of Alternative Explanations for the Decline in Sound Recording Sales		
Mr. Strong and Dr. Sinnreich's Candidate Hypotheses	Evidence	Can it explain some of the decline?
Librarying	Inconsistent with data on share of old music. No support whatsoever.	No.
Prerecorded Video	No evidence that the growth in prerecorded video impacted the growth in sound recording sales.	Very little.
Videogames	Timing of growth of videogames doesn't match timing of decline in sound recording sales.	Little if any.
Economic Downturns	2000-2007 period contained the weakest downturn of any decade in the analysis.	No, not until 2008.
Increased Bootlegging	Evidence from Dr. Sinnreich was not for the United States; no evidence that bootlegging in US increased.	No.
Growth in Market for Independent Music	No evidence that sales of music from independent labels are undercounted in the measured data; any growth suggested by the data is very recent and cannot explain the sustained decline in sound recording sales over the last decade.	No.
Increase in Sales of Used CDs	No evidence that sales of used CDs have grown. Merely that their market share has risen because new music sales have fallen.	No.
Consumer Psychology	The ability to 'rip and burn' and create playlists would increase demand for CDs, not decrease it	No.
Unbundling	Inconsistent with economic theory; incapable of explaining decline prior to 2004; inconsistent with sales declines in other countries where digital sales are small.	Not meaningfully, and nonexistent until after 2004.
Cost Reduction in Digital Transmission	Might increase or decrease revenues. Should definitely increase the quantity sold, but the quantity sold has fallen. Profits should also rise, but have not.	No; Cost reductions do not harm industries.
End of Minimum Advertised Pricing	Reduction of monopoly would increase the quantity being sold. It cannot be used to explain a decline in sales.	No.

VIII. Direct Examinations of File-Sharing's Impact

66. Economists have conducted numerous direct examinations of the relationship between file-sharing and sales of sound recordings. These studies have been performed using data covering different years, different countries and using different approaches. Although there are imperfections in all studies,²⁸ this does not mean that it is impossible to perform a reasonable study or that no general results have emerged.

²⁸ Liebowitz (2005) discusses at length the strengths and weaknesses involved in performing these studies with various types of data.

67. I should mention that sometimes a study that appears to be reasonable in terms of data and methodology is found to be unreasonable because it generates results that are impossible or unreasonable. For example, if a scientist claims to have demonstrated that bees cannot fly because their flying would violate current laws of aerodynamics, most of us would conclude that either the scientist has wrongly applied the laws of aerodynamics or that the current laws of aerodynamics are wrong. We would conclude this because we can see with our own eyes that bees can fly.
68. Mr. Strong and Dr. Sinnreich each report on various studies that have addressed the question of file-sharing's impact on sound recording revenues, some of which are in the academic literature. I restrict my focus to academic studies since if they are published it means they have been peer reviewed which provides some (admittedly weak) evidence of quality and also because academic studies are usually performed at a higher level of economic and statistical competence than are studies by industry analysts or government bureaucrats. There is also the hope that academic studies are more objective than are studies by industry or government analysts.
69. Dr. Sinnreich, beginning on his page 27, lists a series of studies that he believes demonstrate that file-sharing has "delivered significant benefits, both helping traditional record sales and opening new avenues for economic exploitation." Dr. Sinnreich explains:

Oberholzer and Strumpf showing that file sharing increases album sales for releases that sell more than 600,000 units... Peitz and Waelbroeck find that file sharing is responsible for a net industry profit... Gopal, et al argue that "online search and sampling capabilities" represented by P2P "have a beneficial impact on sales,"... A study commissioned by the Canadian government finds that "there is a strong positive relationship between P2P file-sharing and CD purchasing"... Johns Hopkins researcher Wendy Chi, analyzing Forrester Research data, finds that "file sharing has a positive and statistically significant effect on music purchases... [Sinnreich, p. 28-29]

Dr. Sinnreich does admit that:

[T]here are many studies over the same time period showing a negative or neutral effect of file sharing on music sales and revenues, as well. It is neither my role nor my intention to dispute these findings. As a researcher, I will simply reiterate that in my opinion there is compelling evidence linking file sharing to positive economic effects for artists and labels... [Sinnreich, p. 30]

70. In spite of his apparent claims to the contrary there are *no* published academic studies finding a *positive* impact of file-sharing on sound recording sales. I believe that the reason there are no published studies showing a positive impact is simply because it is too difficult for most academic observers to believe, given such a large decline in

record sales, that file-sharing is having a positive impact. It starts to approach ‘bees can’t fly’ territory.²⁹

71. For example, the first article in Dr. Sinnreich’s list is a paper by Felix Oberholzer-Gee and Koleman Strumpf written in March of 2004.³⁰ Dr. Sinnreich is correct that they find that the top-selling quartile of albums is positively affected by file-sharing. Dr. Sinnreich fails to mention, however, that the top quarter of albums are responsible for a disproportionately high share of sales, in the range of 90% of the industry total, so that this finding effectively indicated that file-sharing had a positive impact on the industry as a whole. I pointed this fact out to Oberholzer-Gee and Strumpf and suggested to them that this result was so counterintuitive and inconsistent with the large decline in record sales that it probably indicated a problem with their estimation. Several months later, when a new version of their paper arrived, the material referenced by Dr. Sinnreich (Table 13 and the discussion surrounding that table) was gone, allowing Oberholzer-Gee and Strumpf to keep their conclusion that file-sharing had no impact on record sales.³¹ Additionally, Oberholzer-Gee and Strumpf have refused to make their data available to other researchers, further casting a shadow over their results.³²
72. A similar story explains the history of the Canadian Government study referenced by Dr. Sinnreich. That study was performed by two academics, Birgitte Andersen and Marion Frenz. In their finished report for the Canadian Government they concluded that “downloading the equivalent of approximately one CD increases purchasing by about half of a CD.”³³ This is consistent with Dr. Sinnreich’s description of the paper. In correspondence with them I suggested that such a result is impossible for a very simple reason. If every CD-equivalent set of illegally downloaded files led to the purchase of one half of a CD, as they report, it would imply, according to the file-sharing data that was the basis of their analysis, that file-sharing increased CD sales by more than the entire number of CDs sold in the country. In other words, they were claiming that in a file-sharing free world, as was the case prior to 1999, there would

²⁹ In Peter Kennedy’s 2003 edition of his econometrics textbook he has a section titled “Getting the Wrong Sign” (p. 397) in which he says “A remarkably common occurrence when doing applied work is to run an *a priori* favorite specification and discover a “wrong” sign. Rather than considering this a disaster, a researcher should consider it a blessing—this result is a friendly message that some detective work needs to be done—there is undoubtedly some shortcoming in one’s theory, data, specification, or estimation procedure.” This is sometimes also known as applying the “laugh test”.

³⁰ Oberholzer-Gee, Felix and Koleman Strumpf (March 2004). “The Effect of File Sharing on Record Sales: An Empirical Analysis.” Working Paper.

³¹ Oberholzer-Gee, Felix and Koleman Strumpf (December 2004). “The Effect of File Sharing on Record Sales: An Empirical Analysis.” Working Paper.

³² Oberholzer-Gee and Strumpf have provided conflicting reasons for keeping their data secret. After publicly promising to make their data available they later claimed they could not because they had signed a nondisclosure form. When asked by reporters to provide a copy of the non-disclosure form, they refused to do so. See Glenn (2008). The journal which published their article has since switched to a policy requiring authors to make their data available.

³³ The government report can be found at: [http://www.ic.gc.ca/eic/site/ippd-dppi.nsf/vwapj/industrycanadapapermay4_2007_en.pdf/\\$file/industrycanadapapermay4_2007_en.pdf](http://www.ic.gc.ca/eic/site/ippd-dppi.nsf/vwapj/industrycanadapapermay4_2007_en.pdf/$file/industrycanadapapermay4_2007_en.pdf).

have been no CDs sold in Canada at all. This is a truly impossible result, more unbelievable than the original Oberholzer-Gee and Strumpf result.

73. In 2010 Andersen and Frenz published their paper in an economics journal. Their conclusion, not surprisingly, had changed from the one they presented in their government report even though their underlying data remained the same. They now join Oberholzer-Gee and Strumpf to report that file-sharing has no impact on sales.³⁴
74. Dr. Sinnreich also mentions a paper by Peitz and Waelbroeck which he describes as finding “that file sharing is responsible for a net industry profit.” The problem with this description of the paper is that Peitz and Waelbroeck did not perform any empirical analysis, did not look at any data, did not conduct any statistical tests and did not measure anything. Instead, their paper creates a purely theoretical model in which file-sharing has a positive impact on record sales. This is not evidence about the actual impact of file-sharing on sound recording sales.
75. In a similar vein, Dr. Sinnreich seems to believe that a paper by Gopal et al (2004) implies that file-sharing provides benefits to sound recording companies.³⁵ That is not correct. Gopal et al attempt to model and then test the impact of *sampling* on record sales, not the impact of file-sharing on record sales. Gopal and his coauthors conclude that *sampling* is beneficial to record owners.³⁶ Gopal and his coauthors seem to believe that piracy is harmful to the industry as indicated in this quote: “This [sampling result] has major implications for the music industry, in that the industry can potentially *reverse the effects of online audio piracy* by providing more legal and efficient sampling techniques that consumers could use” (my italics).³⁷
76. Finally Dr. Sinnreich refers to an unpublished paper by Wendy Chi, a doctoral student at Johns Hopkins at the time her paper was written.³⁸ This is the only extant paper of which I am aware claiming to find a positive impact of file-sharing on sound recording sales. Although Dr. Sinnreich does state that there are articles finding a negative impact I believe a more complete and more accurate description of the academic literature would be that there are a few papers finding no impact of file-sharing on record sales and a considerably larger number finding a negative impact of file-sharing on record sales.³⁹

³⁴ See Andersen Birgitte and Marion Frenz (2010) “Don’t blame the P2P file-sharers: The Impact of Free Music Downloads on the Purchase of Music CDs in Canada” Journal of Evolutionary Economics Vol. 20, No 5, Pp 715-740.

³⁵ Gopal Ram D., Sudip Bhattacharjee and G. Lawrence Sanders “Do Artists Benefit From Online Music Sharing?” Working Paper, February 2004.

³⁶ As an aside, their sampling model does not include the possibility that consumers can become satiated with sound recordings, so it leaves out an important countervailing factor.

³⁷ Found on page 37 of Gopal.

³⁸ See <http://www.econ.jhu.edu/jobmarket/2008/ChiW/>.

³⁹ There are several unpublished papers finding the file-sharing decreasing record sales: Blackburn (2004) and Zentner (2009). See Blackburn, D. (2004) “Online piracy and recorded music sales.” Working Paper, Department of Economics, Harvard University and Zentner, A., (2009) “Ten Years of

77. Mr. Strong approaches this literature from a slightly different angle than Dr. Sinnreich. Nevertheless he concludes:

Although the academic literature is focused on a different question than the impact of LimeWire on music sales, *the fact that it finds such small effects of all file sharing on music sales* is broadly consistent with my conclusion that the impact of LimeWire is likely to have been minimal. (my italics) [Strong para 52]

Mr. Strong apparently reaches his conclusion that the impact is “minimal” based on two papers that have surveyed the literature.

In a survey of the literature, two economists conclude that “[t]he majority of studies finds that file sharing reduces sales, with estimated displacement rates ranging 3.5% for movies to rates as high as 30% for music. A typical estimate is a displacement rate of about 20%.” However, these same authors go on to note, “[w]hile the majority of papers reports some sales displacement, the four studies using actual measures of file sharing find that file sharing is unrelated to changes in sales.” Similarly, another survey of the literature notes that the working paper version of one of these papers “stands out from the others in terms of sophistication and data.” In this study, the authors find that “downloads have an effect on sales that is statistically indistinguishable from zero.” Meanwhile, the paper that yields the highest estimate (30%) has some serious limitations. [Strong, para 51]

78. The second survey Mr. Strong mentions is an article by Marie Connolly and Alan Krueger that contains a section on the file-sharing literature.⁴⁰ Mr. Strong relies on Connolly and Krueger’s statement that one paper finding a zero effect on sales “stands out from the others in terms of sophistication and data.” The paper Connolly and Krueger refer to is the 2007 Oberholzer-Gee and Strumpf paper discussed at some length above which concluded, after removing a table whose inclusion would have changed the results, that file-sharing had no impact on sound recording sales. What Mr. Strong fails to mention is that while Connolly and Krueger mention the paper’s sophistication and data, they also point out potential problems with the Oberholzer-Gee and Strumpf paper including “One criticism is that if, as the authors [Oberholzer-Gee and Strumpf] argue, file sharing leads to more CD sales through an advertising or (sampling effect), then cost shifters should enter the demand equation for CDs directly, rendering the identification strategy invalid.”⁴¹ Connolly and Krueger also state: “Liebowitz (2004b)...warns about a potential fallacy of composition...[t]his effect, as Liebowitz points out, can seriously change the interpretation of Oberholzer and Strumpf’s results.” In my 2007 and 2010 papers I concluded that the Oberholzer-

File Sharing and its Effect on International Sales of Copyrighted Music: An Empirical Analysis Using a Panel of Countries” Available at SSRN: <http://ssrn.com/abstract=1724444>.

⁴⁰ See Krueger, Alan B. and Marie Connolly “Rockonomics: The Economics Of Popular Music”

⁴¹ Page 59 in Krueger and Connolly

Gee and Strumpf paper contained far more errors than I had thought when I wrote my (2004b, actually 2005) paper referenced by Connolly and Krueger. And as noted in paragraph 71 above, the unwillingness of Oberholzer-Gee and Strumpf to make their data available to other researchers further undermines the credibility of their results.

79. The first survey of the literature in Mr. Strong's quote above is by Oberholzer-Gee and Strumpf (2009), but this is a newer and different paper than the Oberholzer-Gee and Strumpf paper discussed at several points above.⁴² Mr. Strong quotes the Oberholzer-Gee and Strumpf survey paper to the effect that a majority of studies find that file-sharing reduces sales and that the typical estimate is a "displacement" rate of about 20%. It is not clear, however, what Oberholzer-Gee and Strumpf mean by the term "displacement." For example, Oberholzer-Gee and Strumpf (2009) state: "Rob and Waldfogel (2006) find an average displacement effect of 20%."⁴³ Rob and Waldfogel had several findings but the key finding was a claim that each downloaded album led to a decline in sound recordings equal to .2 albums (although another result, based on instrumental variables, in which they have less confidence, is four times as large) for data that cover the end of 2003 and early 2004.⁴⁴ If this is what Oberholzer-Gee and Strumpf mean by displacement then displacement is the portion of shared files that replace purchased files.⁴⁵ A 20% displacement can explain the entire decline in sales if the number of infringing files is five times as large as legitimate sales, which has sometimes been claimed (see Liebowitz, 2006).
80. But Oberholzer-Gee and Strumpf do not use this definition of "displacement" consistently. In a footnote, Oberholzer-Gee and Strumpf state that Liebowitz (2008) "reports a displacement rate of more than 100%."⁴⁶ My 2008 paper did conclude that file-sharing was responsible for more than the entire decline in sound recording sales (meaning that sales would have increased if not for file-sharing). But Oberholzer-Gee and Strumpf are now defining displacement as the share of the total decline accounted for by file-sharing, not as the percent of each downloaded file that replaces a sale.

⁴² See Oberholzer-Gee, Felix and Koleman Strumpf (2009). "File-Sharing and Copyright" , Working Paper 09-132, Harvard Business School, May 15.

⁴³ Page 16 in Oberholzer-Gee, Felix and Koleman Strumpf (2009). "File-Sharing and Copyright" , Working Paper 09-132, Harvard Business School, May 15.

⁴⁴ Found in Rob, Rafael, and Joel Waldfogel. 2006. "Piracy on the High C's: Music Downloading, Sales Displacement, and Social Welfare in a Sample of College Students." *Journal of Law and Economics* 49(1) p 29-62.

⁴⁵ Note that estimates of file-sharing generally indicate that there are more files being shared than being sold, with files being shared usually considered to be larger by a factor of three or four (Liebowitz, 2006). If so, than using Robb and Waldfogel's result of each file-shared downloaded album-equivalent leading to a reduction of .2 albums sold, and if there are 3 times as many album equivalent files being downloaded illegally as being sold, then file-sharing would be expected to have caused sales of legitimate sound recordings to decline by 60% (3x.2) (and even larger number emerges with their instrumental variables estimate). This result is obviously compatible with a claim that file-sharing was responsible for the entire decline.

⁴⁶ Page 16 in Oberholzer-Gee and Strumpf (2009) which refers to Liebowitz, Stan J. April 2008a. "Testing File-Sharing's Impact on Music Album Sales in Cities" *Management Science*, (4) Vol. 54, pp. 852-859.

With this definition of “displacement” the Peitz and Waelbroeck paper (discussed in paragraph 87) and the Rob and Waldfogel paper discussed in paragraph 79 and footnote 45 also have displacement rates of about 100% since the declines found in those papers are similar in size to the actual decline that occurred.

81. Finally Oberholzer-Gee and Strumpf report (p. 16) a displacement rate for the Zentner (2006)⁴⁷ paper of 30%. Oberholzer-Gee and Strumpf appear to be confused here. Zentner does not find a 30% decline in sales, nor does he find that each download reduces sales by .3 units. What he finds is that file-sharing reduces the probability of purchasing music by file-sharers by 30%. Zentner then concludes that sales would have been about 8% higher if file-sharing did not exist.
82. Oberholzer-Gee and Strumpf, therefore, use three inconsistent definitions of “displacement” within a single paragraph. This alone should invalidate any general statement by them about “average displacement” caused by files-sharing. But these are not the only problems with their literature review and assessment.
83. Mr. Strong cites a claim made by Oberholzer-Gee and Strumpf: “[w]hile the majority of papers reports some sales displacement, the four studies using actual measures of file sharing find that file sharing is unrelated to changes in sales.” The four studies are: “Tanaka, 2004; Bhattacharjee et al., 2007; Oberholzer-Gee and Strumpf, 2007; Smith and Telang, 2008.” Oberholzer-Gee and Strumpf suggest these four papers are superior to other papers because they use “actual measures of file sharing.”
84. It is worth examining this claim. Taking them in order, the first paper is Tanaka (2004).⁴⁸ His paper is very clearly not finished. I don’t believe any professional economist would say that his paper is even close to a finished paper. For example, I do not understand what is contained in his tables. The author himself lists the paper as version “0.1”. His conclusion begins “This research is very preliminary because we have not yet tried sufficient instrumental variables.” This is not just professional modesty. Since his main econometric technique is supposed to be instrumental variables, not “trying sufficient instrumental variables” is a major problem. All the other papers discussed so far have been published in an economics journal—this one never will be.⁴⁹
85. The next paper in the Oberholzer-Gee and Strumpf list is Bhattacharjee et al., 2007.⁵⁰ Oberholzer-Gee and Strumpf claim that this paper finds that file-sharing is unrelated to sales. The problem is that this paper found no such thing. This paper concludes

⁴⁷ Zentner, Alejandro. 2006. “Measuring the effect of music downloads on music purchases” *Journal of Law and Economics* 49(1): 63–90.

⁴⁸ Tanaka, Tatsou (2004). “Does File-sharing Reduce CD sales? A Case of Japan,” Working paper.

⁴⁹ In correspondence on February 8, 2011, Dr. Tanaka told me that he has no plans to ever finish the paper.

⁵⁰ Bhattacharjee, Sudip., Ram Gopal, Kaveepan Lertwachara, James R. Marsden, Rahul Telang “The Effect of Digital Sharing Technologies on Music Markets: A Survival Analysis of Albums on Ranking Charts” *Management Science* Vol. 53, No. 9, September 2007, pp. 1359–1374.

that file-sharing harms chart survival for a majority of the albums on the charts. When I pointed this out at a conference, a reporter writing an article about the conference decided to check on my claim and spoke to Dr. Bhattacharjee. Here is the reporter's review of what the Dr. Bhattacharjee said:

“It is not correct to say that our work shows file sharing is unrelated to changes in sales,” said the Management Science paper's lead author, Sudip Bhattacharjee, in an e-mail message to The Chronicle. “The paper did not look directly at sales, only at chart longevity, also known as chart survival.” And “we did report a decrease in survival over all,” said Mr. Bhattacharjee, who is an associate professor of operations and information management at the University of Connecticut. [Glenn 2010].

86. The third paper that Oberholzer-Gee and Strumpf listed is their own 2007 article. And the fourth paper is about video, not music. Only one paper, therefore, has the results claimed by Mr. Strong.
87. There are more published articles than have been referenced by Mr. Strong and Dr. Sinnreich. The published papers, of which I am aware, all finding some degree of harm are Hong (2007), Liebowitz (2006, 2008), Michel (2006), Peitz and Waelbroeck (2004), Rob and Waldfogel (2006), Waldfogel (2010) and Zentner (2005, 2006).⁵¹
88. In order to compare the results of these papers to one another, I translate the amount of the decline that they find due to file-sharing into a percentage of the decline in sound recording sales that had occurred at the time of their measurement. By way of comparison, U.S. sound recording sales had declined by 5% in 2000, 11% by 2001, 20% by 2002, and 26% by 2003.⁵²
89. Zentner (2006), using 2001 survey data from Europe, found that file-sharing appeared to decrease sound recording sales by 8%. Peitz and Waelbroeck concluded that file-sharing caused a worldwide 20% decline between 1998 and 2002. Michel, using data through 2003, found that file-sharing in the U.S. led to a decline in sound recording sales of about 13%. For the values found in each of these published articles just mentioned the share of the decline explained by file-sharing range from about 50% of the decline (Michel; 13/26) to about 70% of the decline (Zentner; 8/11) to about 100% of the decline (Peitz and Waelbroeck; 20/20). Using more direct metrics, Hong

⁵¹ The articles not already cited are: Hong, S. H. (2007) “The recent growth of the internet and changes in household-level demand for entertainment,” *Information Economics and Policy*, 2007; Zentner, A. (2005) “File sharing and international sales of copyrighted music: An empirical analysis with a panel of countries” *Topics in Economic Analysis & Policy* 5(1): Article 21; Waldfogel, Joel (2010) “Music file sharing and sales displacement in the iTunes era” *Information Economics and Policy* Volume 22, Issue 4, December 2010, Pages 306-314; Michel, Norbert J. (2006) “The Impact of Digital File Sharing on the Music Industry: An Empirical Analysis,” *Topics in Economic Analysis & Policy*: Vol. 6 : Iss. 1, Article 18.

⁵² These are revenue values from the RIAA database, with ringtones and performance rights excluded, adjusted for inflation.

found a decline due to file-sharing that was 20% of the total decline to that point, Liebowitz (2006, 2008) found declines that were essentially 100% of the total, Robb and Waldfogel found results consistent with 100% of the total, Waldfogel found the same basic results as Rob and Waldfogel, and Zentner (2005) found that file-sharing explained between 44% and 80% of the total decline.

90. In summary, there are two published articles that find that file-sharing has no impact on sound recording sales (Oberholzer-Gee and Strumpf 2007 and Andersen and Frenz 2010). Each of these has a somewhat checkered history. In the above paragraphs I discussed nine published articles finding harm due to file-sharing with many of them finding that file-sharing caused a large portion of the decline in sound recording sales.

IX. Are There Important Offsets to the Damage from File-Sharing?

91. Mr. Strong and Dr. Sinnreich suggest that the industry losses from unauthorized file-sharing are significantly offset by new sources of revenue that have been stimulated by the digital distribution of music. (Strong para 119-125; Sinnreich p. 30-32). Many of the alternative sources of revenue they mention, however, have no apparent connection to file sharing, or even to the digital distribution of music.
92. Mr. Strong argues, for example, in his paragraph 119 that growth areas for the music industry include “licensing music for use in a variety of media products such as mobile phone ringtones and video games.” Dr. Sinnreich on page 31 lists “synch rights revenues...whenever their [record companies] songs are used in television shows or movies.” I fail to see how the licensing of music in a videogame or a movie has anything to do with file-sharing specifically or even more generally the digital distribution of music. Nor have Mr. Strong and Dr. Sinnreich demonstrated that music licensing in videogames or movies has increased more than would be expected just from the growth in videogame and movie revenues. I also fail to see how the demand for mobile phone ringtones is impacted by file-sharing. Even if file-sharing increased music listening (and it is not clear that it does since even if it increased the amount of listening to prerecorded music, radio was always available as a free listening alternative), it is not clear that the value of songs that are used as ringtones necessarily increases.
93. Dr. Sinnreich suggests on his page 30 that new “360 deals” are a bonanza to the record companies which have “begun to reorganize to take advantage of the newly-energized, P2P-driven fan base for their artists.” But this is another example of getting cause and effect backwards. It is not surprising that the record companies would be attempting to switch to new sources of revenues, particularly sources that are not vulnerable to piracy, such as live concerts. But what needs to be remembered is that record companies always had the option of trying to claim a share of concert revenues. The reason they did not has nothing to do with record company benevolence, but has

everything to do with the way markets work. Competition between the record companies kept the share of revenues taken in by the companies to a level that did not require them to share in concert revenues because record companies could earn normal-or-better returns just from selling records. With the monetization of music listening being shredded by file-sharing, however, record companies need to switch to a 'second best' business model, which is what we see emerging now. The fact that the current model was not chosen by the record companies over many decades when they could have used it, indicates that the new model is inferior to the old one in a world without file-sharing. The switch in business models is the effect of the loss of revenues. Because it is an inferior model, the record companies will be worse off with it than they would have been keeping the old model, except for the fact the file-sharing has damaged the better model.

94. Further, on page 32 Dr. Sinnreich claims that live events (concerts) generate revenues for record companies of "a billion dollars and growing." It is not clear to me what his number is based on but his footnote for this statement refers to an IFPI document. Since the IFPI represents the recording industry world-wide it would appear that the statistic he is putting forward would be for the entire world. The total reduction in revenues from the 1999 level are over \$55 billion and the yearly amount is now over \$10 billion.⁵³ Worldwide, the number would be much larger since the U.S. is considerably less than one half of world sales. The new sources of revenues that Mr. Strong and Dr. Sinnreich mention appear to be a pittance compared to these losses. I would note that neither Mr. Strong nor Dr. Sinnreich attempt to quantify the total revenues that the record labels are generating from these alternative sources.
95. Finally, Mr. Strong makes a concluding claim about the vitality of the music industry:

The fact that the music industry as a whole remains healthy can be seen in the fact that file sharing has not harmed the development of new artists and new recorded music...One academic paper found that both the number of new albums and the number of artists releasing these albums increased steadily...another academic study from 2009 notes that "[s]ince 2000, the annual release of new music albums has more than doubled." [Strong, para 126]

Interestingly, Dr. Sinnreich makes the opposite claim:

Another result...is a diminution in the total number of albums released per year...With fewer major labels releasing fewer albums by fewer artists each year.... [Sinnreich p. 20]

96. Why the contrary conclusions? The answer, I believe, is that Mr. Strong and Dr. Sinnreich have different definitions of 'albums'. Dr. Sinnreich refers to the number of albums released by "major labels." The sources listed by Mr. Strong do not. The first paper Mr. Strong cites uses the "MusicBrainz" database which does not attempt to

⁵³ These statistics come from the RIAA database and are based on retail revenues.

measure or sample the entire industry year by year but instead is based on reporting by readers of the website, including possibly the artists making the albums.⁵⁴ Mr. Strong's second source uses Nielsen SoundScan data.⁵⁵ SoundScan data has increasingly included albums from artists without recording contracts, due to the growth of companies like CD Baby and TuneCore (discussed in paragraph 49 above). The number of new releases in these databases appears to be increasing but this is not necessarily because more music is being produced, but merely because the newer statistics on album releases contain many albums from what used to be known as 'garage bands' whereas the old statistics included mainly professional albums. The evidence cited by Mr. Strong regarding 'trends' in the number of albums released is unreliable and not related to the health of the music industry.

X. Expenses Saved by LimeWire

97. On pages 66-68 of his report Mr. Strong attempts to calculate the "expenses saved" by LimeWire's infringement of copyrighted works owned by the Plaintiffs. In other words, if LimeWire did not infringe the Plaintiffs' copyrights it would have needed to purchase the rights to the copyrighted works. Mr. Strong makes this point and tries to determine how much LimeWire would have needed to pay the Plaintiffs in order to bring about a voluntary deal with them. The amount of this negotiated deal is what LimeWire saved by not negotiating a deal and infringing copyright instead.

98. In order to determine the amount of a hypothesized negotiated deal, Mr. Strong assumes:

that both sides would consider the profits to be gained from the exploitation of the intellectual property, and some sharing of those profits between the commercial exploiter (LimeWire) and intellectual property owners, as a starting point. As a rational economic actor, Lime Wire would not have paid a royalty that was greater than the profits it expected to generate (i.e., Attributed Profits Earned) from commercializing those same copyrights. [Strong para 143]

99. Mr. Strong is correct to presume that LimeWire, as a rational economic actor, would have not paid more than its expected profits. But Mr. Strong does not use "expected" profit in his calculations; instead he uses actual profits earned. Expected profits are not the same as actual profits. Mr. Strong provides no evidence to support a claim that the actual profits earned when LimeWire was engaged in infringement would be similar in size to the profits that LimeWire would have anticipated earning if it had purchased the rights to the music.

⁵⁴ Mortimer, Julie Holland, Chris Nosko, and Alan Sorenson, "Supply Responses to Digital Distribution: Recorded Music and Live Performances," Working paper 2010.

⁵⁵ Oberholzer-Gee, Felix and Koleman Strumpf (2009). "File-Sharing and Copyright," Working Paper 09-132, Harvard Business School, May 15.

100. Mr. Strong also states:

In turn, the record companies would likely be willing to agree to such a license because the majority of the costs to the record companies of producing the Works have already been incurred. [Strong, p. 68]

101. There is an extremely important cost left out of Mr. Strong's hypothetical discussion of the record companies' financial decisions. In any contract with LimeWire, the record companies would need to consider what effects a particular contract might have on its other markets. If, for example, allowing a record to be played at the Super Bowl was thought by the record companies to enhance the sale of records in the sound recording markets, then the record companies would be willing to accept a lower payment, perhaps nothing, from the Super Bowl organizers. But on the other hand, if providing their music to LimeWire were to reduce the labels' revenues and profits in their traditional CD and newer digital download markets such as iTunes, the record companies would require compensating higher payments in order to agree to such a license. Mr. Strong's discussion of what the record companies would require in such negotiations ignores possible losses from other markets and thus bears no relationship to how an actual negotiation between the parties would have proceeded.

XI. Conclusions

102. The decline in record label revenues during the last decade is enormous. Mr. Strong and Dr. Sinnreich suggest that the decline has little or nothing to do with the emergence of unauthorized file-sharing services such as LimeWire, which began at the same time that revenue began to fall. They present a large number of possible alternative explanations for the decline. I endeavored to test these alternative explanations, with data where possible, and have concluded that they are not capable of having caused the massive decline in revenues and units sold that has occurred, either individually or in combination.

103. Mr. Strong and Dr. Sinnreich rely on two econometric studies showing no impact on sales of recorded music. I discuss these two as well as a much larger number of studies in detail and show that the large majority find that file-sharing has caused losses, and that these losses are often a very substantial share of the total decline. Indeed, a reasonable portion of these studies find that file-sharing appears to be responsible for virtually the entire decline.

104. Mr. Strong and Dr. Sinnreich describe ways in which unauthorized file-sharing might benefit the revenues generated by record labels. They list many entertainment products that are doing very well. Yet some of these products bring no or little revenue to the record labels and even for those that do, the revenues seem to have nothing to do with file-sharing. The changes that the record labels are making in their contracts with artists do not represent new opportunities, since those opportunities were always there, but are an effect that was caused by the decline in revenues due to file-sharing. These new models indicate that record labels are resorting to revenues

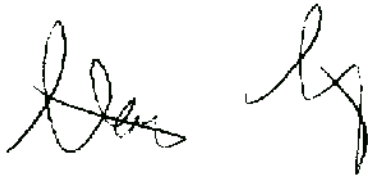
models they had previously rejected as inferior, because they can no longer monetize prerecorded music very well.

105. Mr. Strong suggests a particular dollar amount for a hypothetical negotiation between record labels and LimeWire in the counterfactual case where LimeWire purchases the rights to the music instead of infringing the rights. Critically, Mr. Strong argues that the record label would accept virtually any amount, as if all their costs were sunk. This ignores, however, the fact that the record labels would take into consideration the expected impact on their other markets of LimeWire's business model consisting of giving music away. Because Mr. Strong did not take this factor into account, Mr. Strong's analysis bears no relationship to how an actual negotiation between the parties would have proceeded.

XII. Recent Testimony

I have provided courtroom testimony or depositions once in the last four years. The case was Sony BMG Music Entertainment, et al., v. Joel Tenenbaum.

I declare under penalty of perjury and the laws of the United States of America that the foregoing is true and correct. Executed this fourteenth day of February, 2011.

A handwritten signature in black ink, appearing to read 'Stan J. Liebowitz', written in a cursive style.

Dr. Stan J. Liebowitz

XIII. Appendix A: Materials Relied Upon

- Andersen Birgitte and Marion Frenz (2010) “Don’t blame the P2P file-sharers: The Impact of Free Music Downloads on the Purchase of Music CDs in Canada” *Journal of Evolutionary Economics* Vol 20, No 5, Pp 715-740.
- Andersen Birgitte and Marion Frenz (Released in 2007 although undated) “The Impact of Music Downloads and P2P File-Sharing on the Purchase of Music: A Study for Industry Canada”
- Bhattacharjee, Sudip., Ram Gopal, Kaveepan Lertwachara, James R. Marsden, Rahul Telang “The Effect of Digital Sharing Technologies on Music Markets: A Survival Analysis of Albums on Ranking Charts” *Management Science* Vol. 53, No. 9, September 2007, pp. 1359–1374.
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XIV. Appendix B: Curriculum Vitae

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Education

Ph.D., Economics, UCLA
B. A., Johns Hopkins University
Sheepshead Bay High School, Brooklyn NY

Employment Summary

2006-present	Ashbel Smith Professor of Managerial Economics, UTD
2004-present	Director, Center for the Economic Analysis of Property Rights and Innovation
1996-1999	Academic Associate Dean, School of Management, University Of Texas at Dallas.
1994-2006	Professor of Managerial Economics, School of Management, University of Texas at Dallas.
1991-94	Associate Professor of Managerial Economics, School of Management, University of Texas at Dallas.
1986-91	Associate Professor of Economics, North Carolina State University.
1985-86	John Olin Faculty Fellow in Law And Economics, University of Chicago.
1982-86	Assistant Professor of Economics, Graduate School of Management, University of Rochester.
1977-82	Assistant Professor of Economics, University of Western Ontario.

Professional Affiliations

President, Society for Research on Copyright Issues, 2006-2008
Editorial Board, Journal of Industrial and Business Economics 2009-
Editorial Board, Journal of Media Economics 2008-
Editorial Board, Review of Economic Research on Copyright Issues 2003-
Editorial Board, Copyright 2005-2006
Editorial Board, Journal of Network Industries 1999-2003
Editorial Board for Special Issue of MIS Quarterly on Standardization 2005.
Advisory Board for the Free State Foundation, 2008-
Academic Advisory Committee, Copyright Alliance, 2007-
Advisory Board for Heartland Institute's Digital Economic Center 1999-present
Advisory Board for the Center for the Study of Digital Property, 2005-
Advisory Board for the Center on Entrepreneurial Innovation 2005-

Advisory Board of the Intellectual Property Institute, University of Richmond Law School
2005-

Advisory Board of the Media Institute 2007-

Adjunct Scholar, Competitive Enterprise Institute, 2003-

Adjunct Scholar, Cato Institute, 2003-

Fellow, Independent Institute, 1998-

Publications: Academic Articles (bold indicates relevant articles)

“Is Efficient Copyright a Reasonable Goal?” *George Washington Law Review*,
forthcoming.

“What are the Economic Impacts of Micropayments for Intellectual Properties?” in
Competition, Innovation and Intellectual Property (Edited by G. Ramello and M.
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"Path Dependence: From Qwerty To Windows," Regulation Magazine, Fall, 1995, Pages 35-42, (with Steve Margolis). Plus reply to letter by Paul Krugman in the Spring 96 issue.

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“Product Quality and the Economic Performance of Firms,” McKinsey and Company, October 15, 1999, 88 pages.

“Breaking Windows: Estimating the Cost of Breaking up Microsoft Windows” The Association for Competitive Technology and The ASCII Group, Inc., April 30, 1999, 20 pages.

“Dismal Science Fictions: Network Effects, Microsoft, and Antitrust Speculation” a Cato Policy Analysis, October 27 1998, (with Steve Margolis), 37 pages.

Why Health Care Costs Too Much, Policy Analysis, June 23, 1994, 27 Pages, The Cato Institute

Work in Progress

“The Internet and Television Viewing: An International Perspective” with Alejandro Zentner November 2010.

“How the Lock-In Movement Went off the Tracks” with Steve Margolis November 2010.

“Is the Copyright Monopoly a Best-Selling Fiction?” September 2008.

“The Key Instrument in the Oberholzer-Gee/Strumpf File-sharing paper is Defective”, April 2010. Available at SSRN: <http://ssrn.com/abstract=1598037>

“How Reliable is the Oberholzer-Gee and Strumpf Paper on File-Sharing?” (September 2007). Available at SSRN: <http://ssrn.com/abstract=1014399>

“Don’t Play it Again Sam: Measuring the Impact of Radio Play on Record Sales” 2007.

Honors, Awards, Publicity

Invited to Present the Tullock “Big Idea” Lecture at George Mason University, February 2011
Who’s Who in America 2009

Erskine Visiting Fellow at the University of Canterbury, 2008 (declined)

Asked to write blog/column for Internet Evolution, 2008

Ashbel Smith Chair at the University of Texas at Dallas 2006-

President, Society for Economic Research on Copyright Issues, 2007-2008.

Keynote speaker at Business Software Alliance Regional Meeting in Kuala Lumpur, November 2005.

U.S. Supreme Court MGM v. Grokster concurring opinion authored by Justice Breyer cited my paper on file-sharing.

Symposium on the 20th anniversary of my concept of indirect appropriability. The Review of Economic Research on Copyright Issues 2005.

Included in Who’s Who in Economics – based on receiving citations from academic articles. Mark Blaug and Howard Vane (eds), Fourth Edition, Edward Elgar Publishing 2003.

Rethinking the Network Economy picked as one of the top 30 business books in 2003 by Soundview Executive Books.

Asked to write column for CIO Magazine, 2000

Article with Steve Margolis in Reason Magazine (1996) selected to be in Reason’s anthology of Best Articles of the Decade (1990s), 2002.

Keynote address at the Inaugural Conference of the Society for Economic Research on Copyright Issues. Madrid Spain, June, 2002.

Keynote address at conference on Competition, Monopoly, and Regulation in the Information Age in Frankfurt, Germany, May 25, 2000.

“Distinguished Research Award” North Carolina State U, 1990

1990 Bradley Fellowship to Attend Mt. Pelerin Society Meetings in Munich Germany

1985-86 John Olin Faculty Fellow at the University of Chicago Law School

1975-76 Smith Richardson Fellowship, UCLA

1973-75 TAship UCLA

1967-71 Open Scholarship, Johns Hopkins

1967 Regents Scholarship, New York State (declined)

Mentions in the mainstream media

The mortgage crisis: **National Post** Sept 22, 2010; **Washington Times** – Apr 13, 2010; **Wall Street Journal** – February 19 2010; **Business Week** - Sep 17, 2009; **Canada Free Press.com** - Jul 18, 2009; **Atlantic Online** - Jul 6, 2009; **worldnetdaily.com** - May 14, 2009; **Forbes** - Mar 24, 2009; **Fox News** Sep 18, 2008; **Boston Herald** October 6, 2008; **NY Times** May 10, 1996

The impacts of file-sharing and other copyright issues: **New York Times**, January 15, 2011; **New York Times** January 11, 2010; **Guardian** (UK) - Jan 23, 2009; **Business Week** - Nov 4, 2009; **Forbes** - May 28, 2009; **National Geographic** - Dec 27, 2009; **Billboard** - Jul 15, 2009; **Palm Beach Post** - May 10, 2009; **Columbus Dispatch** - May 18, 2009; **ChannelWeb** - Feb 25, 2009; **Washington Times** - Jan 9, 2009; **Billboard Business News** - Jul 30, 2009; **Billboard Business News** - Mar 10, 2009; **Chronicle of Higher Education** February 1, 2002; **Dallas Observer** (lengthy interview, August 08, 2002; **Salon** (2nd interview) Aug 23, 2002; **NPR All Things Considered** December 30, 2002; **Boston Globe** April 13, 2003; **New Media Age** 12-JUN-03; **Sydney Morning Herald** December 31, 2003; **Salon** Jan 15, 2004; **Wired** Mar 30, 2004; **NY Times** Apr 5, 2004; **Washington Post** May 6, 2004; **New York Times** Nov 21, 2004; **NPR Talk of the Nation** June 27, 2005; **Internet Financial News** 2007-11-08; **Chronicle of Higher Education** Jul 25, 2008; **Fortune** September 16, 2002; **Rolling Stone** Apr 5, 2004; **USA Today**; **ABC World News Now**; **Wall Street Journal** debate, October 16 2006; **Salon** 1st interview June 13 2002.

Network effects, path dependence, and lock-in: **Financial Post** – Dec 22, 2010; **Financial Post** - Oct 23, 2009. **Business Week** Feb 14, 2000; **NY Times** Sep 26, 2000; **The Register** (UK) Oct 2, 2000; **San Francisco Business Times** Jul 9, 2001; **The Hindu Business Line** Aug 22, 2001; **Knight Ridder/Tribune News Service** September 04, 2001; **The Dallas Morning News** (Dallas, TX) November 03, 2001; **SF Chronicle** September 24, 2002; **CFO Magazine** October 1, 2002; **LA Times** Nov 4, 2002; **San Antonio Express** May 10, 2003; **The Baltimore Sun** (Baltimore, MD) March 29, 2005; **Business Week** Apr 25, 2006; **Wall Street Journal** Jan 26, 2006; **The Guardian** (UK) Jun 18, 2006; **NY Times** Aug 6, 1995; **The Washington Times** October 23, 1995; **Boston Globe** January 15, 1996; **CNet News** September 20, 1996; **Wall Street Journal**

Dec 31, 1996; **Wall Street Journal** (entire article about my research) Feb 25, 1998; **Wall Street Journal** Apr 13, 1998; **LA Times** Oct 5, 1998; **USA Today** Oct 23, 1998; **Dallas Morning News** November 15, 1998; **Wall Street Journal** Feb 22, 1999; **Fort Worth Star-Telegram** - May 15, 1999; **Seattle Times** May 30, 1999; **Fort Worth Star Telegram** Aug 12, 1999; **Information Week** Oct 4, 1999; **San Jose Mercury News** October 24, 1999; **Wired** Sep 10, 1999; **CNN** November 17, 1999; **The Economist** (entire article about my work) September 18, 1999; **The Economist** April 3, 1999; January 1997 Issue of **Die Ziet**; **Financial Times**, March 6, 2001; **Wall Street Journal** Microsoft Debate with Mike Scherer in May 1, 2000; **NBC Evening News**, November 8, 1999; **Cavuto Business Report**, Fox News, September 21, 1999; May 1, 2000; **PBS Lehrer News Hour**, April 14, 2000.

Research Contracts

- 1999 McKinsey and Company, To Investigate the Impact of Product Quality on Firm Performance.
- 1988 U.S. Congress, Office of Technology Assessment, To Review Work By William Johnson On The Impact Of Copying On Copyright.
- 1983 U.S. Congress, Office of Technology Assessment, the Impact Of Intellectual Property Laws On The Research And Development of Computer Technologies.
- 1982 Centre For The Economic Analysis Of Property Rights, University of Western Ontario - To Examine Interactions Of Complementary Products When One Is A Copyrighted Material.
- 1981 Department Of Communications - To Investigate the Efficiency of The Canadian Broadcasting Corporation.
- 1979 Bureau of Intellectual Property, Consumer and Corporate Affairs - To Investigate the Impact of Reprography on The Copyright System.
- 1978 Bureau of Intellectual Property, Consumer and Corporate Affairs - To Investigate Impact of Cable Television on Copyright, 1978-1979.