

UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA  
SAN JOSE DIVISION

APPLE IPOD ITUNES ANTI-TRUST  
LITIGATION

Lead Case No. C-05-00037-JW

**Declaration of Roger G. Noll  
[REDACTED]**

My name is Roger G. Noll, and I reside in Palo Alto, California. My education includes a B. S. with honors in mathematics from the California Institute of Technology and a Ph. D. in economics from Harvard University. I am Professor *Emeritus* of Economics at Stanford University, Senior Fellow in the Stanford Institute for Economic Policy Research (SIEPR), and Co-Director of the SIEPR Program in Regulatory Policy.

My primary area of scholarship is the field of industrial organization, which includes the economics of antitrust, regulation, technology policy, and specific industries. I have taught these subjects at both the undergraduate and graduate level. I am the author, co-author or editor of thirteen books, and the author or co-author of over 300 articles. Much of my research for the past forty years has focused on the entertainment industry, and more recently on antitrust and intellectual property issues associated with the digital revolution. My complete *curriculum vita* is attached as Appendix A.

I have served as a consultant to the Antitrust Division of the U.S. Department of Justice, the U. S. Federal Trade Commission, the Federal Communications Commission, and the Senate Subcommittee on Antitrust and Monopoly. I also have participated on committees of the National Research Council that investigated antitrust and intellectual

property issues associated with the rise of digital information technology and the delivery of entertainment products over the Internet, including the Board on Science, Technology and Economic Policy and the Committee on Intellectual Property Rights and the Emerging Information Infrastructure. As a member of the latter Committee, I was co-author of *The Digital Dilemma*, a study of the implications of developments in information technology for the traditional publishing and entertainment industries. I also was a member of the California Council on Science and Technology, for which I organized and edited a study of disparities in access to computers and the Internet that was published by CCST as *Bridging the Digital Divide*.

I have served as an economic expert in previous litigation, some of which involved economic issues associated with digital entertainment technologies and the Internet. During the past five years I have testified at trial in the following cases:

*Metropolitan Intercollegiate Basketball Association vs. National Collegiate Athletic Association* (U.S. District Court, New York, New York);

*Gordon, et al., vs. Microsoft* (Superior Court, Hennepin County, Minneapolis, Minnesota);

*Seven Network v. News Limited* (Federal Court, District of New South Wales, Sydney, Australia);

*In Re Tableware Antitrust Litigation* (U. S. District Court, San Francisco, California);

*In the Matter of Adjustment of Rates and Terms for Pre-existing Subscription and Satellite Digital Audio Radio Service* (Copyright Royalty Board, Washington, D. C.);

*Bernard Parish, et al., vs. National Football League Players Association* (U.S.

District Court, San Francisco, California);

*Application for the Determination of Reasonable License Fees by MobiTV*

*Related to U.S. vs. ASCAP* (U.S. District Court, New York, New York); and

*Reggie White vs. National Football League* (U.S. District Court, Minneapolis, Minnesota).

I also testified at an arbitration hearing in a process created by the Federal Communications Commission to resolve disputes over retransmission agreements between Fox television network and multi-channel video distribution systems:

*Echostar Communications vs. News Corporation.*

In addition, I have submitted expert reports and/or been deposed in the following other cases that are still pending or have reached conclusion within the last five years:

*Coordination Proceedings Special Title, Microsoft Cases I - V* (California Superior Court, San Francisco);

*Gemstar Patent Litigation* (U. S. District Court, Denver, Colorado);

*In Re Napster Copyright Litigation* (U. S. District Court, San Francisco, California);

*National Association of Optometrists and Opticians, et al., vs. Lockyer, et al.,* (U.S. District Court, Sacramento, California);

*Fran Am Partnership vs. Sports Car Clubs of America* (U. S. District Court, Denver, Colorado);

*Intertainer vs. Time-Warner, et al.* (U.S. District Court, Los Angeles, California);

*Joe Comes, et al., v. Microsoft* (District Court for Polk County, Des Moines, Iowa);

*In Re Dynamic Random Access Memory (DRAM) Antitrust Litigation* (U. S. District Court, San Francisco, California);

*Brian Bock, et al., vs. Honeywell International* (Superior Court, San Francisco, California);

*Vincent Fagan and Anthony Gianasca v. Honeywell International* (Superior Court for Middlesex County, Boston, Massachusetts);

*John McKinnon v. Honeywell International* (Superior Court for York County, Alfred, Maine);

*Alfred T. Wright vs. Honeywell International* (Superior Court for Orange County, Chelsea, Vermont);

*Fleury vs. Cartier International* (U. S. District Court, San Francisco, California);

*Eric Seiken vs. Pearle Vision* (Superior Court for San Diego County, San Diego, California);

*Jason White, et al., vs. National Collegiate Athletic Administration* (U. S. District Court, Los Angeles, California);

*In Re Static Random Access Memory (SRAM) Antitrust Litigation* (U. S. District Court, San Francisco, California);

*Fair Isaac, et al., vs. Equifax, et al.* (U. S. District Court, Minneapolis);

*Minority Television Project vs. Federal Communications Commission* (U. S. District Court, San Francisco, California);

*Novell vs. Microsoft* (U. S. District Court, Baltimore, Maryland);

*In Re Flash Memory Antitrust Litigation* (U. S. District Court, Oakland, California);

*In re Applications of AT&T Mobility, Ericsson and Verizon Wireless, Related to U.S. vs. ASCAP* (U.S. District Court, New York, New York); and

*SmithKlein Beecham d/b/a GlaxoSmithKline vs. Abbott Laboratories* (U.S. District Court, Oakland, California).

Within the last five years I also was the co-author of an *amicus* submission to the Federal Trade Commission on the *FTC Strategic Plan* and two *amicus* briefs filed with the U.S. Supreme Court:

*PSEG, et al., v. Riverkeeper*; and

*American Needle v. National Football League*.

## **ASSIGNMENT**

Attorneys for the plaintiffs have asked me to determine the economic evidence that would be used to analyze whether the defendant harmed competition by using software and firmware updates to exclude potential competitors from the markets for portable digital media players and digital audio files in order to maintain and extend its monopoly power in those markets, and whether this evidence involves the use of facts and methods that are predominantly common to all members of the alleged class.<sup>1</sup>

Plaintiffs' attorneys also have asked me to determine whether the methods that would be used to determine the damages to each class member would be predominantly common to

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<sup>1</sup> Initially I was asked to determine the economic evidence that would be used to analyze whether the defendant harmed competition by tying its portable digital music player to online music sales through its iTunes Music Store. See *Declaration of Roger G. Noll*, July 15, 2008, and *Reply Declaration of Roger G. Noll*, October 19, 2009. I understand that the Court dismissed plaintiffs' Section 1 tying claims and that plaintiffs are now proceeding solely on their Section 2 monopolization and attempted monopolization claims relating to Apple's conduct in and after 2004.

all class members. In addressing these questions, I focus on the methods an economist would use in assessing the validity of the plaintiffs' allegations and the methods plaintiffs could use to calculate damages. For my work on this matter, I am being compensated at the rate of \$700 per hour.

To carry out my assignment, I have reviewed numerous submissions by the parties and decisions by the Court,<sup>2</sup> including the *Amended Consolidated Complaint* (January 26, 2010, hereafter *Amended Complaint*), the prior *Consolidated Complaint* (hereafter *Complaint*), Apple's answers to these complaints, and the submissions of the parties on Apple's motions to dismiss, to decertify the class, and to grant summary judgment. I also have read the orders of the Court on these motions, and Apple's responses to interrogatories by plaintiffs in both the direct and indirect purchaser cases.

I have read numerous other documents and business records that recently were produced by the defendant. I have been assisted by Dr. Robert D. Stoner and his staff at Economists, Inc., who, under my direction, have categorized numerous discovery documents and analyzed the transaction and cost data that Apple recently provided. The discovery material that I have considered is listed in an Appendix B to this report.

I also have read published articles and reports by financial analysts about the music industry, portable digital media players, digital downloads of audio entertainment, and Apple, Inc., and its products. The articles and reports on which I have relied are cited in this report. I also have relied on four decades of experience in studying the entertainment and information technology industries and the digital distribution of audio and video entertainment over the Internet. I also rely on my experience in other recent

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<sup>2</sup> Some of these documents were filed in *Melanie Tucker v. Apple Computer, Inc.*

class action litigation, including the DRAM, SRAM and flash memory cases, all of which were filed in the Northern District of California.

## **BACKGROUND INFORMATION**

To clarify my assignment and the motivation for the contents of this report, this section provides a brief description of the *Amended Complaint, Defendant Apple Inc.’s First Amended Answer and Defenses to Plaintiffs’ Amended Consolidated Complaint* (henceforth *Defendant’s Answers*), the history of downloads of audio recordings that would form the basis of an economic analysis of liability and damages in this matter, and the extent of data production by Apple.

### ***The Amended Complaint***

The essence of the dispute in this litigation is as follows. Plaintiffs allege that Apple used its control of the software that enables Apple’s iPod portable digital media players to play audio files that were available for download from Apple’s iTunes Music Store (iTMS), now known as the iTunes Store (iTS), to maintain monopoly power in the markets for audio digital files and portable digital media players. Apple agrees that software updates created new incompatibilities between its products and the products of competitors, but claims that these changes benefited consumers.

Plaintiffs allege that Apple initially obtained monopoly power in the market for permanent downloads of audio files because it was the first legal download service to obtain licenses from the major record companies to sell a comprehensive catalog of audio recordings over the Internet. Plaintiffs also allege that Apple obtained monopoly power

in portable digital media players because the Apple iPod was the only portable digital media player that could play audio recordings that were downloaded from iTunes. I understand that the Court has ruled that Apple's initial monopoly power in the markets for audio downloads and portable digital media players that arose from the technical interdependence between iTunes and iPods was not the result of anticompetitive behavior.

The *Amended Complaint* alleges that audio downloads and portable digital media players are relevant product markets for purposes of antitrust analysis.<sup>3</sup> The use of iPods and iTunes also involves another product, iTunes, which is the defendant's media player software that consumers can download to their personal computers. iTunes, among other things, allows personal computers to store, catalog and play digital recordings that have been "ripped" (copied) from compact discs (CDs) and in some but not all formats that have been downloaded from the Internet. iTunes also can be used for loading and cataloguing files on an iPod. The relevant geographic market is the United States.

The plaintiffs have defined the class as all persons or entities in the United States that purchased an iPod directly from Apple between October 1, 2004 and March 31, 2009 (the "Class Period") except government entities and Apple employees.<sup>4</sup> The class includes consumers who bought iPods directly from the defendant and intermediaries who bought iPods from the defendant for resale.

The *Amended Complaint* alleges that Apple engaged in anticompetitive conduct that harmed consumers who owned iPods and audio recordings acquired from iTunes.<sup>5</sup> In

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<sup>3</sup> The relevant markets are alleged in the *Amended Complaint*, pp. 3-7.

<sup>4</sup> *Ibid.*, p. 7.

<sup>5</sup> *Ibid.*, p. 1.

the market for audio downloads, consumers who sought to play music downloads on an iPod were prevented from purchasing downloads from competitors of iTunes.<sup>6</sup> In 2004 RealNetworks, which offers a service that competes with iTunes, introduced a technology, known as Harmony, that enabled its customers directly to transfer audio files to an iPod that were downloaded to a computer from RealNetworks' online audio recording store. According to the *Amended Complaint*, Apple subsequently used software updates of its proprietary file format for audio recordings and of iPods that connected to iTunes to disable the interoperability between iPods and RealNetworks.<sup>7</sup>

The plaintiffs further allege that by maintaining monopoly power in portable digital media players, Apple caused anticompetitive harm to consumers of iPods. The form of this harm was less choice and innovation in portable digital media players and monetary damage through overcharges for iPods that Apple was able to impose because of its alleged anticompetitive conduct.<sup>8</sup>

Apple does not dispute that it updated its software on iTunes and iPods in a manner that created new incompatibilities between audio recordings from iTunes and competing portable digital media players, and between iPods and audio recording from competitors or iTunes. Instead, Apple denies plaintiffs' allegations about the relevant markets<sup>9</sup> and all claims in the *Amended Complaint* that these actions were

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<sup>6</sup> *Ibid.* The *Amended Complaint* also alleges that Apple used updates of the formats of audio recordings that prevented users of portable digital media players that competed with iPods from playing audio recordings that were purchased from iTunes. I understand that the plaintiffs are not pursuing this allegation and so I do not discuss it in this report.

<sup>7</sup> *Ibid.*, pp. 11-12.

<sup>8</sup> *Ibid.*, pp. 16-17.

<sup>9</sup> *Defendant's Answers*, pp. 3-6.

anticompetitive.<sup>10</sup> Apple denies that its software updates had an adverse effect on competition, based on the observation that several firms sell audio downloads and portable digital media players.<sup>11</sup> In addition, Apple alleges that its software updates benefited consumers by improving the technology of digital downloads and portable digital media players,<sup>12</sup> and were designed to prevent the use of illegal software (“hacks”) that circumvent Apple’s anti-piracy technology.<sup>13</sup>

### ***The Audio Download Industry***

The alleged anticompetitive conduct in this matter pertains to Apple’s proprietary digital rights management (DRM) format (FairPlay). DRM refers to a system for encrypting a digital file in a manner that enables the creator of a file to maintain control over access to its content. Several file formats are used by manufacturers of audio recordings, online download stores, and portable digital media players for storing, transferring and playing audio files. Many of these file formats are unprotected. For audio, MP3 and Advanced Audio Coding (AAC) are industry standards for unprotected audio file formats that can be played on most portable digital media players and that do not require royalty payments for their use. In addition, proprietary unprotected audio formats require royalty payments for use in both audio files and portable digital media players. The most important proprietary formats are Windows Media Audio (WMA),

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<sup>10</sup> *Ibid.*, pp. 1-16.

<sup>11</sup> *Ibid.*, pp. 17, 19.

<sup>12</sup> *Ibid.*, pp. 17-19.

<sup>13</sup> *Ibid.*, pp. 19-20.

which is used by Microsoft, and RealAudio, which is used by RealNetworks. Both are licensed to many audio download services and manufacturers of portable digital media players. Apple has chosen not to make the iPod compatible with RealAudio and WMA, but it can play unprotected audio recordings in the MP3 and AAC formats.<sup>14</sup>

Initially nearly all companies in the audio recording industry, including all of the five (now four) major record distribution companies that collectively accounted for about 90 percent of all sales of audio recordings, did not allow widespread online distribution of unprotected audio files.<sup>15</sup> The first legal Internet sites that sold downloads of audio recordings used unprotected formats, but the record companies made very few titles available to them because they feared that consumers would violate the copyrights in recordings by allowing others to copy their digital audio files. Several file-sharing Internet sites, such as Napster and Grokster, filled the resulting market vacuum by making a large number of audio recordings available as downloads of audio recordings that consumers had transferred from a CD to a computer and posted for download on a file-sharing service.

Around the year 2000 the audio recording industry decided to make many more audio recordings available for download over the Internet, but required the use of DRM systems to encrypt recordings that were distributed over the Internet. The purpose of this requirement was to allow the record companies and other digital download vendors to control the use of audio recordings after they were sold. Examples of such controls are

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<sup>14</sup> For more details about which audio formats are compatible with an iPod, see Apple's web site: <http://support.apple.com/kb/HT1334>.

<sup>15</sup> The five major record companies at the time iTMS was created were BMG and Sony (now merged), EMI, Universal and Warner.

limits to the number of times a recording could be played or the number of devices on which it could be stored and played. Microsoft and RealNetworks created protected versions of their proprietary audio formats and licensed these DRM systems to manufacturers of portable digital media players and online download stores.

Prior to the creation of iTMS, the major record distribution companies formed two joint ventures, MusicNet and Pressplay, to distribute audio recordings for download over the Internet. Pressplay used the Microsoft DRM system, and MusicNet used the RealNetworks DRM system.<sup>16</sup> In 2002, the U.S. District Court in the Napster copyright infringement litigation refused to grant a permanent injunction against Napster on the grounds that MusicNet and Pressplay may have been anticompetitive and thereby constituted misuse of copyrights by the record companies.<sup>17</sup> The record companies soon thereafter abandoned their joint ventures and decided instead to allow Apple's iTMS to become the sole retailer of downloads of audio recordings.

In creating iTMS, Apple chose not to use the DRM formats that were available from others when iTMS was launched. Apple's protected audio file format combines AAC and FairPlay, Apple's proprietary encryption system. Apple also decided not to license FairPlay to others, with one exception. Before Apple introduced the iPhone, Motorola was licensed to manufacture a smart phone that included the features of an iPod and that could access iTMS,<sup>18</sup> but this license was not renewed after Apple introduced the

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<sup>16</sup> Several years later Microsoft developed a version of its protected WMA format that it does not license and that cannot be used with any portable digital media player other than Microsoft's Zune.

<sup>17</sup> "Memorandum and Order," *In Re Napster Copyright Litigation*, U. S. District Court (Northern California), MDL 00-1369 MHP and C 99-5183 MHP (February 2002).

<sup>18</sup> Matthew Hicks, "Motorola Previews iTunes Phone," January 7, 2005, *eWeek.com*.

iPhone. Apple has not licensed FairPlay to any other manufacturer of portable digital media players or audio download service that competes with iTunes.<sup>19</sup>

Beginning in 2007, the record labels began gradually to move away from requiring DRM protection for audio downloads. On April 2, 2007, EMI, one of the major record distribution companies, began selling its entire catalog of music on iTunes without DRM. In January, 2008, EMI and the other major record distribution companies agreed to allow several Internet vendors to sell their audio recordings without DRM protection, including Amazon.com/MP3, Napster, RealNetworks Rhapsody and WalMart. Over the next few months, these sites made the transition to complete DRM-free audio downloads. The other record companies eventually decided to allow Apple to sell DRM-free audio recordings. In January 2009, Apple announced that it would begin selling most music without DRM, and by April 1, 2009, all digital audio files sold through iTunes could be purchased without FairPlay DRM.

The alleged anticompetitive conduct occurred during the class period between October 1, 2004, and March 31, 2009. During this period Apple updates to FairPlay and the software on iPods prevented interoperability between iPods and audio recordings from audio download stores other than iTunes. The task of an economic analysis in this litigation is to determine the effects of these software upgrades on competition in the alleged relevant markets and, ultimately, on consumers of portable digital media players. For purposes of class certification, the goal of this report is to describe how an economic analysis of these issues would proceed, and whether the evidence and analysis pertaining

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<sup>19</sup> Hewlett-Packard apparently is the only equipment manufacturer to reach an agreement with Apple to market an iPod with the HP brand. These devices also were capable of playing audio files in the FairPlay format.

to these issues is predominantly common to members of the class.

*Status of Discovery*

During the last month, Apple has produced an enormous number of documents and extensive business data, with production ongoing as I finish my report. I have not been able to take all of this information into account in writing this report for two reasons. First, the quantity of information is simply too vast to have been studied and incorporated into this report by the submission deadline. Second, as is always the case, the information in the data files is neither transparent nor complete. While some of the uncertainties about these data have been resolved in depositions of Apple employees and responses to inquiries, others remain unresolved, making reliable application of statistical methods infeasible.

[REDACTED]

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20 [REDACTED]





[REDACTED]

Second, some data are incomplete or insufficiently documented to make a comprehensive statistical analysis feasible as of the due date of this report. This state of affairs is not unusual. A large, comprehensive, complex data set requires substantial time-consuming work before rigorous statistical analysis is feasible. With continued interaction and cooperation with Apple personnel, a comprehensive, usable data set can be created that will support reliable econometric analysis in a few more weeks. For now, all that can be done in this report is to show the kind of information that has been

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21 [REDACTED]

produced, the methods that can be used to examine liability issues and to prove damages, and the commonality of those methods to class members.

## **SUMMARY AND CONCLUSIONS**

This section summarizes the results of my analysis. I conclude that the economic aspects of plaintiffs' allegations with regard to liability and damages, if true, would be proved using evidence and analysis that is predominantly common to class members. Subsequent sections of this report explain the basis for these conclusions.

### ***Liability***

An economic analysis of liability issues in rule of reason antitrust litigation can proceed in two ways. The traditional approach deals with the following issues: market definition, market power, sources of market power, anticompetitive effects, and reasonable business justifications. The economic analysis of rule-of-reason allegations includes all issues in both alleged markets (online music and portable music players).

### ***Market Definition***

Market definition begins with a "reference product" (a product that is a subject of the complaint) and identifies other products, if any, that are close substitutes for the reference products. As pleaded in the *Amended Complaint*, the reference products are iPods and digital audio recordings sold by iTMS. In addition, an economic analysis of these products inevitably requires taking into account another product, iTunes.

Market definition analysis identifies plausible substitutes for each reference

product, based on technical descriptions, functional uses, and informed opinions among buyers, sellers and industry observers concerning which products are substitutes for the reference products. When feasible, economists also undertake statistical analysis of the effect of the price of one product on the sales of another, and on the correlation of prices among products that plausibly are close substitutes.

All of the reference products and their plausible close substitutes are mass-produced goods that are sold to consumers at posted prices (for iTunes and other brands of media player software, the price is zero), including through websites that offer the same products on the same terms to all U.S. consumers. For such products, the information that is necessary to undertake a market definition analysis includes prices, sales, descriptions of technical features and functional uses of products, and perceptions of informed buyers, sellers and industry observers about which products substitute for the reference product. All of this information is identical for every consumer, and so proof of market definition is common to all class members.

### *Market Power*

Indicators of market power in antitrust economics include excess profits, high operating margins, the inability of competitors to capture market share or otherwise substantially to reduce the profitability of the reference product, and high market concentration in the presence of barriers to entry.

In economics, common direct measures of market power are the ratio of operating profits to operating costs and the ratio of the difference between price and average variable cost to price (the Lerner Index). [REDACTED]

[REDACTED] and Apple's audited financial reports to the Securities and Exchange Commission contain this information by line of business.

Measures of profitability that are derived from these data are common to class members.

To prove market power using market concentration requires data about the market shares of the significant sellers in each relevant market during the class period (October 1, 2004 to March 31, 2009). In antitrust economics, standard measures of market concentration are the market share of the largest firm, the combined market shares of the four largest firms, and the Herfindahl-Hirschman Index (HHI). The HHI is the sum of the squares of the market shares of all sellers in the market. Market share data are regularly collected by several consulting firms, and are widely reported in the trade press.

[REDACTED]  
[REDACTED]  
[REDACTED]

Barriers to entry include high fixed costs (a large minimum efficient scale for production facilities or substantial research, development and product design effort before a product can be manufactured), intellectual property rights, and impediments for buyers to change vendors (the lock-in effect, whereby consumers must incur significant costs to switch among sellers, and bundling, whereby products are sold together or are technically incompatible across brands, thereby forcing competitors to offer products in all relevant markets in order to compete in any single relevant market). All of these barriers to entry apply to mass-produced products or sales within a market, so that proof of barriers to entry is common to all class members.

### *Sources of Market Power*

An economic analysis of sources of market power seeks to determine whether market power arises from offering a better product or engaging in anticompetitive conduct. Economic analysis can ascertain whether the alleged conduct affected the defendant's market power and, if so, whether this conduct was anticompetitive or reflected superior foresight and efficiency.

Plaintiffs' monopolization claims are based on Apple's conduct in maintaining incompatibility between Apple's iPod/iTMS and competitive portable digital media players and online music stores. An example in the *Amended Complaint* is disabling RealNetworks Harmony. To assess whether maintaining technical incompatibility is anticompetitive, economists examine whether continued technical incompatibility is a reasonably necessary by-product of a technology that provides benefits to consumers. This analysis hinges on balancing the benefits and costs of maintaining incompatibility, where the benefits relate to consumers and suppliers, not the profits of Apple. Hence, a valid economic analysis must deal with whether product performance was enhanced by maintaining incompatibility and whether incompatibility is costly to maintain.

Product enhancements include features that make the product more valuable to consumers and, in this case, features that are necessary to protect the copyrights in audio recordings. The relevant costs include the direct cost of making products incompatible and the indirect cost of lost sales because users of incompatible products can not buy complementary products from Apple.

Plaintiffs allege that technical incompatibility between the defendant's products and its competitors created 'lock-in,' whereby consumers face significant transition costs

if they switch vendors in a relevant market.<sup>22</sup> Lock-in increases the market power of a vendor over its customers, but it also makes the vendor a less effective competitor for the customers of other vendors in each of the relevant markets. In so doing, lock-in reduces competition for all vendors in the market. Costly creation of lock-in with no accompanying performance benefit is anticompetitive because it imposes costs on both society and the firm that pursues it while providing no offsetting benefits to consumers.

Proof that technical incompatibility is anticompetitive involves evidence about product performance, direct costs, and indirect costs in the form of foregone market opportunities. The same evidence would apply equally to all customers and so is common to all class members.

### *Harm to Competition*

Harm to competition refers to the ways in which consumers were harmed by anticompetitive conduct. One harm is elevated prices to all consumers of the reference product, but this harm is also part of damages and so is examined in the development of a method to calculate damages. Anticompetitive conduct also harms consumers in ways that normally are not included in damages. For example, direct purchaser wholesale and retail firms that resold iPods are likely to pass on their wholesale overcharge to their customers. Higher prices also reduce the quantity of products sold and thereby cause “dead-weight loss” – the loss of welfare arising from the lost sales that would have been made if prices were lower. In addition, competitors in the relevant market for portable digital media players may charge higher prices because anticompetitive conduct by the

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<sup>22</sup> *Amended Complaint*, pp. 6-7.

dominant seller reduced competition against their products, causing their consumers to pay more than they otherwise would have paid.

Technical incompatibility and lock-in harm competition by reducing the choices available to consumers. Consumers can not shop for the best deal in each relevant market and can not switch from one product without bearing the additional costs of switching vendors for other products.

Another harm to competition arises from the effect of lock-in on technological progress. Lock-in reduces a competitor's prospective sales from product innovation in only one relevant market, and hence decreases the incentive to innovate. Thus, if the plaintiffs' allegations are true, technological innovation will be slower in all relevant markets than if competition were more intense.

The evidence that is necessary to establish these harms to competition applies to product features and market outcomes (prices, sales, and entry and exit by competitors). Examples of such information are consumer surveys about purchases of products in the relevant markets, informed opinions by industry participants and the trade press about product quality and the adoption of new technologies by vendors, data about costs, prices and quality of competitive products, and histories of competitive products. All of this information is common to all class members.

### *Business Justifications*

A business justification of anticompetitive conduct is a benefit to consumers that arises from conduct that also has the effect of reducing competition. An act that reduces competition can be reasonable if it provides consumer benefits that can not be obtained

by any other reasonable, less anticompetitive means.

Apple's *Motion to Dismiss or, Alternatively, for Summary Judgment*, as well as its response to the *Amended Complaint*, indicate that Apple will assert one or more of the following as a business justification. First, creating and maintaining incompatibility was justified because "Apple's products worked better together than with competitors' products."<sup>23</sup> Second, Apple states that it was contractually obligated to remedy security breaches in FairPlay, and "[i]f Apple did not stop those hacks, its ability to continue offering music to consumers would be jeopardized, depriving consumers of what plaintiffs concede is the 'huge benefit' of obtaining music on the iTunes Store."<sup>24</sup> Third, preserving the interoperability established by Harmony (or any other competitor) would have required continuing costly cooperation between Apple and its rivals.<sup>25</sup>

Economic analysis can assist in resolving these issues, and does so by analyzing the technical characteristics and performance of products in the relevant markets. Only Apple and Microsoft sell products in each relevant market that are technically incompatible with the products of competitors. Most other competitors in one of the markets at issue in this litigation do not sell products in all relevant markets. For example, Amazon.com and RealNetworks sell audio downloads, and RealNetworks sells a proprietary audio format, but neither manufactures portable digital media players. Likewise, Creative Worldwide and SanDisk manufacture portable digital media players, but do not sell audio downloads or file formats. An economic analysis of business

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<sup>23</sup> *Apple's Reply in Support of Motion to Dismiss or, Alternatively, for Summary Judgment*, p. 1.

<sup>24</sup> *Ibid.*

<sup>25</sup> *Ibid.*, pp. 1-2.

justifications addresses whether the presence in the market of numerous vendors that are not vertically integrated has harmed consumers of their products or has caused more infringement of intellectual property rights. The focus of this analysis is products, markets and systems of complementary products, and so is common to all class members.

***Damages***

In antitrust economics, damages are calculated by comparing actual prices for the reference product with “competitive benchmark” prices that would have been charged in the “but-for” world in which the alleged anticompetitive acts had not occurred. The competitive benchmark is not necessarily a highly competitive market, but a market that reasonably reflects the extent of competition that would have prevailed in the relevant market had the anticompetitive conduct not occurred.

In this matter, the class includes both end-users and intermediaries who bought iPods from the defendant. These two types of customers paid different prices: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

To reflect accurately Apple’s pricing practices, the method for calculating damages should take into account whether the product is sold at retail or wholesale. A damages method easily can account for differences between these channels because of [REDACTED]. Damage

calculations can be based in part on the defendant's wholesale transactions prices and the widely publicized retail prices of models of iPods. For each channel, damages can be estimated from a formula that is derived from an econometric model that explains the defendant's prices over time for each model of iPod as a function of, among other things, the extent of competition in the market.

Another factor to consider in developing a method for calculating damages is technological progress. Damages may vary during the class period due to technological change in iPods and their components. Technology is taken into account by including technical features and component costs in the econometric model of transaction prices.

Economists use three basic approaches to estimating competitive benchmark prices: "before-after," "yardstick," and "mark-up." The before-after method compares prices during periods when anticompetitive conduct may have affected prices with periods when the conduct had no effect. The yardstick method compares prices for the reference product with prices of other products that have similar costs and functions but that are sold in more competitive markets. The mark-up method bases damages on actual mark-ups versus mark-ups that would be expected in a more competitive market.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Each of the three methods produces a formula for damages that is based on data about prices, product characteristics, costs, and conditions in the market. Each method would be based on data and analysis for all iPods sold to all direct purchasers, and so would be predominantly common to class members.

The remainder of this report explains the basis for these conclusions.

**LIABILITY**

The alleged anticompetitive acts in this case involve a rule of reason violation (maintaining monopoly power). The traditional form of economic analysis in the liability phase of rule-of-reason antitrust litigation is a multi-step analysis of several related issues: (1) market definition, (2) market power, (3) sources of market power, (4) harm to competition, and (5) business justifications. This report summarizes how these methods of antitrust economics would be applied in this matter. Recently in many cases the first four steps have been replaced by a “direct effects” analysis in which economic analysis is used to show that anticompetitive conduct caused harmed to consumers.<sup>26</sup> Because this

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<sup>26</sup> The 2010 revision of the *Merger Guidelines* of the U.S. Department of Justice and

approach is very similar to the methods for assessing harm to consumers and measuring damages, I do not discuss it separately in this report.

### ***Market Definition***

The purpose of relevant market analysis is to identify products that are close substitutes. Products are substitutes on the demand side if buyers would switch from one product to another in response to a small reduction in the relative price of the latter. Products are substitutes on the supply side if sellers would switch production from one product to another in response to a small increase in the relative price of the latter.

In antitrust economics, a relevant market consists of a reference product (the product that is the subject of the complaint) and close substitutes for that product that could be profitably monopolized. The task of market definition analysis is to identify the closest substitutes for a reference product that significantly limit the market power of its supplier. To be close substitutes, products must be sufficiently similar that consumers regard them as substitutes for performing the same functions, and must be conveniently available to consumers in the same geographic area. The relevant market consists of the smallest number of products that, if sold by a single supplier, would be able to impose a small but significant non-transitory increase in price (SSNIP) in comparison with the prices that are charged when each product is sold separately.<sup>27</sup>

The *Amended Complaint* alleges two relevant markets: online downloads of

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Federal Trade Commission adopt and describe “direct effects” analysis as a valid approach to antitrust economic analysis.

<sup>27</sup> *Merger Guidelines*, U. S. Department of Justice and Federal Trade Commission, 1994 and 2010.

audio recordings and portable digital music players. The geographic area for these markets is the United States. The reference products are iPods and digital audio downloads that are sold by iTunes. A third product, the iTunes digital media player, plays an important role in the alleged anticompetitive acts by the defendant but plausibly is not part of any of these relevant markets. iTunes is a computer program that enables a consumer to store, catalog and access digital files on personal computers and iPods.

The class includes both consumers and intermediaries who bought iPods. Typically wholesale and retail sales occur in different relevant markets because, theoretically, one can be profitably monopolized without monopolizing the other. Thus, Apple may have substantial market power as the dominant firm in portable digital media players, but may face intense competition from other retailers in selling iPods to consumers. One also can imagine circumstances in which a retailer has substantial market power in the retail market for portable digital media players that, in turn, were produced by many competing manufacturers, none of which enjoyed market power.

In this litigation, the alleged anticompetitive conduct involves technical features of iPods that reduce the substitutability of other products for those of the defendant from the perspective of final consumers. Whereas the Apple Store can not substitute other brands of portable digital media players for the iPod, final consumers and other retail outlets can engage in such substitution. The possibility for substitution among final consumers provides the incentive for other retailers to engage in such substitution in the wholesale market. Hence, the appropriate focus for an analysis of the relevant market for portable digital media players for both types of class members is to identify close substitutes for iPods among final consumers, regardless of whether the product was sold

at retail by the defendant or at wholesale by the defendant to another retailer.

Economists use several methods to identify a relevant market. In some cases, economists estimate the cross-elasticity of demand (that is, how the sales of one product are affected by the price of another product) between the reference product and each other product that might be regarded as close substitutes. In most cases data limitations preclude econometric estimation of cross-elasticity of demand.

If reliable estimation of cross-elasticity of demand is not feasible, economists look for indirect evidence that products are close substitutes: similarity of components and functional uses, statements outside the context of litigation by executives and industry analysts about their beliefs about which products are close competitors, surveys of buyers about which products they considered before buying a product that is a candidate to be included in a relevant market,<sup>28</sup> and the correlation of prices among products that are candidates for inclusion in the relevant market.<sup>29</sup>

On rare occasions products are sold only to a single buyer. Examples are unique construction projects such as home renovations, specialized semiconductor products that are custom designed for a specific electronic device, or price discrimination by a monopoly or a cartel against each buyer, such as the bid-rigging conspiracy for off-shore oil platforms. In these circumstances, the information required to establish market definition (as well as other liability allegations and damages) may be individual, rather

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<sup>28</sup> For a discussion of the use of customer surveys in market definition, see Graeme Reynolds and Chris Walters, “The Use of Customer Surveys for Market Definition and the Competitive Assessment of Horizontal Mergers,” *Journal of Competition Law and Economics*, Vol. 4, No. 2 (June 2008), pp. 411-31.

<sup>29</sup> George J. Stigler and Robert A. Sherwin, “The Extent of the Market,” *Journal of Law and Economics*, Vol. 28, No. 3 (October 1985), pp. 555-85.

than common to the class. More typically, a large group of consumers makes purchases from the same or a mostly overlapping group of sellers, each of which offers similar products at posted prices. In this circumstance, the information that is used to define relevant markets is common to all consumers.

The “audio download” market is described in the *Amended Complaint* as online audio download stores that enable consumers legally to purchase a digital audio file that can be retained indefinitely. This product market is alleged to be distinct from the market for a physical recording that is purchased from either a traditional bricks-and-mortar retail outlet or an online retailer that ships physical products to the consumer. According to the descriptions in the *Amended Complaint*, the alleged relevant market pertains to permanent downloads, and excludes streaming audio services and services that sell temporary downloads that self-destruct after a predetermined time period or when the customer stops paying a monthly subscription fee.

I also infer that the crucial characteristic of a digital download that is sold online is that it is an audio recording, not that it contains music. Although the conventional term that is used in the industry and trade press to describe audio recordings, whether physical copies or digital downloads, is “music,” some audio recordings contain no music, such as recordings of comedy routines, programs from the “golden age” of radio, political speeches, and readings of books and plays. For example, a permanent digital download of “I Can Hear It Now,” the news/history recording based on old radio programs, starring Walter Cronkite and produced by Fred Friendly, is listed for sale under “music” on both Amazon.com and iTunes, as are comedy recordings by Bob Newhart. Likewise, both “music” sites offer “best sellers” on audio books. Thus, I conclude that the actual

relevant market that is alleged in this complaint is the market for legal permanent downloads of all types of audio recordings.

The “portable digital media player” market is described in the *Amended Complaint* as containing battery-powered portable devices that can play digital audio files, as distinct from portable CD players. The key characteristic of these products is the ability to store and play digital audio recordings that have been either downloaded from an audio download store or copied from a physical recording.

The technology of portable digital players has evolved since Apple introduced its first iPod in 2001. Apple and its competitors have taken advantage of rapid technological progress in microprocessors, memory devices and wireless communications to improve portable digital media players. One form of improvement is to make portable digital media players smaller and lighter, and to increase the number of recordings that they can store. In addition, the functionality of portable digital media players has improved.

In 2005, Apple introduced an iPod that could play digital video files and simultaneously began to sell video downloads through iTunes, leading to the change in its name to iTunes.<sup>30</sup> In 2007 Apple introduced the iPod touch, which can directly access the Internet for audio downloads and can be used for many other applications, including video games.<sup>31</sup> Digital media players also are now bundled with “smart phones,” such as

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<sup>30</sup> “Apple Unveils the New iPod” and “Apple Announces iTunes 6 with 2,000 Music Videos, Pixar Short Films & Hit Shows,” Apple Press Releases, October 12, 2005. See also [http://www.apple-history.com/?page=gallery&model=iPod\\_video](http://www.apple-history.com/?page=gallery&model=iPod_video).

<sup>31</sup> “Apple Unveils the iTunes WiFi Music Store” and “Apple Unveils iPod Touch,” Apple Press Releases, September 5, 2007. Despite the growing capability of iPods to play video files and access the Internet, Apple continued to call these devices “the world’s most popular family of digital music players” in the latter press release.

Apple's iPhone, which was launched in July 2007.<sup>32</sup> A smart phone combines the features of a mobile telephone and a personal computer. If a smart phone has sufficient memory, it can be used to store and to play digital audio and video files, and so can be a substitute for a portable digital media player.<sup>33</sup>

All portable devices that store and play digital video files as well as digital audio files are plausible substitutes for portable digital audio players.<sup>34</sup> Thus, the appropriate description of this product market since roughly the summer of 2007 is likely to include products that bundle a portable digital media player with a mobile telephone and/or the capability to access the Internet.<sup>35</sup>

A third product, which is confusingly named a digital media player, must be incorporated into an economic analysis of the issues in this litigation.<sup>36</sup> A digital media

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<sup>32</sup> "iPhone Premieres This Friday Night at Apple Retail Stores," Apple Press release, June 28, 2007.

<sup>33</sup> Financial analysts have concluded that iPhones and iPods are substitutes. See, for example, "AAPL: The Reason for the iPhone's Reported Woes Is Closer than You Think: It's the iPod touch," Needham & Company, January 28, 2008, and "Apple's Negative Guidance Tone at the FQ1 Call Means a Lower Valuation of Multiple: Hold," Kintisheff Research, January 23, 2008. The former focuses on iPods cannibalizing the sale of iPhones, and the latter focuses on iPhones cannibalizing iPod sales.

<sup>34</sup> Because the price of a smart phone is roughly equal to the sum of the prices of a digital media player and an ordinary mobile telephone, a smart phone plausibly is a close substitute for the separate purchase of a portable digital audio player and a mobile telephone. Mobile telephone penetration in the United States is over 240 million, so that a very large fraction of consumers who want a portable digital audio player also are likely to want a mobile telephone. Thus, for the vast majority of consumers, smart phones are likely to be a reasonable alternative to a portable digital audio player.

<sup>35</sup> An example of an analyst's report that reached this conclusion is Charlie Wolf, "AAPL: Its MacWorld and We're Just Living in It, Upgrading Apple from Buy to Strong Buy," Needham and Company, January 23, 2008.

<sup>36</sup> A digital media player should not be confused with the similarly named portable digital media player. The latter is a physical electronic device that plays digital files,

player (without the word portable) is a computer program that allows a consumer to transfer, store, catalog and play audio and video files on a personal computer, to make physical copies of those files if permitted by the DRM system, and to transfer and catalog these files to a portable digital media player. iTunes is the only digital media player that can download a recording from iTMS and that can play a recording that uses the FairPlay format. Recordings in the FairPlay format can not be transferred to and played on a portable digital media player other than an iPod without using another program and, in almost all cases, a CD burner or other electronic equipment.<sup>37</sup> Likewise, iTunes can not convert WMA files into a format that can be played by an iPod. Protected WMA was the most commonly used format by other online download vendors for audio recordings that were required to be sold in a DRM-protected file. Thus, iTunes has played an essential role in maintaining technical incompatibility between the defendant's products and competing products in the relevant markets. Because some iPod customers have files that were downloaded from iTMS or ITS in protected format, iTunes continues to play a role in making other portable digital media players incompatible with audio recordings in a consumer's library.

To define the relevant markets in which portable digital media players and audio downloads are sold involves collecting information about prices, product characteristics, and informed beliefs among buyers, sellers and industry observers about the closest substitutes for each reference product will be collected for the reference products and

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while the former is a computer program that, among other things, loads files to the latter.

<sup>37</sup> Some hackers have offered programs for breaking FairPlay's encryption and converting a protected file from iTMS to an unprotected AAC or MP3 file, but these programs are not wholly successful and in at least some cases may be illegal.

plausible close substitutes.

For iPods, the most obvious substitutes are other portable digital media players.<sup>38</sup> Amazon.com offers the following brands of portable digital media players: Archos, Coby, Cowon, Creative, Ematic, Ibiza, iPods, iRiver, Latte, Meizu, Philips, Pyrus, SanDisk, Samsung, Sony, Toshiba and Zune.<sup>39</sup> [REDACTED]

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<sup>38</sup> For an example of detailed comparisons of the iPod and its leading substitutes, see “Portable Digital Players: iPods Rule but Consider Other Brands,” *Consumer Reports*, November 2006, at [http://www.consumerreports.org/cro/electronics-computers/audio-video/audio/ipods-mp3-players/mp3-players-11-06/overview/1106\\_mp3\\_ov\\_1.htm](http://www.consumerreports.org/cro/electronics-computers/audio-video/audio/ipods-mp3-players/mp3-players-11-06/overview/1106_mp3_ov_1.htm).

<sup>39</sup> For lists of portable digital media players that are sold by Amazon.com, see [http://www.amazon.com/MP3-Players-Audio-Video/b/ref=amb\\_link\\_86347991\\_3?ie=UTF8&node=172630&pf\\_rd\\_m=ATVPDKIKX0DER&pf\\_rd\\_s=top-1&pf\\_rd\\_r=0TT5Q01MYZKSP88YNK53&pf\\_rd\\_t=301&pf\\_rd\\_p=157251702&pf\\_rd\\_i=mp3](http://www.amazon.com/MP3-Players-Audio-Video/b/ref=amb_link_86347991_3?ie=UTF8&node=172630&pf_rd_m=ATVPDKIKX0DER&pf_rd_s=top-1&pf_rd_r=0TT5Q01MYZKSP88YNK53&pf_rd_t=301&pf_rd_p=157251702&pf_rd_i=mp3); [http://www.amazon.com/gp/search/ref=sr\\_tc\\_2\\_1?rh=n%3A1264866011%2Ck%3Amp3&keywords=mp3&ie=UTF8&qid=1294860099&sr=1-2-tc](http://www.amazon.com/gp/search/ref=sr_tc_2_1?rh=n%3A1264866011%2Ck%3Amp3&keywords=mp3&ie=UTF8&qid=1294860099&sr=1-2-tc); and [http://www.amazon.com/MP3-Players-Portable-Audio-Video/b/ref=amb\\_link\\_157669822\\_24?ie=UTF8&node=1264866011&pf\\_rd\\_m=ATVPDKIKX0DER&pf\\_rd\\_s=center-5&pf\\_rd\\_r=1T562SPGE1105HXYHVFZ&pf\\_rd\\_t=101&pf\\_rd\\_p=945911022&pf\\_rd\\_i=172630](http://www.amazon.com/MP3-Players-Portable-Audio-Video/b/ref=amb_link_157669822_24?ie=UTF8&node=1264866011&pf_rd_m=ATVPDKIKX0DER&pf_rd_s=center-5&pf_rd_r=1T562SPGE1105HXYHVFZ&pf_rd_t=101&pf_rd_p=945911022&pf_rd_i=172630).

<sup>40</sup> *Defendant Apple Inc.’s First Amended Objections and Answers to Plaintiff’s Second Set of Interrogatories 9-13*, p. 5.

[REDACTED]

For audio downloads from iTunes, the most plausible substitutes are downloads from other online sites that offer a large catalog of audio files from the major distribution companies. Other Internet sites that sell legal permanent downloads of audio recordings from the four major record distribution firms include Amazon.com, BuyMusic, Napster, Puretracks, Rhapsody, WalMart and Zune.<sup>41</sup> Several sites entered the download business before iTunes, but iTunes was the first and, for nearly a year, the only site that offered a full catalog of digital audio recordings from the then-five major record distribution companies. Other online sellers of permanent downloads, such as eMusic and Ruckus, should be considered in this analysis, but they are not as close substitutes for iTunes because they offer downloads only from independent distributors or artists who have no distributor. Most download sites, including those that offer audio recordings from the major labels, seek to differentiate their product by being the exclusive distributor for some independent artists or labels, and as a result even the largest download vendors are not perfect substitutes for each other.

[REDACTED]

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<sup>41</sup> For descriptions and reviews of audio download sites, see <http://music-download-review.toptenreviews.com/>. I have not included the sites that may not be legal.

[REDACTED]

First is a service that charges a fixed monthly subscription price and allows subscribers permanently to download a fixed number of audio recordings each month. Second is an Internet site that charges a subscription fee for streaming and allows a consumer to select the audio recordings to be streamed, in some cases allowing temporary storage and replay, but disallowing permanent downloads. Third is a streaming audio service for which the user does not select the audio files that are streamed. Fourth is the original form of file-sharing, where users access recordings that are stored in another user's computer or on the server of the file-sharing service after having been uploaded from a CD owned by a user of the service. Fifth is another type of file-sharing, for which a consumer inserts a CD into a computer, the site either uploads the recording or notes that the consumer owns the CD, and the site then streams the recording back to the consumer upon request.

All candidates for inclusion in the two relevant markets are mass-produced products that are sold at posted prices through traditional and online retail outlets. Trade associations such as the Recording Industry Association of America (RIAA) and several trade research organizations publish data and analyses that contain information about

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42 [REDACTED]

prices and sales,<sup>43</sup> and trade publications and reports by securities analysts contain information about the extent of competition between the defendant and other entities for each reference product.<sup>44</sup> In addition, based on my review of the materials produced recently by the defendant, I have determined that a great deal of relevant information for undertaking market definition analysis is possessed in the defendant's corporate records.

[REDACTED]

[REDACTED]

[REDACTED] Identically the same information would be required to prove the relevant market if each member of the class were to make separate antitrust claims against the defendant. Thus, proof of the relevant market would be common to all class members.

An issue that may arise in this litigation is whether all or some of Apple's digital play products should be regarded as part of one market for an integrated "system" of complementary products, rather than separate product markets. The textbook example of a system market is right shoes and left shoes. Whether complementary products are part of a single relevant system market hinges on whether each component has independent demand. Demand is independent if at least some consumers make distinct decisions about whether to acquire a component of the system. Demand can be independent because some consumers do not want all components or prefer to acquire different components from different vendors. In the case of shoes, demand for right and left shoes

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<sup>43</sup> For example, the NPD Group publishes reports about developments in digital media products and issues press releases that reveal some of the information in these reports. See, for example, "The NPD Group: Amazon MP2 Music Download Store Offers a New Hope for Digital Music Growth," NPD Press Release, April 15, 2008.

<sup>44</sup> For example, see Antone Gonsalves, "Microsoft Gets More Social with Zune Update," *Information Week*, May 6, 2008.

is not independent because virtually no one wants a shoe for one foot or shoes for each foot that have different styles, so that a pair of shoes is priced and sold together.

Economic analysis of market definition explores whether nearly all consumers always acquire all three types of products, and whether almost all consumers patronize the same vendor for all three types of products. If nearly all consumers purchase all of a group of complementary products from the same vendor, economic analysis can determine whether the cause is tying or bundling, rather than a true preference for an integrated system. If a significant number of consumers do not buy all products from the same vendor, or for that matter do not buy all of the complementary products, each vendor will price each product independently, and each product will constitute a separate relevant market. Proof of independence of demand is a condition of the markets for these products, and so proof of separate demand is common to all class members.

A plausible outcome of an economic analysis of market definition is that digital media players (like iTunes) are a distinct relevant product market. The reason is that these products have many other uses, such as accessing media content on many other types of web sites. For example, a consumer does not need to own an iPod or to make purchases from iTunes to find iTunes useful. iTunes can be used to transfer unprotected digital files from physical recordings to a personal computer, to catalog and play these recordings on a personal computer, and to make physical copies of these recordings. If iTunes and other digital media players<sup>45</sup> are used by some consumers exclusively for

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<sup>45</sup> Whereas numerous digital media players are available, the leaders are Apple (iTunes and Quick Time), Microsoft (Windows Media Player) and RealNetworks (RealPlayer). See “iTunes Player Hits a High Note, Passes RealPlayer – U. S. Broadband Penetration Increases to 86.79% among Active Internet Users – January 2008 Bandwidth Report,” [WebSiteOptimization.com](http://WebSiteOptimization.com), January 2008. All of these products are given away for free.

purposes other than to buy permanent downloads of audio and video recordings and/or to play recordings on iPods, then these products constitute a separate product market.

### *Market Power*

Market power is the ability to control prices or exclude competitors. Economists use both direct and indirect measures of market power.

Direct measures of market power include the profits and mark-ups of price over average variable cost and incidents in which a competitor was driven from the market or abandoned an attempt to enter the market as a direct result of the defendant's actions.<sup>46</sup> A firm with market power will have profits and price-cost margins that exceed an appropriate competitive benchmark and will be able successfully to defend its sales and excess profits against attempts by competitors to capture a larger market share. A substantial, sustained increase in price-cost margins for a profitable product is a reliable indicator of increased market power because, in a competitive market, prices are driven towards the long-run average cost of production. Hence, if competitive conditions in a market do not change, price changes through time should reflect changes in costs.

### *Margin Analysis*

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>46</sup> Another direct indicator of market power is the own-price elasticity of demand (the responsiveness of sales to price) for the reference product; however, I believe that reliable estimate of own-price elasticity is not likely to be feasible here.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

My examination of the information that Apple has produced and that is available in public documents supports the conclusion that data are readily available that permit estimation of profit margins for each model of iPod and for audio downloads from iTunes. Because the presence of market power is detected by examining sales and profits at the product line level, the analysis of these data that would be undertaken to prove that Apple enjoys market power in iPods would be common to all class members.

Regarding publicly available data, Apple's financial reports to the Securities and Exchange Commission contain revenues and costs by product line. In Apple's financial report for the second quarter of fiscal 2008 (Form 10-Q, submitted in May of 2008), the reported product lines include "iPod," "iPhone and related products," and "Other music related products and services," which is mostly iTunes sales.

Financial analysts regularly provide interpretations of data about Apple's publicly reported sales, costs and profits. For example, one financial analyst reports that the price difference between two models of iPods that differ only in memory capacity is more than double the difference in cost.<sup>47</sup> This price difference could not be sustained in a competitive market, and so is an example of market power. Likewise, an academic

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<sup>47</sup> "The Mix Get Richer: New iPod touch & iPhone Capacities," Credit Suisse, February 5, 2008.

analysis of the relationship between price and component costs for “high-end” consumer electronics finds that Apple earns higher margins on iPods than other manufactures earn on other innovative consumer electronics products.<sup>48</sup>

As described in the section of this report entitled the “Status of Discovery,” [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] These data also can be used to calculate profit margins.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>48</sup> Jason Dedrick, Kenneth L. Kraemer and Greg Linden, “Who Profits from Innovation in Global Value Chains? A Study of the iPod and Notebook PCs,” *Industrial and Corporate Change*, June 22, 2009, at <http://icc.oxfordjournals.org/cgi/reprint/dtp032r1>. The authors state that a “key reason ... is that Apple’s control of the core software, proprietary standards and complementary infrastructure of the iPod enables it to retain greater profits, whereas a large share of the PC industry profits are siphoned off by Microsoft and Intel, whose ownership of valuable standards allows them to charge a considerable price premium.”

<sup>49</sup> [REDACTED]

<sup>50</sup> [REDACTED]



[REDACTED]

*Exclusion of Competitors*

The evidence pertaining to the exclusion of competitors involves analyzing the success of attempts by competitors to offer products that directly compete with a reference product. Examples are the entry of other online sellers of digital downloads and of new portable digital audio players, such as the introduction of portable digital media players by manufacturers that used Harmony to play recordings that were stored in the defendant’s DRM format. Another example is the LG Voyager smart phone.

In antitrust economics, the term “exclusion of competitors” means that the market shares of competitors were substantially less than otherwise would have been the case,

not that competitors could not survive in the market. The core issue is whether the leading product was able to use market power to sustain supra-competitive profits that were not eroded by the entry of competing products.

Both trade publications and the web sites of competitors contain information about products that have been introduced into the relevant market since the introduction of iPods and iTunes, and several organizations periodically provide estimates of the market shares of these competitors. If the plaintiffs' allegations are correct, these attempts to compete will not have been successful in substantially capturing sales from and undermining the market power of the defendant. This evidence also involves market-level information, and so is common to all class members.

#### *Market Concentration*

An indirect indicator of market power is seller concentration in the presence of barriers to entry. The most common measure of market concentration is the Herfindahl-Hirschman Index (HHI), which equals the sum of the squares of the market shares of the firm in the market. In the presence of barriers to entry, an HHI exceeding roughly 2500<sup>52</sup> is regarded as sufficient to infer that large firms in the market possess market power, and an HHI between 1500 and 2500 is sufficient to “warrant concern” about the intensity of competition.<sup>53</sup> In the presence of barriers to entry, the 2500 benchmark implies that a

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<sup>52</sup> A market with four firms of equal size has an HHI of 2500.

<sup>53</sup> *Merger Guidelines*, 2010, *op. cit.*, p. 19. These numbers have been modified from the 1992 *Merger Guidelines*, which used an HHI of 1800 as indicating insufficient competition and a range between 1000 and 1800 as possible insufficiently competitive.

firm is likely to enjoy market power if its market share exceeds 50 percent, or if a firm is among four or fewer firms that account for all or nearly all of sales in a market.

Several private companies regularly collect data about market shares for audio downloads and portable digital media players.<sup>54</sup> These data are based on sample surveys, and as a result have limitations, and Apple regards the NPD data as the “most reliable... regarding sales of iPods compared to MP3 players, as defined by NPD.”<sup>55</sup> Data from these sources are reported in public sources, including reports by financial analysts, trade associations, and trade publications. [REDACTED]

Public sources report that the iPod is the dominant portable digital player. For several years, iPod’s market share by revenue in portable digital media players exceeded 80 percent,<sup>56</sup> but before iTunes was introduced, iPod’s market share was under 30 percent.<sup>57</sup> [REDACTED]

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<sup>54</sup> The NPD Group, IDC, Gartner, Forrester and IPSOS are some examples of organizations that collect information on the market shares of competitors in the alleged markets. [REDACTED]

<sup>55</sup> [REDACTED]

<sup>56</sup> Philip Elmer-DeWitt, “How to Grow the iPod as the MP3 Market Shrinks,” *Fortune*, January 20, 2008, accessed on <http://apple20.blogs.fortune.cnn.com/2008/01/29/beyond-the-incredible-shrinking-ipod-market/>.

<sup>57</sup> Joe Wilcox, “Media2Go Team Gets Creative,” *C/Net News.com*, March 13, 2003, reporting the iPods market share at the end of 2002 was 27 percent; Rob Walker, “The Guts of a New Machine,” *New York Times*, November 30, 2003, reporting that iPods market share jumped to 56 percent in the summer of 2003 after the launch of iTunes; Mark Heflinger, “Zune MP3 Market Share up to 4%, Creative Drops to 2%,” *Media Wire*, May 12, 2008, reporting that iPod’s market share was 71 percent in early 2008,

[REDACTED]

Likewise, publicly available sources report that iTMS has accounted for 70 percent or more of sales of legal digital downloads for nearly all of the time since it was launched.<sup>58</sup> [REDACTED]

[REDACTED]

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compared to 72 percent a year earlier.

<sup>58</sup> “Since its inception on the MAC platform five years ago, Apple’s iTunes music store has dominated the paid digital landscape. Only a few competitors have survived, however, and those that remain garner a comparatively small market share of digital music unit sales,” from “The NPD Group: Amazon MP3 Music Download Store Offers a New Hope for Digital Music Growth,” NPD Group Press Release, April 15, 2008. The second place download site reportedly was Amazon.com, but it had about one-tenth the share of iTMS and very little of its business had come at the expense of iTMS.

<sup>59</sup> [REDACTED]

<sup>60</sup> [REDACTED]

<sup>61</sup> [REDACTED]

<sup>62</sup> [REDACTED]

Assuming that the relevant markets are correctly pleaded by the plaintiffs, the market shares of both iPod and iTunes are sufficient to cause the HHI in each market to exceed 5000, which is double the level that is used to indicate the presence of market power. Moreover, these shares exceed the threshold that antitrust economics regards as sufficient to infer that a firm has unilateral monopoly power in the presence of barriers to entry. Of course, this evidence is based on information about the entire market, and so is common to members of the class.

### *Barriers to Entry*

In addition to market share information, the market share approach to ascertaining market power also requires showing that conditions in the market are conducive to the exercise of market power. The most important of these conditions is the presence of barriers to entry. A barrier to entry is any condition that would prevent a firm from either entering a market or expanding its output in a market in which it is already present.

Examples of barriers to entry are high fixed costs that require an entrant to sell a large amount of output at existing market prices in order to operate profitably and intellectual property rights that protect an incumbent with market power from competition.

Anticompetitive acts also can create a barrier to entry. An example is tying or bundling. In the presence of tying or bundling, an entrant must succeed in successfully producing both products, rather than only one, in order to compete in either market.

Entry barriers are assessed in part by examining the cost structure of the firms in the industry to determine the relative size of fixed and variable costs. The higher is this ratio, the higher is the fixed-cost barrier to entry. These data are easy to obtain because

all publicly traded companies, including Apple, must collect and report financial data in a form that separates fixed from operating costs. In addition, the nature of intellectual property in the industry also needs to be assessed. For example, a major issue in this litigation is whether Apple's digital rights management system and its "crippleware" (for example, the code that prevented Harmony from playing FairPlay files) was a legitimate exercise of its intellectual property rights or an anticompetitive act to exclude competitors. A threshold issue in resolving this question is whether these acts reduced the sales of competitors in the portable digital media player market and/or the online digital download markets.

In all of these examples, the proof of an entry barrier involves general information about the defendant and its competitors. Proof of the existence of barriers to entry, therefore, is common to all members of the class.

Some class members are intermediaries, and in principle the retail market for digital media players could be sufficiently concentrated that one or a few retailers could enjoy market power as sellers in the retail market and buyers in the wholesale market (monopsony power). If so, seller concentration in the wholesale market could be a misleading indicator of market power. The evidence that an economist would use to determine whether this is in fact the case involves analyzing market concentration and entry barriers among wholesale buyers. The criteria for determining whether buyers have market power are the same as those for determining whether sellers have market power.<sup>63</sup>

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<sup>63</sup> For a discussion of the symmetry between buyer power and seller power in antitrust markets, see Roger G. Noll, "Buyer Power' and Economic Policy," *Antitrust Law Journal* Vol. 72, No. 2 (2005), pp. 589-624.

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED] Proof of the absence of buyer power involves the analysis of market-level data, and so is common to all class members.

### *Sources of Market Power*

If a firm enjoys market power, economic analysis can be used to determine whether its market power is due all or in part to anticompetitive acts. In this section, I assume that the defendant's market power in both relevant markets has been established, and that the task of economic analysis is to determine whether this market power was enhanced or maintained by anticompetitive acts.

Firms may enjoy market power due to "superior foresight and efficiency," i.e., their products are cheaper and/or better because they have superior technology and/or management. For example, technological innovations that are protected by valid intellectual property rights or that otherwise are difficult for competitors to copy can be a source of market power. Likewise, if the production technology in an industry exhibits economies of scale that are sufficiently strong that only a small number of firms can achieve the minimum efficient scale of production, firms in that industry are likely to enjoy market power and to earn excess profits. In antitrust economics, these sources of market power are not regarded as anticompetitive.

Firms also may acquire or maintain market power by anticompetitive means. In antitrust economics, an act is regarded as unambiguously anticompetitive if it increases or

maintains market power, does not improve the quality or diversity of products available and so delivers no benefits to consumers, is unrelated to the legitimate protection of intellectual property rights, and requires costly action by the firm that undertakes it. An act may be anticompetitive if it provides benefits to consumers and is not costly to the firm with market power, but only if there are no reasonable alternative means to achieve the same consumer benefits.

In this litigation, plaintiffs allege that Apple maintained monopoly power in both relevant markets by creating and perpetuating unnecessary incompatibility between its digital recording products and potentially substitute products offered by others. The burden of an economic analysis of the sources of market power is to determine whether these alleged anticompetitive acts affected market power and, if so, whether these acts were anticompetitive.

#### *Maintaining Technical Incompatibility as an Anticompetitive Source of Market Power*

To demonstrate that Apple perpetuated technical incompatibility between its products and the products of competitors in the relevant markets requires a two-step analysis. The first step is to show that, in fact, Apple's competitors made or easily could have made their products compatible with Apple's products without infringing on Apple's valid intellectual property rights. The second step is to show that perpetuating incompatibility was costly to Apple in terms of the direct cost of maintaining technical incompatibility and possibly an indirect cost in lost functionality of its own products.

During the class period, in order to play digital recordings acquired from iTunes on a portable digital media player, a consumer was forced to buy an iPod because only an

iPod could play recordings in the DRM-protected FairPlay format that is used by iTunes. Even after Apple stopped selling recordings encrypted with DRM-protected FairPlay in 2009, consumers who have a pre-existing library of digital recordings purchased from iTunes are still precluded from playing those files directly on any portable digital player other than an iPod unless they have paid Apple to upgrade their files to the iTunes Plus format.<sup>64</sup> Because the FairPlay format is common to all DRM-protected digital recordings on iTunes, proof of its existence, the inability of competing online download stores to sell DRM-protected recordings for use on iPods, and the refusal of the defendant to license FairPlay all are characteristics of the relevant markets, and so are common to all class members.

Plaintiffs allege that RealNetworks attempted to compete against iTunes by inventing a digital media player that could translate the digital audio recordings offered by its Rhapsody audio download service into the FairPlay format for use by iTunes and iPods. Plaintiffs allege that RealNetworks was thwarted in this effort when the defendant changed its encryption code to defeat the compatibility of Harmony with iTunes and FairPlay. This allegation, if true, is an example of how perpetuation of technological incompatibility creates a barrier to entry in the market because it requires a competitor to experience recurring costs to reverse engineer an ever-changing technical incompatibility.

Another relevant piece of economic evidence is whether perpetuating the technological incompatibility increased barriers to entry in the relevant markets for digital recordings by eliminating owners of iPods as potential customers for a new

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<sup>64</sup> See “iTunes Store: iTunes Plus Frequently Asked Questions (FAQ)” on Apple’s website, <http://support.apple.com/kb/ht1711>. iTunes users can upgrade a previously-purchased song to a DRM-free version for \$0.30 or an album for 30% of its price.

competitive source of digital recordings. In this case, plaintiffs allege that Apple's continued efforts to preclude interoperability with competing products caused increased sales of iPods, which in turn created a large installed base of iPod owners who possess digital recordings obtained from iTunes.

The economic basis for the plaintiffs' allegations is as follows. Initially, the introduction of Harmony made iPods more attractive to consumers because it enabled iPod owners to download audio recordings from Internet vendors other than iTunes. At the same time, Harmony combined with Rhapsody's lower prices increased demand for audio downloads from Rhapsody, causing Rhapsody's market share to double from 10% to 20%.<sup>65</sup> Thus, the initial effect of Harmony was to reduce the market share of iTunes.

The long run effect of Harmony would have been to increase competition against iPods by reducing the extent to which iPod users were locked in to iTunes. Lock-in occurs when consumers face significant transition costs if they switch vendors for one of a complementary group of products.<sup>66</sup> The textbook example is a computer applications program. Once a consumer has learned to use a particular application, such as a word processor or a spreadsheet, over time the consumer will develop a library of files that are repeatedly used with that application.

A consumer who buys a new computer typically will buy a new version of the same application that takes advantage of the enhanced capability of the new computer.

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<sup>65</sup> "Real Says Digital Song Sale Doubled Market Share", Jefferson Graham, USA TODAY, September 9, 2004 (see AIIA00090447-79). This article describes how RealNetworks rolled out Harmony with a three week sale at \$0.49 per song on Rhapsody. After the sale, RealNetworks planned to keep the \$0.49 per song price for weekly top 10 singles.

<sup>66</sup> For a discussion of lock-in, see Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy*, Harvard Business School Press, 1999.

But a consumer who buys a competing version of the same applications program may face two significant extra costs. First, the consumer must learn how to use the new applications program, which takes time and may require buying instruction manuals and training. Second, the new applications program may not be able to read the old files that were created by the old applications program, thereby causing the consumer either to recreate the files in the format used by the new program or to abandon using those files. Consumers are said to be locked in to an applications program if these costs are sufficiently large that they continue to buy the same program even though an alternative has superior performance and/or a lower price.

Lock-in increases the market power of a vendor over its customers. Once a consumer is locked in, a vendor can raise the price of its product as long as the price increase is less than the net cost of switching.<sup>67</sup> But lock-in also makes the vendor a less effective competitor for the customers of other vendors. Thus, in the case of a software applications product, creating technical incompatibility means that consumers of competing applications programs can not switch to the vendor's product without experiencing switching costs associated with file format incompatibility. Because lock-in is a two-way street (also involving "lock-out" of customers of other vendors), a strategy of creating lock-in through technical incompatibility is more attractive as the installed base of the vendor grows larger.

Lock-in occurred for consumers who purchased iPods and digital music on iTunes,

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<sup>67</sup> The net cost of switching is the gross switching cost minus the additional benefit in terms of quality and price of the best alternative product.

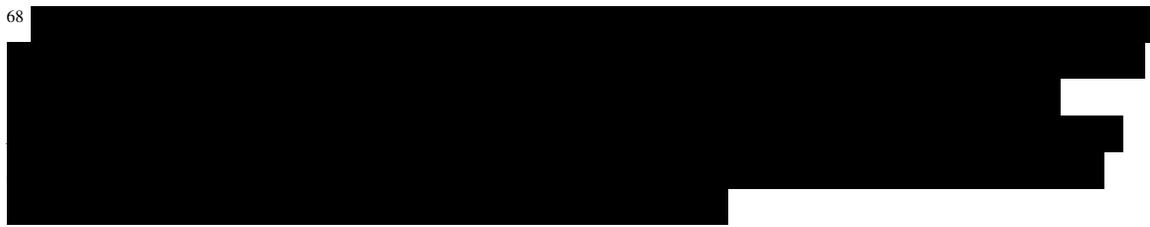
thereby obtaining a library of music files that could play only on Apple's iPod.<sup>68</sup> The high market share of iPods for over six years after the launch of iTunes but before iTunes abandoned the FairPlay DRM system created an enormous installed base, estimated to be over 110 million users, over 71 million of whom have activated the iPod for use with Internet downloads.<sup>69</sup> Thus, the number of iPod users who own audio recordings that can only play on an iPod is nearly double the number of iPod customers who do not.

Switching costs for iPod users who own audio recordings protected by FairPlay include the cost of dealing with the incompatibility between FairPlay protected audio recordings and portable digital media players that compete with iPods. A consumer who sought to replace an iPod with a competing product had four options, each of which imposes substantial costs on the consumer.

One option is to burn DRM-protected audio recordings to a CD and then copy the CD into another digital media player. To exercise this option requires buying a CD burner and blank CDs, and then taking the time to burn to a CD the audio recordings that are protected by FairPlay and rip the CD to a different digital media player. Another choice is to pay iTunes 30 percent of the original price of an audio recording to obtain a recording that is not protected by FairPlay. A third option is to replace the recordings acquired from iTunes by purchasing them from another online digital vendor. The fourth

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<sup>68</sup>



<sup>69</sup> Robert Sample, Stephanie Sun and Thompson Wu, "Happy Holidays!" Credit Suisse, October 3, 2007.

choice is simply to abandon the use of audio recordings from iTunes on a new, incompatible portable digital media player. Because each of these options is costly, they qualify as switching costs that lock in consumers to iPods. Switching costs that cause lock-in increase the market power of a vendor of locked-in products because they enable the vendor profitably to raise price above the competitive level by an amount less than the switching cost.

The extent to which an iPod user is locked in is determined by the number of audio recordings in the user's library that are protected by FairPlay. iTunes has sold over five billion audio recordings,<sup>70</sup> or about 70 recordings for every iPod that has been registered by iTunes. Most of these files are in the DRM-protected FairPlay format. Even though iTunes has sold downloads of some recordings without DRM protection since May 2007 and recordings from all of the major record companies without DRM protection since April 2009, iTunes still charges 30 percent of the original purchase price to convert old recordings that are protected by FairPlay to the unprotected format. Thus, iPod owners are likely to own many recordings that cannot be played on any competing brand of portable digital media player.

Harmony reduced these switching costs by giving iPod owners the opportunity to buy audio recordings from Rhapsody that could be played on other portable digital media players when the user decided to buy a new one. Had Harmony not been blocked in October 2004, iPod users would have had access to another source of audio recordings that were compatible with portable digital media players other than iPods for over three years before audio downloads without DRM protection were available from other

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<sup>70</sup> "iTunes Store Tops Over Five Billion Songs Sold," Apple Press Release, June 19, 2008.

Internet vendors and over four years before iTunes switched to DRM-free audio recordings. As a result, the proportion of audio downloads that were incompatible with competing portable digital media players would have begun to decline years earlier.

If iPod users who purchased audio recordings from iTunes and from Rhapsody using Harmony decided to replace an old iPod sometime after October 2004, the cost of switching to a competing product would have been lower had Harmony survived, thereby intensifying competition between iPod and other brands. Given the rapid technological progress in portable digital media players during the class period, Harmony plausibly would have increased competition against iPods substantially before DRM-free audio recordings became available. By updating FairPlay to block interoperability with Harmony, Apple kept iPod owners fully locked into iTunes.

If the allegations of the plaintiff are true, disabling Harmony a few months after it was released preserved the lock-in effect on iPod users. Economic analysis is useful to assess whether the net effect of perpetuating the incompatibility between iPods and competitors of iTunes reduced competition in the market for portable digital media players and allowed Apple to charge higher prices for iPods. The evidence that addresses this issue is an analysis of sales, prices and profit margins of iPods before, during, and after the period when Harmony was effective in eliminating the technical incompatibility between iPods and competitors of iTunes. This analysis uses Apple's business records, as identified above, to examine the conditions in the markets for audio downloads and portable digital media players and so is common to all class members.

The preceding analysis uses Harmony as an example, but is not limited to Harmony. As others began to find ways to allow iPod users to acquire audio downloads

from sites other than iTunes, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The switch to DRM-free audio recordings is likely to have reduced the lock-in of iPod users. The transition to DRM-free content was slow, proceeding for nearly two years. In April 2007, EMI announced that a “premium” version of downloads of audio recordings (singles, but not albums, selling for a higher price), with iTunes being the first to offer these downloads but others expected to follow in a few weeks.<sup>72</sup> In May 2007, iTunes introduced iTunes Plus, which initially offered recordings from EMI, some independent record labels, and some unaffiliated artists in an unprotected format. iTunes Plus recordings can be loaded onto some portable digital media players other than iPods, although doing so requires manipulation of the files using both iTunes and another digital media player program.<sup>73</sup> Other audio download sites made deals with EMI in the ensuing weeks, but no other DRM-free service that included EMI’s repertoire was launched for several months.

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<sup>71</sup> [REDACTED]

<sup>72</sup> “EMI Launches DRM-Free Superior Sound Quality Downloads Across Its Entire Digital Repertoire,” *Webwire*, April 3, 2007, at <http://www.webwire.com/ViewPressRel.asp?aId=31281>.

<sup>73</sup> To repeat a point that may avoid confusion from standard industry terminology, a digital media player is a computer program that allows a user to store, play and record audio files (e.g., iTunes), whereas a portable digital media player is a physical device for playing audio recordings (e.g., iPods).

In August 2007, Universal announced that it would conduct an experiment from August 2007 to January 2008 in which it would release some DRM-free audio recordings to several audio download services, including Amazon.com, Best Buy, Google, Rhapsody and WalMart.<sup>74</sup> Several download sites were launched in August and September that offered EMI and Universal DRM-free recordings.

Universal and the other two major distribution companies, Sony-BMG and Warner, committed to sell a large number of audio recordings without DRM protection between late December 2007 and early January 2008, and the transition to offering a large inventory of DRM-free audio recordings by audio download services was complete in March 2008. In January 2009, Apple announced that it would sell audio recordings from all of the major distribution companies without DRM protection, and on April 1, 2009, a large repertoire of audio recordings could be purchased on iTS without DRM protection. As a result, audio files from many sites can be loaded, catalogued and played on an iPod, and DRM-free audio recordings from iTS can be played on other portable digital media players, although doing so requires using two digital media players.

The widespread availability of DRM-free audio downloads should have reduced the effects of Apple's alleged anticompetitive conduct. DRM-free audio recordings enable iPod users to buy audio recordings from competitors of iTMS. As time progresses, a larger proportion of a consumer's library, and all of the more recent acquisitions, will be in a DRM-free format. For some users, the value of older DRM-protected recordings probably will decline, in which case some users may decide that the

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<sup>74</sup> Colleen Bowen, "Universal Launches DRM-Free Music Test," *TWICE*, August 10, 2007, at [http://www.twice.com/article/258659-Universal\\_Music\\_Launches\\_DRM\\_Free\\_Music\\_Test.php](http://www.twice.com/article/258659-Universal_Music_Launches_DRM_Free_Music_Test.php).

loss of the ability to store and play an old audio recording on a portable digital media player is no longer an important reason not to replace an old iPod with another brand.

A key issue in determining the extent to which DRM-free audio downloads reduced the effect of lock-in is when DRM-free audio downloads from sites other than iTunes could be played without problems on an iPod. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Economic analysis can address whether Apple's conduct was anticompetitive or an example of superior efficiency. Costly creation of lock-in with no performance benefit for consumers is anticompetitive because it imposes costs on both society and the firm that pursues it while providing no offsetting benefits to consumers. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The

issue to be resolved in this litigation is whether the problem arising from using files from other audio download sites was common to all programs that accomplished the task of removing iPod's incompatibility with other formats for audio files, and whether the most reasonable (that is, least costly and most direct) resolution of the problem was to prevent

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75 [REDACTED]

iPods from playing audio recordings from any download site other than iTunes. Proof that Apple's conduct to maintain technical incompatibility was anticompetitive involves evidence about product performance and software upgrades that applies equally to all customers of each product, and so is common to all class members.

One element of the economic analysis of the allegations concerning the maintenance of technical incompatibility is to examine whether the technical incompatibility was costly to the defendant. The costs associated with the technical incompatibility have two components: direct cost and opportunity cost.

The direct cost is the incremental cost of creating incompatibility. The issue here is not that the defendant had to incur costs to implement its proprietary file format, but that the defendant was forced to incur additional costs for actions that had no purpose other than to create or maintain incompatibility. For example, the analysis would identify costs associated with defeating the capability of RealNetworks' Harmony to read files downloaded from iTunes while preserving FairPlay's DRM protection of these files.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] These records sometimes take the form of accounts of the time that systems analysts spent producing the new software. If Apple does not produce data of this form, another approach is to examine the code that accomplished the maintenance of the incompatibility between iPods and downloads from competitor to iTunes. This analysis can determine the extent to which incompatibility was created separately from other upgrades. Lines of code are also a rough indicator of the cost of software.

Opportunity cost refers to the sacrifice of sales in one product in order to create and maintain incompatibility between its competitors and the other product. One element of this analysis is whether iTunes experienced lower sales and profit margins as a result of the introduction of Harmony and then higher sales when Apple restored incompatibility between iPods and competing audio download vendors. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The analysis of the benefits, if any, and the costs of maintaining incompatibility pertains to the experiences of the defendant. This evidence would be identical for all class members.

### ***Harm to Competition***

In antitrust economics, “harm to competition” by a seller with market power refers to reductions in the welfare of consumers. In this litigation one alleged harm to consumers is higher prices for iPods. The *Amended Complaint* alleges that because it excluded actual and potential competition by updating its software to preclude interoperability, Apple was able to maintain its market power in the relevant markets longer than it otherwise would have been able to do. As a result, plaintiffs allege, the prices of iPods were higher than they would have been in the absence of the defendant’s

anticompetitive acts.<sup>76</sup> This effect is the source of damages, so the discussion of the quantification of this harm is discussed in the section about damages.

Consumers also can suffer financial harm in ways that normally are not included in the calculation of damages. One example is the “dead-weight loss” arising from higher prices.<sup>77</sup> Dead-weight loss is the loss of welfare arising from the reduction in output that occurs when prices exceed the incremental cost of production. An approximation of dead-weight loss is  $\frac{1}{2}(P_m - P_c)(Q_c - Q_m)$ , where  $P_m$  and  $P_c$  are the prices under monopoly and competition, and  $Q_m$  and  $Q_c$  are the quantities sold under monopoly and competition.

Another harm to consumers is that the defendant’s anticompetitive acts may reduce the intensity of competition among other firms in the market. These firms may charge higher prices for other products in the relevant market, either because they cannot take away a significant amount of business from dominant incumbents by lowering their prices or because the market power of dominant firms prevents them from achieving scale economies that would lead to lower prices if the market were more competitive.

In addition, consumers can be harmed in ways that cannot reliably be expressed in monetary terms. Technical incompatibility and lock-in harm competition by reducing the choices available to consumers. A consumer whose iPod is obsolete or no longer functional and who previously bought DRM-protected downloads from iTunes for use in the defunct iPod can not switch to another portable digital media player without taking one of three costly actions. First, the consumer can abandon the use of these downloads

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<sup>76</sup> *Amended Complaint*, pp. 16-17.

<sup>77</sup> Christopher R. Leslie, “Antitrust Damages and Deadweight Loss,” *Antitrust Bulletin*, Vol. 51, No. 3 (Sept. 2006).

on a portable digital player, thereby in essence throwing away otherwise useful recordings. Second, a consumer can repurchase the same recordings from another vendor at a substantial cost (approximately \$1 per recording). Third, the consumer can make physical copies of these recordings and then read them back into a personal computer as DRM-free files – assuming the consumer has purchased the electronic equipment necessary to pursue this path. To the extent that some consumers have undertaken one of these costly acts in order to switch, the costs are another anticompetitive harm arising from technical incompatibility.

Another harm to competition arises from the effect of lock-in on technological progress. The incentive to innovate is derived from the sales that a firm expects to make if it produces a new product with lower cost, higher quality and new features. Lock-in reduces a competitor's prospective sales from product innovation because switching costs drive a wedge between the value of the new product that is necessary to induce locked-in customers to switch and the lower value of the established, less desirable product. Hence, lock-in reduces the incentive to innovate. Thus, if the plaintiffs' allegations are true, technological innovation will be slower in all relevant markets than if competition were more intense.

The evidence to establish these harms to competition applies to product features and market outcomes (prices, sales, and entry and exit by competitors). Examples of such information are consumer surveys about decisions to replace a portable digital player and to patronize a particular online seller of legal downloads, informed opinions by industry participants and the trade press about product quality and the adoption of new technologies by vendors, data about costs, prices and quality of competitive products, and

histories of competitive products. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] All of this information is common to all class members.

### ***Business Justifications***

A business justification is a benefit to consumers arising from an act that also had the effect of reducing competition. Higher profits and greater sales are *not* business justifications. Instead, an act can be reasonable if it provides consumer benefits that can not be obtained by any reasonable alternative, less anticompetitive means.

The defendant's submissions in this litigation indicate that Apple will assert one or more of the following as a business justification. First, maintaining incompatibility between Apple's products and its competitor's products was justified because "Apple's products worked better together than with competitors' products."<sup>78</sup> Second, Apple was contractually obligated to remedy security breaches, and that "[i]f Apple did not stop those hacks, its ability to continue offering music to consumers would be jeopardized, depriving consumers of what plaintiffs concede is the 'huge benefit' of obtaining music on the iTunes Store."<sup>79</sup> Third, preserving the interoperability established by Harmony (or any other would-be competitor) would have required continued cooperation between

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<sup>78</sup> *Apple's Reply in Support of Motion to Dismiss or, Alternatively, for Summary Judgment*, p. 1.

<sup>79</sup> *Ibid.*

Apple and its rivals.<sup>80</sup>

Apple's asserted product quality justification is common in antitrust cases involving technological incompatibility. For example, in *U. S. v. Microsoft*, the defendant argued that it tied Internet Explorer to its Windows operating system for the purpose of technically integrating the two products and thereby providing higher quality. The plaintiff, the U. S. government, contested this claim by arguing that Internet Explorer was not integrated in any meaningful way into Windows, and in any case that bundling the two together actually reduced the quality of Windows.<sup>81</sup>

Apple's claim that the record labels wanted Apple to maintain incompatibility between iPods and other legal audio download sites is contradicted by the discovery record. [REDACTED]

[REDACTED] In addition, all four major record distribution companies have submitted declarations stating the same point.<sup>83</sup>

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>80</sup> *Ibid.*, pp. 1-2.

<sup>81</sup> For a more complete discussion of this issue, see *Findings of Fact, U. S. v. Microsoft*, U. S. District Court for the District of Columbia, and the decision in the same matter by the U. S. Court of Appeals for the District of Columbia.

<sup>82</sup> [REDACTED]

<sup>83</sup> *Declaration of Lawrence Kanusher* (Sony), *Declaration of Amanda Marks* (Universal), *Declaration of Mark Piibe* (EMI), and *Declaration of Howie Singer* (Warner).



In antitrust economics, damages are calculated by comparing actual prices for the reference product with prices that would have been charged in the “but-for” world in which the alleged anticompetitive acts had not occurred. A damage analysis estimates prices in a hypothetical more competitive market – the “competitive benchmark” – that would have been present during the historical period that damages occurred.<sup>85</sup> In discussing the methods for calculating damages, I assume that plaintiffs’ allegations about market definition, market power, sources of market power, and harms to competition other than through elevated prices for iPods have been proved, and that the remaining task is to quantify the effect of the defendant’s anticompetitive conduct on the prices for iPods that were paid by class members.

In analyzing damages in this matter, the task is to calculate the extent to which the alleged anticompetitive acts enabled the defendant to set higher prices for iPods than otherwise would have been charged if the market for portable digital media players had been more competitive. The competitive benchmark is not necessarily an intensely competitive market. Instead, it represents the degree of competition that would have been present had the anticompetitive acts not occurred, which in some circumstances is an oligopoly. Thus, a valid damage analysis must take into account that in the absence of the anticompetitive acts, Apple still may have enjoyed some market power in iPods.

### ***General Considerations in Estimating Damages***

The alleged class in this matter includes both end-users and intermediaries who

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<sup>85</sup> In their textbook Professors Kip Viscusi, Joseph Harrington and John Vernon state the general principle: “Standard antitrust practice is to calculate damages... as the additional revenue on the units sold.” W. Kip Viscusi, Joseph E. Harrington, Jr., and John M. Vernon, *Economics of Regulation and Antitrust*, 4th Edition, MIT Press, 2005, p. 145.

bought iPods from the defendant. These two types of customers paid different prices. Consumers paid retail prices from the online or traditional retail outlets of the Apple Store, while wholesale distributors and large retail competitors of the Apple Store paid reseller prices from Apple's wholesale distribution operation. Consequently, the method for calculating damages should take into account whether the product was sold at retail or wholesale. If markets are competitive, the wholesale and retail prices of a firm that operates in both markets differ according to the firm's sales costs in the two distribution channels; however, a firm that enjoys market power in manufacturing may have the power to engage in effective price discrimination among categories of buyers. Consequently, the amount of damages per unit sold may differ between retail and wholesale buyers.

The possibility of price discrimination among types of resellers raises the issue of whether damages are common among class members. Price discrimination by channel, which means differentiating among distributors, large retailers, and consumers who buy directly from Apple, can be taken into account by including the sales channel in an analysis of prices or profit margins by using an indicator variable for channel in the econometric estimation. Likewise, prices that differ according to the buyer power (if any) of a large purchaser, which in principle could apply to a few large resellers, can be taken into account by including the total sales to each buyer in the econometric model. In both cases, damages still are calculated from a common formula that takes into account the magnitude of price discrimination among buyers. Consequently, the presence of price discrimination does not prevent the use of a formula for calculating damages that is common to members of the class.

### *Methods of Damage Estimation*

Economists use three basic approaches to estimating competitive benchmark prices: “before-after,” “yardstick,” and “mark-up.”<sup>86</sup> My experience in other class action litigation provides further evidence that these methods are standard within the economic profession and in antitrust litigation. I have successfully proposed one or more of these methods for calculating damages in several class action antitrust cases dealing with many different types of products: luxury tableware,<sup>87</sup> dynamic random access memory

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<sup>86</sup> These approaches are described and widely accepted in scholarly writings in antitrust economics. Professors Roger Blair and David Kaserman devote a section of their text to damages calculation. They summarize the standard approaches in antitrust economics by stating that “the measure of damage is roughly equal to the wealth transferred to the monopolist from the buyers. Roger D. Blair and David L. Kaserman, *Antitrust Economics*, Richard D. Irwin, 1985, p. 78. They list “three basic theories or how one goes about measuring... overcharges” as the “before and after theory,” the “yardstick theory,” and the “market share theory.” *Ibid.*, pp. 78-79. (The last is only relevant to estimating the lost profits of a competitor that is harmed by anticompetitive conduct, so is not pertinent here.) The “yardstick approach to damage estimation is based upon a comparison of the plaintiff’s experience with that of a firm or market that was unaffected by the illegal activity... A plaintiff that is claiming damage due to overcharges may attempt to compare the prices it paid with those charged in similar markets where there was no antitrust violation.” The before-after and yardstick methods are described in John Johnson, “Economic Approaches to Antitrust Damage Estimation,” National Economic Research Associates, January 2005. All three methods (with the mark-up approach separated into three ways that it can be implemented) are discussed in John M. Connor, “Forensic Economics: An Introduction with Special Emphasis on Price Fixing,” *Journal of Competition Law and Economics*, Vol. 4, No. 1 (March 2008), pp. 31-59. According to Professor Connor: “The principle challenge for forensic economists is to calculate the relative competitive benchmark price...” *Ibid.*, p. 45. He then goes on to describe the principal methods of calculating damages as the “before and after method” (which he dates to the 1920s), the “yardstick method” (which he notes has been used in cases involving bread, milk and construction services), the “cost-based approach,” the “constant-margin approach” (which was used in the Vitamin E conspiracy), and the game theory method. *Ibid.*, pp. 46-53. His yardstick approach is the same method that I call the yardstick method, and his constant-margin and game-theory approaches are the methods that I call the mark-up test.

<sup>87</sup> *In re Tableware Antitrust Litig.*, No. 04-cv-3514 (N.D. Cal.).

(DRAM),<sup>88</sup> static random access memory (SRAM),<sup>89</sup> compact discs,<sup>90</sup> and repair and maintenance service for complex equipment such as high-speed photocopiers<sup>91</sup> and body imaging devices.<sup>92</sup>

I conclude that all of these methods can be implemented in this case. Although identification of the most reliable method depends in part on answers to inquiries about the data that have been produced, my expectation is that the yardstick method would be most difficult to implement because of data requirements for other products. I also conclude that each method would involve data and analysis that would be predominantly common to all class members.

#### *Before-After Method*

The “before-after” method compares prices of the reference product before and/or after the occurrence of the anticompetitive acts with prices during the damage period. Depending on the complexity of product variation and the frequency of price changes, this method sometimes is implemented by estimating an econometric model of price formulation, and sometimes is used by simple price comparisons in a table.

The damage period in this case begins when Apple allegedly upgraded the

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<sup>88</sup> *In re Dynamic Random Access Memory (DRAM) Antitrust Litig.*, No. M-02-1486 PJH (N.D. Cal.).

<sup>89</sup> *In re Static Random Access Memory (SRAM) Litig.*, No. 07-cv-01819 CW (N.D. Cal.).

<sup>90</sup> *Consolidated Compact Disc Antitrust Litig.*, No. 2:98-ml-01216-JSL (C.D. Cal.).

<sup>91</sup> *R&D Bus. Sys. v. Xerox*, No. 2:92-cv-00042-TH (E.D. Tex.).

<sup>92</sup> *Southeast Georgia Regional Med. Center vs. Gen. Elec. Corp.*, No. 2:99-cv-00381-AA (S.D.Ga.).

software on iPods and iTunes to disable RealNetworks' Harmony software in October 2004. The end of the damage period is March 31, 2009, when iTunes began to sell audio recordings from all of the major record distribution companies without DRM protection. In this case, the price effect of the alleged anticompetitive conduct is not likely to disappear when the alleged anticompetitive conduct ends because of the lock-in effect on iPod users, described above. Hence the "after" period is likely to exhibit a slow transition to the new price regime over the typical life-expectancy of an iPod.

Several events other than Apple's alleged anticompetitive conduct plausibly influenced the markets for audio downloads and portable digital media players since the introduction of the first iPod. The effects of these factors can be taken into account to detect the separate effect of the alleged anticompetitive conduct by using the general method of event studies, where indicator variables are used in an econometric model to measure changes in market conditions. The complicating factors are as follows.

Apple introduced the first iPod in 2001. While the initial versions of the iPod were successful, the iPod was not dominant in the market for portable digital media players. The initial event that caused Apple to obtain monopoly power in both audio downloads and portable digital media players was the launch of iTunes and an iPod that was the only portable digital media players that could play audio recordings in the FairPlay DRM system. These products were launched in April 2003. This period establishes the baseline for measuring Apple's market power in iPods that arose from the initial incompatibility between iTunes and competing portable digital media players. The *Amended Complaint* alleges that Apple subsequently maintained the market power that it enjoyed after April 2003 by engaging in anticompetitive conduct.

Two important events occurred in October 2003. First, iTunes became accessible on Windows-based personal computers, and second, the major record labels licensed competitors to sell audio downloads with DRM protection. During a transition period between October 2003 and February 2004, several Internet sites – including Napster, Rhapsody and WalMart – became fully operational as competitors to iTunes. By March 2004, iTunes had several competitors in audio downloads.

Harmony was introduced in July 2004. Harmony enabled many brands of portable digital media players, including iPods, to be compatible with the RealNetworks audio download service. Harmony converted files that used the RealNetworks Helix DRM protection into either the protected WMA or FairPlay format for use on an otherwise incompatible portable digital media player. The important aspect of Harmony for purposes of damage estimation is that it enabled iPod users to download audio recordings from a site other than iTunes. Harmony was operational until Apple's software upgrade of October 2004. RealNetworks apparently made another attempt in 2005 to restore Harmony's compatibility with iPods, but Harmony again was made incompatible with iPods and RealNetworks abandoned the product.

After October 2004 until May 2007 conditions were like those before July 2004. Although several download sites competed with iTunes during this period, incompatibility between these sites and iPods had been restored, and audio recordings downloaded from iTunes remained incompatible with portable digital media players that competed with iPods. Between May 2007 and March 2009 legal audio download sites made a gradual transition to DRM-free audio recordings. EMI allowed DRM-free downloads in April 2007, and iTunes began selling EMI selling audio downloads without DRM protection in May 2007.

Competitors to iTunes began selling some DRM-free downloads from EMI and Universal in August 2007. All four other major record companies allowed Apple's competitors to sell a complete digital repertoire of DRM-free downloads in January 2008, and by March 2008 this change in policy had been fully implemented. In January 2009, the major record distribution companies agreed to let iTunes sell DRM-free downloads, which was fully implemented on April 1, 2009. Competing audio download sites had an advantage compared to iTunes/iTunes until iTunes began to provide complete DRM-free downloads.

In addition to events affecting competition in the market, other factors also could affect the price of iPods. The demand for iPods is likely to depend on the availability of digital downloads, so that one factor affecting price changes for iPods over time may be the number of permanent downloads that are available on iTunes. Moreover, digital media players vary in their technical characteristics and, like all electronics products, experience rapid technological progress. To take technology into account, economists can undertake a regression analysis that explains the price of a product model in each time period as a function of product features, input costs, and the stage of the product in its life-cycle, as described above.

Apple's sales of iPods at retail are made at posted prices to all consumers who choose to buy directly from the defendant. [REDACTED]

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93 [Redacted]

94 [Redacted]

95 [Redacted]

96 [Redacted]

[REDACTED], which

obey “Moore’s Law” – the cost of a semiconductor device of given capacity falls roughly in half every 18 to 24 months.<sup>97</sup>

[REDACTED]

[REDACTED]

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[REDACTED]

<sup>97</sup> See [ftp://download.intel.com/museum/Moores\\_Law/Printed\\_Materials/Moores\\_Law\\_2pg.pdf](ftp://download.intel.com/museum/Moores_Law/Printed_Materials/Moores_Law_2pg.pdf) for a copy of Gordon Moore’s original 1965 diagram of the relationships among time, chip size and manufacturing cost.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Regardless of whether a firm enjoys market power, the price of a product is determined in part by its variable cost. Falling prices do not necessarily indicate diminished market power, and rising prices do not necessarily indicate increasing market power, if variable costs also are changing. In addition, a new technical feature that is valued by consumers and unavailable from competing producers can enhance the market power of the innovating firm. Rising market power due to innovation is not anticompetitive, and price increases that reflect unique product attributes should not be included in calculating damages.

To take into account the effect of costs and technical specifications, the before-after price model should include measures of costs and the technical features of a product in each damage period, which can lead to different damages for different time periods during the class period. In selecting the appropriate time interval, economists must take into account data availability. A shorter time interval can take into account short-term volatility in costs and frequent changes in technology, but inevitably shorter periods lead to reduced reliability of estimates because the number of observations per time period is smaller. For Apple, semiconductor component prices change relatively frequently (every few weeks), so that the relatively short time period of a month is appropriate for taking

cost changes into account. [REDACTED]

[REDACTED] But certainly the formula

for calculating damages must take into account each model's cost when the initial price is set or subsequently changed, whether the model has been discontinued and so has end-of-life pricing, and the model's technical characteristics.

*Yardstick Method*

The "yardstick" method estimates the competitive benchmark from the prices of other products that are subject to similar underlying market forces except for the effects of the anticompetitive acts. The basic approach is to use prices or price-cost margins of yardstick products, correcting for variations due to technical features, as the benchmark

for the product for which anticompetitive conduct is alleged. The validity of this method depends on identifying other consumer electronics products that have similar technical capabilities, that are free from distortions due to anticompetitive conduct, and that plausibly have a market structure that is similar to the market structure for portable digital players that would have arisen in the but-for world.

The best candidates for yardstick comparison are products that are technically and functionally similar to iPods. Several products plausibly can serve as benchmarks for at least part of the damages period. One candidate is smart mobile telephones that do not have sufficient memory and power to be used as portable digital media players, but that can be used to access the Internet for streaming audio and video. Another candidate is a personal digital assistant (PDA) that is not equipped to be a mobile telephone and that does not have sufficient memory to be used as a portable digital media player, but that can be used as a small personal computer, has access to the Internet, and can be used for streaming entertainment. Both of these products have converged in 3G mobile telephones, which are not appropriate yardsticks because they also are portable digital media players. Another candidate is portable CD/DVD players with small screens, such as the Cody TF-DVD500 3.5 inch Portable DVD player.

A difficulty with the yardstick approach is the requirement to find other products that constitute a reliable basis for comparison, and then collecting data from third parties to support the analysis. For wholesale direct purchasers, the yardstick approach would require extensive third-party discovery of prices, costs and technical features of comparable products, and then a price analysis that isolates the relationship between cost and price. Because of the complexity of the method for highly differentiated products

like consumer electronics, the yardstick method is not likely to be the most cost-effective method for establishing a competitive benchmark for wholesale purchasers of iPods.

For retail direct purchasers, a form of yardstick analysis is more practical and is a plausible, reliable method for developing a competitive benchmark. Normally other products that are sold in the same market can not be used as yardsticks for a reference product. In the case of a dominant firm with a competitive fringe, which is the market structure for portable digital media players that is implied by the plaintiffs allegations, fringe firms might simply follow the price leadership of the dominant firm so that all prices are elevated equally. The portable digital media player market could behave differently if the alleged anticompetitive conduct has eliminated most competition between iPods and other devices, but competition among the other devices is robust. If, as the plaintiffs allege, lock-in of consumers of Apple's reference products is an important factor explaining price performance in the relevant market, it is possible that other firms in the market for portable digital media players compete intensely with each other for customers who are not locked in, while Apple and other vendors of portable digital players do not really compete intensively. In this circumstance prices from fringe firms would be lower than the prices of comparable Apple products, and would provide a lower bound estimate of the effects of the alleged anticompetitive acts.

For the most part, manufacturers of these yardstick products do not have significant direct sales to consumers; however, because [REDACTED]  
[REDACTED]  
[REDACTED] The yardstick method

can be implemented by collecting retail prices and technical specifications for the most important (based on market share) competing portable digital media players. These data would then be used to estimate a price equation that includes technical features as explanatory variables, plus an indicator variable for Apple that is interacted with the event periods described above.

[REDACTED]

#### *Mark-up Method*

The “mark-up” method directly estimates the competitive benchmark mark-up over average operating cost in the but-for world. The competitive benchmarks that economists commonly use are the defendant’s mark-ups in more competitive markets, typical mark-ups (operating profits) in the same industry (here, consumer electronics), or the results from a game theoretic model of price formulation in the relevant market.

The first two mark-up approaches use accounting data for revenues and operating costs. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Product-line financial information is included in Apple’s audited financial reports that are submitted to the Securities and Exchange Commission. These data can be used to compare Apple’s operating margins by product line. Similarly, the public financial reports of other consumer electronics firms can be used to produce benchmark estimates of profit margins by product line.<sup>99</sup>

To account for the possibility of price discrimination between wholesale and retail customers, data about operating margins and costs need to be collected by distribution channel. While each channel has the same direct costs of manufacturing, they have different sales costs that need to be taken into account to determine whether Apple engages in price discrimination between its retail and wholesale customers. As described more completely elsewhere, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>99</sup> See, for example, “AAPL: Weak Macro Environment; Downgrading on Poor Risk/Reward,” Morgan Keegan Company, April 7, 2008.

[REDACTED]

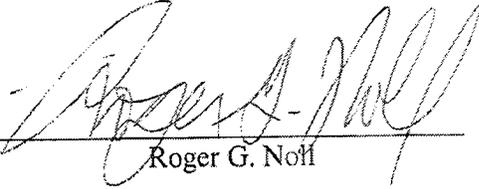
[REDACTED]

[REDACTED]

To implement a game-theoretic model of price formulation requires information about the prices and variable production costs of different models of iPods at both the wholesale and retail level throughout the data period. Here the wholesale data are used to calculate a wholesale price index for all wholesale customers over the class period. These models calculate the effect of market concentration on the mark-up of price over unit costs. The benchmark prices are calculated using the market concentration in portable digital media players that would have occurred in the absence of the anticompetitive acts. Thus, the validity of the method hinges on accurately estimating market concentration in the but-for world and using a valid theoretical model to characterize the nature of price formation. The former is deduced from the extent of concentration in other consumer electronics markets. The latter normally is based on the Nash-Cournot model of imperfect competition, as calibrated to fit the actual price data given actual market concentration during the damage period.

As with the other methods, the mark-up method will produce two common formulas for calculating damages to retail and wholesale buyers. Each will make use of the same data about product and market characteristics, combined with data about prices and costs in each channel.

I declare that the foregoing is true to the best on my knowledge. Executed on January 18,  
2011, in Palo Alto, California.



Roger G. Noff

CERTIFICATE OF SERVICE

I hereby certify that on January 18, 2011, I authorized the electronic filing of the foregoing with the Clerk of the Court using the CM/ECF system which will send notification of such filing to the e-mail addresses denoted on the attached Electronic Mail Notice List, and I hereby certify that I caused to be mailed the foregoing document or paper via the United States Postal Service to the non-CM/ECF participants indicated on the attached Manual Notice List.

I certify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on January 18, 2011.

s/ Bonny E. Sweeney

BONNY E. SWEENEY

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