

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN JOSE DIVISION

APPLE IPOD ITUNES ANTI-TRUST
LITIGATION

Lead Case No. C-05-00037-JW

**Reply Declaration of Roger G. Noll
REDACTED**

My name is Roger G. Noll, and I reside in Palo Alto, California. Previously I submitted declarations in the matter concerning class certification, most recently the *Declaration of Roger G. Noll* (henceforth *Noll Report*) of January 18, 2011.

Attorneys for the plaintiffs have asked me to review the *Expert Report of Dr. Michelle M. Burtis* (henceforth the *Burtis Report*) to determine whether anything in that report causes me to alter any of the analysis or conclusions in the *Noll Report*. In undertaking this assignment, I also have read *Apple's Opposition to Renewed Motion for Class Certification* (henceforth *Apple's Opposition*) and the most recent deposition of Dr. Burtis on March 14, 2011 (henceforth *Burtis Declaration*).

Apple has provided substantial additional information about its [REDACTED] [REDACTED], since the submission of the *Noll Report*. While the process of clarifying and cleaning the data remains incomplete, sufficient progress has been made to support a preliminary regression analysis of Apple's wholesale prices, which is reported here. This analysis shows conclusively that (1) virtually all of the variation in prices of iPods across models and over time can be explained in a linear regression analysis and (2) the before-after method of calculating the effect of Apple's

conduct can be implemented. I conclude that none of the statements in the *Burtis Report* and *Apple's Opposition* are consistent with my statistical analysis of wholesale prices, and nothing in either document causes me to alter any of the analysis and conclusions in my prior report. This reply declaration explains the basis for these conclusions.

REVIEW OF THE *BURTIS REPORT* AND *APPLE'S OPPOSITION*

This section analyzes the main arguments pertaining to an antitrust economic analysis of liability and damages in this matter that are contained in the *Burtis Report* and *Apple's Opposition*. Most of the assertions in these documents are variations on two ideas. The first is that rapid technological evolution of iPods and the uneconomic nature of Apple's pricing decisions make a traditional econometric analysis of Apple's actual transactions for the purpose of calculating damages essentially impossible.¹ The second is that the *Noll Report* is insufficiently clear about how damage calculations would be implemented after the reorientation of the plaintiffs' allegations from the implementation of Apple's FairPlay digital rights management (DRM) system to Apple's attack on RealNetworks' Harmony, which eliminated the incompatibility between iPods and audio download sites that used the RealNetworks DRM system.

The ultimate test of the validity of these arguments is whether an economic analysis of iPod prices can reliably quantify damages to class members. The next section provides a regression that explains nearly all of the variation in wholesale iPod prices on the basis of technical characteristics and costs of iPod models plus conditions in the

¹ Dr. Burtis states that empirical analysis to calculate damages is so difficult that "I don't think that that method will work," but she also states that "I don't know that it's impossible. I can't think of how one is going to do it." *Burtis Deposition*, pp. 69-71.

market. This regression analysis includes an implementation of the “before-after” test that was described in the *Noll Report*. The results demonstrate the feasibility of this method for calculating damages that was described in my prior reports.

This section focuses on the accuracy of the *Burtis Report* and *Apple’s Opposition* in describing the analysis that is contained in the *Noll Report* and the validity of the economic assertions in both of the defendant’s submissions.

Overview of the Burtis Report

A striking feature of the *Burtis Report* is that it does not state the basis for its conclusions in either facts or economic analysis. The *Burtis Report* contains no analysis of the data that Apple has produced about iPod sales, costs and transactions prices,² and makes no reference to discovery about Apple’s pricing decisions and Apple’s reaction to the introduction of Harmony. The *Burtis Report* also offers conclusions about methods for assessing liability and calculating damages without citing sources in antitrust economics that support its assertions.

Dr. Burtis presumably had access to data about Apple’s revenues, costs and pricing decisions for at least a month longer than I did before submitting the *Noll Report*, but the *Burtis Report* does not discuss any of this information, let alone analyze the extent to which this information supports its conclusions. For example, in discussing the possible effect of Harmony on prices, [REDACTED]

² Dr. Burtis states that she thought only retail price data were relevant (*Burtis Deposition*, pp. 45-6). [REDACTED]

[REDACTED]³ Dr. Burtis did not review

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED].⁴ The *Burtis Report* does not mention, let alone challenge, [REDACTED]

[REDACTED]

Dr. Burtis also makes economic assertions that have no foundation in scholarly publications. For example, Dr. Burtis states:

“Plaintiffs’ theory is fundamentally different from more typical antitrust cases in which a direct purchaser claims that as a result of price-fixing or another antitrust violation, a defendant raised prices at a particular time and that prices from the point until the end of the conspiracy were unlawfully elevated as a result.”⁵

Dr. Burtis apparently believes that a monopoly maintenance claim is both atypical and “fundamentally different” from a monopoly acquisition claim, but the *Burtis Report* provides no citations to any work in antitrust economics or any other source to show that this claim has any substantive basis.

Monopoly maintenance cases are not atypical. For example, many antitrust cases against Microsoft between the mid-1990s and mid-2000s, including several class actions, alleged maintenance of a monopoly in PC operating systems. These complaints alleged that Microsoft acquired monopoly power in the 1980s through superior efficiency but

³ *Burtis Report*, pp. 6-7.

⁴ *Ibid.*, p. 13.

⁵ *Ibid.*, p. 6.

then maintained monopoly power after competition emerged around 1990 by engaging in exclusionary acts that, among other things, locked-in consumers to Microsoft Windows.⁶

An older canonical example of monopoly maintenance is *U.S. v. AT&T*, in which an almost complete national monopoly in telecommunications services that was legally acquired and extensively regulated was alleged to have been maintained as a result of anticompetitive conduct after regulators decided to permit competitive entry.⁷

Monopoly acquisition and monopoly maintenance are not substantively different. Both cases can involve a period of transition (for monopoly acquisition, a period in which market power and prices rise due to anticompetitive conduct, and for monopoly maintenance a period when market power and prices would have declined in the absence of anticompetitive conduct). In both cases, economic analysis must determine the baseline competitive price, the equilibrium monopoly price, and the transition process between the two.

⁶ I served as an expert in direct purchaser class actions against Microsoft in California, Iowa and Minnesota, all of which settled prior to the termination of litigation with substantial payments to purchasers of Windows. I am a co-author of two *amicus* submissions in *U.S. v. Microsoft* that contain a comprehensive economic analysis of liability and relief issues. See “Remedies Brief of *Amicus Curie*,” co-authors Robert Litan, William Nordhaus and Frederic M. Scherer, *U.S. v. Microsoft*, U.S. District Court for the District of Columbia, April 2000, available regulation2point0.org/wp-content/uploads/downloads/2010/04/brief.pdf, and “Comments on Revised Proposed Final Settlement,” co-authors Robert Litan and William Nordhaus, *U.S. v. Microsoft*, U.S. District Court for the District of Columbia, January 2002, available at www.brookings.edu/~media/Files/rc/reports/2002/01_judgment_litan/01_judgment_litan.pdf.

⁷ I served as an economic consultant to the Antitrust Division of the U.S. Department of Justice on this case, and am a co-author of two articles that discuss the case in detail. See Roger G. Noll and Bruce M. Owen, “The Anticompetitive Uses of Regulation: *U.S. v. AT&T* (1982),” in John E. Kwoka, Jr., and Lawrence J. White (eds.), *The Antitrust Revolution*, Scott. Foresman, 1988, and “*U.S. v. AT&T*: An Interim Assessment,” in Stephen P. Bradley and Jerry A. Hausman (eds.), *Future Competition in Telecommunications*, Harvard Business School Press, 1989.

An important implication of the assertions by Dr. Burtis about the difficulty of estimating damages in a monopoly maintenance case involving lock-in is that these arguments are not related to class certification. If a single plaintiff sued Apple over disabling Harmony, Dr. Burtis' arguments about the impossibility of establishing a competitive benchmark and estimating the transition to a but-for world that had no lock-in effect would apply with equal force. The argument in the *Burtis Report* amounts to the claim that no damages can be calculated to compensate for anticompetitive conduct that causes a defendant's monopoly power to decline more slowly than otherwise would have occurred. I am aware of no support in antitrust economics for this argument.

Effect of Harmony Period

According to Dr. Burtis, the *Noll Report* does not identify when the damage period began because it identifies two opposing effects of the introduction of Harmony.⁸ One effect was to increase the value of iPods to consumers because iPods could be used to access audio content on download sites other than the iTunes Music Store (iTMS). The other effect is to reduce the lock-in of iPod users, thereby increasing competition for replacement of an older iPod. Dr. Burtis argues that if the immediate effect of Harmony made iPods more attractive, then “inferentially” the prices of iPods would have increased in response to greater demand until later, when the effect of lock-in would have dissipated and competition against iPods was more intense.⁹

Apple's Opposition reiterates this theme, stating: “Plaintiffs do not demonstrate

⁸ *Burtis Report*, pp. 2-3, 5-6.

⁹ *Ibid.*, p. 5.

that any class-wide method exists to discern whether the alleged long-term impact ever occurred or, if so, when it occurred.”¹⁰ According to the *Apple Opposition*, the *Noll Report* does not explain when the “initial” effect (iPods more valuable) would be offset by the “long-run” effect from less lock-in.¹¹

Dr. Burtis characterizes the *Noll Report* as arguing that Harmony should have caused a short-run increase in iPod prices.¹² Dr. Burtis asserts that as a result “some proposed class members would not have been impacted and some may have benefited from the challenged conduct” because “according to Professor Noll, impact did not occur until some undetermined ‘long-run’ after an initial period of increased demand for iPods... According to Professor Noll, the demand for iPods... initially would have been higher, which (under Professor Noll’s logic) would mean that iPod prices during that time period would have been higher than they actually were.”¹³

The characterizations of the *Noll Report* in *Apple’s Opposition* and the *Burtis Report* are incorrect. The *Noll Report* actually says the following.

“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%. Thus, the initial effect

¹⁰ *Apple’s Opposition*, p. 1.

¹¹ *Ibid.*, p. 5.

¹² Dr. Burtis also states that the release of Harmony “is claimed” to have caused the price of iPods either to increase or not to decline as rapidly as otherwise would have been the case, and that disabling Harmony caused the iPod prices to decrease. *Burtis Report*, p. 6. The *Noll Report* does not make either claim, either directly or inferentially.

¹³ *Ibid.*, p. 20-1.

of Harmony was to reduce the market share of iTunes.

The long run effect of Harmony is 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...¹⁴

“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 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.”¹⁵

As stated above, the *Noll Report* does not state that the immediate effect of the release of Harmony should have been to increase iPod prices. The argument in the *Noll Report* is that switching costs began to decline immediately (“[a]t the same time”) due to the initial market impact of Harmony on iTunes sales, and would have declined steadily thereafter had Harmony not been disabled. The *Noll Report* does not state that the positive effect of Harmony would have caused iPod prices to increase in some ambiguous “short run” and then to decline in some equally ambiguous “long run.” Instead, the argument in the *Noll Report* is that Harmony had the one-time, immediate effects of making iPods more attractive and creating a competitor to iTunes for downloads to iPods, and then had a continuing and growing effect to erode lock-in. The net impact of these offsetting effects on prices may have been either positive or negative immediately after

¹⁴ *Noll Report*, p. 54.

¹⁵ *Ibid.*, p. 57.

Harmony was released, but the net effect can be determined only by empirical analysis.

Dr. Burtis is incorrect as a matter of economic theory to claim that the positive effect of Harmony on the value of iPods necessarily would lead to higher iPod prices for some period after Harmony was introduced. The reason is that economic theory provides no robust predictions about whether Apple's best response to Harmony was to raise or lower iPod prices. In short, the assertion that, according to the economic analysis of the Harmony launch in the *Noll Report*, the immediate "short-run" effect would have been a price increase, followed eventually by price reductions, is an incorrect assumption by Dr. Burtis that has no basis in either the *Noll Report* or economic theory.

The erosion of the lock-in effect would cause the market demand for iPods to become increasingly price-elastic as the audio libraries of some iPod customers contain higher proportions of files that can be played on another portable digital media player, and a higher price-elasticity of market demand would cause lower prices. In addition, if Apple cut the prices of iPods as soon as Harmony was released, the resulting increase in iPod sales would cause an increase in the number of portable digital media players that could acquire audio files from iTunes. Lower iPod prices would prevent the loss of market share to Rhapsody, and hence reduce the rate at which lock-in was being eroded. Thus, from the moment Harmony was launched, Apple had conflicting profit incentives. If the demand-enhancing effect of Harmony on iPods was small compared to the effect on iTunes sales and the reduction of lock-in, Apple's best response to Harmony would be to drop iPod prices when Harmony began to cause iTunes to lose market share.

In the end, whether Apple's best immediate response to Harmony was to increase or to reduce iPod prices is an empirical matter, not a theoretical one, because it reflects

the net effect of offsetting incentives. The issue can be resolved only by empirical analysis of prices during the period when Harmony was available and then after Apple disabled it.

The *Burtis Report* contains a discussion of when the period in which Harmony affected audio downloads and the markets for iPods came to a close.¹⁶ Dr. Burtis notes that Harmony was disabled only for new iPod owners or owners of old iPods who updated their iPod software. [REDACTED]

[REDACTED] As a result, Harmony could have been used by some iPod owners after the updates disabled it on other iPods. Thus, Dr. Burtis concludes that Harmony could have reduced lock-in of iPod users for some time after the time that Apple began to disable it.

Dr. Burtis and I agree that Harmony probably did affect the demand for replacement iPods after the date that iPod upgrades disabled it. We also agree that some iPod users who used Harmony no longer suffered lock-in when they considered replacing an old iPod, and that Harmony continued to cause the price-elasticity of demand for iPods to be greater than if Harmony had not been introduced. But this analysis has no fatal consequence for either the calculation of damages or the suitability of this complaint for class certification.

As stated in the *Noll Report*, distinguishing the period after Harmony was disabled from the period when it was fully operational takes into account the possibility that Harmony had a continuing effect on iPod prices after Apple released the software updates that disabled Harmony. The fraction of all iPods that could access an alternative

¹⁶ *Burtis Report*, pp. 9-10.

to iTunes using Harmony fell after Apple released software upgrades that disabled Harmony because some iPods were upgraded and newly purchased iPods blocked Harmony. The effect of Harmony on lock-in and iPod prices after the upgrades were released necessarily was smaller than Harmony's effect would have been if the upgrades had not been released and new iPods had not blocked it. If the plaintiffs' allegations are true, iPod prices were higher after Apple disabled Harmony; however, if Harmony was not disabled for all iPods, Apple was unlikely to have recovered all of the price-reducing effect of Harmony after disabling it.

Dr. Burtis also is incorrect to infer that class certification is inappropriate because of the diversity of class members in the extent to which they used Harmony and were directly affected by Apple's software upgrades. *Apple's Opposition* asserts that somehow the identity of the consumers who used Harmony to purchase audio downloads is an essential element to undertaking an economic analysis of the price effect of the introduction of Harmony and its disabling through iPod software upgrades.¹⁷ According to the defendant, "[a] customer who had no interest in purchasing a different player or who was not prevented by the updates from doing so would not have suffered any injury."¹⁸ This assertion is economic nonsense.

The damage to a class member in this case is the overcharge on an Apple iPod that was made possible by disabling Harmony and thereby preventing iPod owners from using Harmony to buy audio downloads from sites other than iTunes. [REDACTED]

[REDACTED] All

¹⁷ *Apple's Opposition*, pp. 9-10.

¹⁸ *Ibid.*, p. 19.

consumers who bought an iPod at retail from Apple suffered exactly the same damage, regardless of whether their libraries of audio files contain downloads from iTunes and/or from other download sites, or whether they have the slightest interest in buying another portable digital media player instead of an iPod. [REDACTED]

[REDACTED]

[REDACTED]

The error in the *Burtis Report* and *Apple's Opposition* is a fallacy of composition. Dr. Burtis apparently believes that because different consumers experience different degrees of lock-in, "in order to figure out the price effect" I (meaning the person who calculates damages) must "figure out... who was locked in, how many people were locked in... So whether or not an individual is impacted by that price effect is going to require some kind of analysis of some individual's lock-in."¹⁹ Dr. Burtis is incorrect that because individuals differ in the magnitude of their switching costs (and hence their lock-in), a damage model must be based on individualized information.

For many reasons individual consumers differ in the extent to which they are price-sensitive in deciding whether to purchase an iPod. After Harmony was introduced, one of many sources of individual differences in the price-sensitivity of demand for iPods was that not all iPod users made use of Harmony, just as not all iPod users make use of iTunes. But price is determined by the price elasticity of *market* demand. While market demand is the sum of individual demands, the aggregation of individual demands into a market demand leads to a single price for each model for all buyers. Differences in the extent of lock-in among consumers do not lead to individualized damages because all

¹⁹ *Burtis Deposition*, p. 108.

consumers who bought iPods paid the same price regardless of whether they were directly affected by disabling Harmony. Consequently, diversity among consumers in the degree to which they suffered from lock-in does not mean that all consumers who purchased an iPod from Apple were not equally damaged by the overcharge.

The relevant point concerning lock-in is whether a significant number of iPod users valued freeing themselves from being locked-in to the FairPlay DRM system. One indicator that many consumers did value having audio files that were usable on other portable digital media players is the success of Harmony in reducing the market share of iTunes before Harmony was disabled. Another indicator is the response of iPod owners to the opportunity to convert their audio files to DRM-free versions for 30 cents per song.

On March 25, 2011, three days before this report was due, [REDACTED]

[REDACTED] These data are shown in Exhibit 1.²⁰ Apple began the transition to DRM-free files for all audio recordings in January 2009, although it offered some DRM-free files beginning in 2007. [REDACTED]

[REDACTED]

²⁰ [REDACTED]

²¹ Dr. Burtis had not seen these data [REDACTED]

Adequacy of Pre-iTMS Period as Benchmark

According to Dr. Burtis, the period before the introduction of iTMS is not an appropriate competitive benchmark for several reasons: too little price variation, too many changes in iPod models, and a different market structure than the post-Harmony period.²² The first two assertions amount to reasons why Dr. Burtis believes that a reliable econometric analysis of iPod prices is essentially impossible. Dr. Burtis is incorrect to assert that estimating reliable price equations is unlikely to work for rapidly evolving consumer electronics products, but the best way to resolve our disagreement is to estimate price regressions from [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Here I focus on the third argument, which is whether the market structure in the pre-iTMS period is appropriate and, by implication, whether Apple should be required to produce sufficient information to use this benchmark in subsequent econometric analysis. The argument put forth by Dr. Burtis is the following.

“Plaintiffs’ but-for world is one in which they claim that Apple would hold legally obtained ‘market power’ that was decaying over time. In the pre-ITS period, however, no company is alleged to have had any market power. This fundamental difference precludes use of the pre-ITS period as a ‘before’ period in this case.”²³

[REDACTED]. *Burtis Deposition*, pp. 89-90.

²² *Burtis Report*, p. 3.

²³ *Ibid.*, p. 3. Dr. Burtis refers to iTMS as iTS in all periods. iTMS was renamed the iTunes Store (iTS) when it began selling products other than audio files.

“Plaintiffs do not assert that Apple had any market power at all in the period before iTunes was launched – let alone market power that was decaying over time. Prices charged in that period are thus not an appropriate measure of what prices would have been years later in a world in which Apple lawfully possessed market power that was being eroded.”²⁴

Dr. Burtis then asserts that “Professor Noll appears to recognize this problem with his theory” when I state that the but-for world plausibly is an oligopoly.²⁵

Dr. Burtis is incorrect that the *Noll Report* states or implies that Apple lacked market power prior to the launch of iTunes. The *Noll Report* explains how economists determine whether a firm has market power, and whether that market power has increased or decreased over time. [REDACTED]

[REDACTED], I concluded that the increase in the profitability of iPods “shows that Apple enjoyed substantially greater market power in iPods after the launch of iTunes.”²⁶ I did not state that Apple enjoyed no market power before iTunes was launched, and in fact in my reports and depositions I have expressed my expectation that Apple is likely always to have enjoyed market power in iPods, including the period before iTunes was launched, due to its technological innovations in portable digital media players.

For purposes of class certification, the role of economic analysis is not to determine whether Apple had market power in iPods in any particular period, but to explain how an economist would go about analyzing market power, as well as other liability issues, and whether these methods are predominantly common to members of the

²⁴ *Ibid.*, p. 12.

²⁵ *Ibid.*, p. 12.

²⁶ *Noll Report*, p. 45.

class. Dr. Burtis apparently believes that Apple did not have market power in iPods prior to the launch of iTunes. Our disagreement here is *not* over whether Apple's pre-iTunes market power can be proved by methods that are common to class members, but about the conclusion that will emanate from such an analysis.

Notwithstanding that the *Noll Report* does not conclude that Apple lacked market power in iPods before iTunes was launched, if further analysis concludes that Apple did lack market power in this period, that result creates no "problem" for using the pre-iTunes period as a benchmark. Dr. Burtis, by focusing on whether Apple enjoyed any market power before iTunes was launched, creates confusion about the real issues in estimating damages. The relevant question pertaining to whether the pre-iTunes period is an appropriate benchmark is not how much market power Apple enjoyed prior to the launch of iTunes, but whether the market power Apple did enjoy is comparable to the market power that Apple would have enjoyed in the but-for world in which Harmony had not been disabled and the lock-in effect had been eliminated.

Dr. Burtis argues that the analysis in the *Noll Report* implies that the introduction of iTunes had an immediate effect on Apple's market power in iPods due to the lock-in effect of the FairPlay DRM system, whereas the alleged effect of Harmony was to erode the lock-in effect, which would have caused a gradual decline in Apple's prices. Dr. Burtis' rejection of the pre-iTunes period as a valid benchmark is based in the distinction between a sudden increase in market power due to iTunes versus a gradual decline in market power due to Harmony.

I disagree with Dr. Burtis about whether the pre-iTunes benchmark is valid for two reasons. The first is that Dr. Burtis' analysis of the effect of the iTunes launch on lock-in

is incorrect, and the second is that, regardless of whether Apple had market power in the pre-iTMS period, Apple's market power in iPods, taking into account iPod technology, should be similar before iTMS was launched and after the lock-in effect was eliminated.

The goal of a hedonic regression is to separate the effect of technology from the effect of lock-in on Apple's market power in iPods. Dr. Burtis and I agree that Harmony and later DRM-free downloads would cause the effect of lock-in to decline. Likewise, the effect of lock-in after the launch of iTMS, and later after the disabling of Harmony, would be expected to grow. The reason is the same: Apple's ability to exercise market power in pricing iPods depends on the price-elasticity of demand for iPods, and lock-in causes higher prices because it reduces this elasticity. The magnitude of the lock-in effect depends on the value of the audio files that can be played only on an iPod and the fraction of total iPod sales that are accounted for by replacement purchases. The price-elasticity of demand for iPods that are purchased by new users of portable digital media players is greater than the price-elasticity of replacement demand because only the latter is affected by lock-in. The price-elasticity of demand for replacement iPods also is greater if owners of old iPods have more audio files that can be played on a competing brand of portable digital media players.

The adoption of FairPlay on iTMS did not instantaneously create lock-in. For two reasons, early users of iTMS could not possibly have accounted for a significant share of sales of portable digital media players immediately after iTMS was launched. First, early iTMS users only gradually accumulated libraries of valuable DRM-protected iTMS audio files, so they would not have suffered lock-in immediately upon the launch of iTMS. Second, only after the passage of time would early users want to replace the iPods that

they used to play iTunes files. Thus, the immediate impact of iTunes was to increase the demand for iPods compared to other portable digital media players because only iPods could play files that were downloaded from iTunes. As time progressed the lock-in effect became more important.

Plaintiffs' initial complaint alleged that the impact of iTunes on the price of iPods constituted anticompetitive harm to consumers. Regardless of whether Apple's DRM system was anticompetitive, its effect on iPod prices has two components: the effect of the uniqueness of iTunes on the demand for iPods when it was introduced in April 2003, and the subsequent effect arising from lock-in that was created by FairPlay. The first component arises from the fact that iTunes was the first download site to offer a large catalog of recordings from the major distribution companies. The second component arises from the inability to play files that were downloaded in the FairPlay format on other models of portable digital media players without incurring a substantial cost.

The amended complaint no longer alleges that these effects are anticompetitive. Nevertheless, the rise of iPod prices after the iTunes launch remains a measure of the amount by which iPod prices would fall after entry of compatible audio download sites that offer comparable arrays of audio files. In short, Harmony made Rhapsody a competitive substitute for iTunes among iPod users, which reduced Apple's market power in iPods through a process that is the mirror image of the process by which Apple's market power increased due to the introduction of iTunes and the lock-in due to FairPlay.

As discussed in the *Noll Report*, the procedures for identifying whether a firm has market power do not hinge on the source of a firm's market power. Thus, the analysis to determine Apple's market power prior to the launch of iTunes, after iTunes was launched,

after Harmony was launched, after Apple disabled Harmony, after other audio download sites began to sell DRM-free files, and after the renamed iTunes Store (iTMS) began to sell DRM-free files, does not hinge on whether the market power Apple enjoyed in any of these periods was due to superior efficiency or anticompetitive conduct. Only the conversion of the price effects of market power to damages hinges on this distinction.

The pre-iTMS period is a useful benchmark because in this period Apple enjoyed no benefits from the unique compatibility of iPods with the only source of legal audio downloads from the major record distribution companies or from lock-in due to its DRM system. During this period Apple plausibly benefited from the technical advantages of iPods in comparison with competitors. The value of the pre-iTMS period as a benchmark is that it provides a baseline estimate of the prices for iPods in a market in which the FairPlay DRM system had no effect on the demand for replacement of iPods.

The essence of the plaintiffs' allegation is that if Harmony had not been disabled, the uniqueness of iTMS and the lock-in due to FairPlay would have been eliminated as a source of Apple's market power in the same fashion that the iTMS launch created market power. Had Harmony not been disabled, plaintiffs allege that Apple would have returned to the market conditions of the pre-iTMS period when its market power hinged solely on its technical advantages. Whereas the iPod's technical advantages in the post-Harmony period may differ from the pre-iTMS period, one purpose of a hedonic price regression is to adjust prices for technical characteristics in order not to attribute falsely the market power arising from technical advantages to the market power arising from the continuing lock-in effect after Harmony was disabled.

Dr. Burtis also raises the issue of the uncertain duration of the period in which the

lock-in effect would have been eroded by Harmony, and hence the speed with which iPod prices would have fallen due to the erosion of lock-in. Another value of the comparison between the pre-iTMS period and the period immediately after iTMS was launched is that it provides an opportunity to see whether iPod prices actually did increase gradually or quickly after iTMS was launched due to the lock-in effect. The rate at which lock-in is created or destroyed, and the resulting time-path of prices that reflect the extent of lock-in, cannot be determined by a purely theoretical analysis. Both the creation and the destruction of lock-in depend on the values that consumers assign to libraries of audio files that are protected by the FairPlay DRM system. Just as iTMS was the source of lock-in, Harmony eroded lock-in. By eliminating the incompatibility between iPods and download services that used RealNetworks' DRM system, Harmony allowed iPod users to acquire files that could be used on competing portable digital media players. How rapidly Harmony increased the price-elasticity of the market demand for iPods due to its erosion of lock-in can only be determined empirically.

The preceding argument does not imply that the launch of iTMS and the introduction of Harmony necessarily caused a gradual rise and fall, respectively, in iPod prices for two reasons. First, a purely theoretical argument cannot establish how fast lock-in was created by iTMS and then destroyed by Harmony. Second, both iTMS and Harmony affected iPod prices in ways other than the lock-in effect. Because iPod prices affect the number of iPods in use and hence the demand for iTMS downloads, Apple also had an incentive to adjust prices quickly after iPod users were able to download files from competitors of iTMS. Thus, whether the effect of creating and destroying lock-in was quick or gradual is a matter to be determined by empirical analysis of iPod prices.

Econometric analysis can determine both the rate of increase in the lock-in effect after the launch of iTunes and the rate of erosion of the lock-in effect after the launch of Harmony and then, later, after the switch to DRM-free audio downloads. The simplest method is to interact a time trend with indicator variables for each distinct market structure: the period after the launch of iTunes but before the introduction of Harmony (growing lock-in); the period when Harmony was operational (declining lock-in); the period after Harmony was disabled but before DRM-free files were widely available on sites other than iTunes (growing lock-in); the period when other download sites offered DRM-free downloads from the major distribution companies (declining lock-in); and the period when iTunes also offered DRM-free audio files from all of the major distribution companies (declining lock-in). Other statistical tests can determine when, if ever, the lock-in effect was eliminated because enough iPod users could migrate all or nearly all of their most valuable recordings from an iPod to a competing portable digital media player. For example, tests of autocorrelation of the residual error of estimate during each time period can determine whether a simple indicator variable for each period, or an indicator interacted with a time trend, is an appropriate specification of the price equation.²⁷

Finally, the possibility that the adjustment in prices took some time does not imply that proof of damages is not predominantly common to class members. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

²⁷ Autocorrelation refers to a circumstance in which the errors in predicted prices are correlated with an independent variable (including time), and are an indication that the functional form of the regression equation is incorrectly specified.

[REDACTED]

[REDACTED]. With accurate price information, including accurate information about discounts to resellers, the econometric estimation will determine how the overcharge changed, if at all, after events that changed or could have changed the effect of lock-in.

Harm to Competition

Dr. Burtis criticizes my analysis of harm to competition on the grounds that these harms were not suffered by class members and/or “would require individualized analysis.”²⁸ According to Dr. Burtis, dead weight loss (the value of the reduction in output arising from higher prices) is “a loss felt by consumers who did not actually make iPod purchases... not a loss felt by putative class members, who all purchased iPods.”²⁹ Similarly, higher prices for competing portable digital media players are for “products not purchased by the putative class, or at least no claim is made for those purchases here. And any such claim would in any event present individual issues regarding what particular purchase was made and at what price.”³⁰ With respect to the harm from fewer choices and reduced technical progress, Dr. Burtis asserts that “determination of impact... requires information about individual consumers’ preferences. This can only be obtained via individualized inquiry. Consumers do not always want the latest

²⁸ *Burtis Report*, p. 17.

²⁹ *Ibid*, p. 4.

³⁰ *Ibid*, p. 17.

electronic devices or prefer the latest technological features or characteristics.”³¹

I am not a lawyer and so I lack qualifications to describe the extent to which the legal requirements for establishing liability differ between a class action and a complaint filed by an individual plaintiff. In antitrust economics, harm to competition is a much broader concept than harm to one or more plaintiffs. An essential component of an economic analysis of an antitrust complaint is whether the conduct of the defendant harmed the competitive process. This inquiry is not the same as calculating the damage that any plaintiff suffered due to the conduct. Instead, harm to competition arises if the conditions in the market in which anticompetitive conduct occurred caused a reduction in output and/or product quality. Whether these harms were confined to the plaintiffs is irrelevant for the purposes of assessing whether the alleged conduct reduced economic welfare and thereby harmed competition.

The harm to competition that is described in the *Noll Report* and that Dr. Burtis challenges is broader than the damages that were suffered by purchasers of iPods. Dead-weight loss arises because the demand for a product has some price elasticity – higher prices cause fewer purchases. Reduced demand is a market-level phenomenon. Dr. Burtis is incorrect as a matter of economic analysis to assert that all of the reduced demand allegedly arising from Apple’s conduct was suffered by people who did not purchase iPods. While higher prices would cause fewer people to buy their first iPod than otherwise would be the case, they also would cause people to buy fewer iPods as gifts and to replace older iPods less frequently. Notwithstanding Dr. Burtis’ error of analysis, the identity of the people who purchased fewer iPods is irrelevant to the key

³¹ *Ibid.*, p. 17-18.

issue of harm to competition, which is whether anticompetitive conduct caused a reduction in output. As a general matter, the economic analysis of liability in antitrust includes an assessment of whether the alleged anticompetitive conduct reduced output, regardless of whether any plaintiff in that lawsuit bought less.

The same fundamental error also is present in Dr. Burtis' analysis of the other harms to competition. If Apple's anticompetitive conduct caused the prices of other portable digital media players to be higher, these higher prices and the dead-weight loss of those other products are an element of the harm to competition, regardless of whether the people who suffered that harm are members of the class. Likewise, Apple harmed competition if its anticompetitive conduct caused other manufacturers of portable digital media players to invest less in research and development, thereby slowing technical progress in the industry, regardless of which consumers bought other products and how much each would have valued better players.

Yardstick Method

Dr. Burtis claims that the yardstick method of calculating damages cannot be applied in this case. The *Noll Report* contains new information about one group of proposed yardstick products: other portable digital media players. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]³² [REDACTED]

[REDACTED]

[REDACTED] Technical

descriptions of these products are available from public sources, such as CNET and the web sites of manufacturers and on-line retailers.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

³² *Noll Report*, p. 81-2.

[REDACTED]

[REDACTED]

[REDACTED] Dr. Burtis does not explain

[REDACTED]

[REDACTED] Dr. Burtis' rejection of the yardstick method is nothing more than an assertion based on the fact that the yardstick method often is more difficult to implement than other methods for calculating damages. The assertions in the *Burtis Report* about the yardstick method are generic observations about problems with the method that are not informed by any facts about the market for portable digital media players [REDACTED]. The *Burtis Report* simply does not engage the *Noll Report* or the evidence in this case on whether competing portable digital media players are a valid benchmark for calculating damages.

Reseller Incentives

Apple's Opposition seeks to distinguish between retail purchasers and resellers by asserting that consumers want lower retail prices while resellers want higher prices.³³

[REDACTED]

[REDACTED]

³³ *Apple's Opposition*, pp. 22-3.

[REDACTED]
[REDACTED]
[REDACTED]. Thus, Apple concludes that whereas consumers want lower retail prices, wholesalers want higher retail list prices so that they can earn greater profit per unit of sale.

The argument in the *Apple Opposition* does not make sense economically, and tellingly the *Burtis Report* contains no support for it.³⁴ [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Moreover, [REDACTED]

[REDACTED]
[REDACTED]

[REDACTED] If a retailer believes that the list price is below its profit-maximizing level, the retailer is free to set a higher price.

Distributors, resellers and direct purchaser consumers all have a common interest in having Apple charge them lower prices. If the alleged anticompetitive conduct by

³⁴

Burtis Deposition, p. 94.

Apple caused it to maintain its market power in iPods, both the retail and wholesale prices of iPods were higher than they would have been in the absence of anticompetitive conduct. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Thus, the interests of distributors, resellers and consumers are fully aligned in seeking to eliminate anticompetitive overcharges by Apple.

ECONOMETRIC ANALYSIS OF PRICES

Both Dr. Burtis and Apple's attorneys assert that econometric methods cannot be reliably implemented to explain Apple's prices. My prior reports explain why I disagree with this claim, and I do not repeat them here. Instead, I report the results of an econometric analysis of the transactions data that Apple has produced in discovery. The analysis in this section is presented as an illustration of the viability of econometric analysis, not as an actual model for calculating damages in this case, due to continuing problems in obtaining the necessary data from Apple.

Data Issues

A proper damage model cannot be estimated until Apple supplies more data and responds to questions about its data that remain unanswered. [REDACTED]

[REDACTED]

[REDACTED] *Apple's Opposition* explains why.

[REDACTED]

35

This statement makes apparent why reliable, [REDACTED]

[REDACTED]

³⁵ *Apple's Opposition*, p. 22.

anticompetitive conduct and the extent of price protection discounts in transactions.³⁶

Apple's Opposition asserts that "fact discovery is now complete..."³⁷ Even as to the data that Dr. Noll did not receive from Apple until early December 2010, Dr. Noll had more than six weeks after receiving the data in which to complete his analysis and submit his report. He offers no explanation for why this was not sufficient time. It is clear from his report... that Plaintiffs have elected to simply not have him conduct the necessary analysis."³⁸

None of these quotations from *Apple's Opposition* is true. Among the reasons that these statements are false are the following.

1. [REDACTED]
[REDACTED] These are the only data that were provided in early December, six weeks before the due date of the *Noll Report*. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

³⁶ Spurious correlation arises when an included variable (here, the period affected by alleged anticompetitive conduct) is correlated with an excluded variable (here, a price protection discount), in which case the coefficient of the former will include some of the effect of the latter. Spurious correlation can be avoided only by including some measure of the excluded variable.

³⁷ *Ibid.*, p. 2.

³⁸ *Ibid.*, p. 20-1.

[REDACTED]

5. On January 28, 2011, ten days after the *Noll Report* was due, Apple responded to several questions about the data. [REDACTED]

[REDACTED]

6. On February 1, 2011, Apple advised [REDACTED]

[REDACTED]

7. On February 11, 2011, plaintiffs' attorneys [REDACTED]

[REDACTED]

8. [REDACTED]

[REDACTED]
[REDACTED]
9. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

10. The *Noll Report* contains an [REDACTED]
[REDACTED]

[REDACTED] the due date of the *Noll Report*, January 18, 2011.³⁹

For these and other reasons, the *Apple Opposition* is not accurate in stating that “fact discovery is complete” and that I offered “no explanation for why this was not sufficient time.” Both the data and documentation remain incomplete as of the filing date of this report, making possible only a provisional econometric damage model at this time.

Transactions Price Regression

[REDACTED]
[REDACTED]
[REDACTED] The first is a standard hedonic model that explains the price of a transaction on the basis of characteristics of the iPod model that was sold and other aspects of the transaction. The second regression supplements the standard hedonic regression by adding a unit cost variable and indicator variables for various time periods in which the

³⁹ *Noll Report*, pp. 14-19.

extent of competition in the market for iPods may have differed, including the periods of alleged anticompetitive conduct.

[REDACTED]

The two regressions are based on [REDACTED]

[REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Exhibits 2 and 3 show the results of the regression analysis. Exhibit 2 is the standard hedonic regression, and Exhibit 3 is the regression that supplements the hedonic regression with the indicator variables for market conditions and the unit cost of the iPod that was transacted. The reported standard errors of the estimated coefficients are adjusted for heteroskedasticity.⁴⁰

The overall power of the regression is measured by “adjusted R²,” which is the

⁴⁰ This adjustment takes into account any change in the random variance in the equation that is correlated with any of the independent variables, such as, for example, changes in variability over time.

fraction of the variation in the dependent variable (here, price) that is explained by the estimated equation, taking into account the number of parameters that are estimated.⁴¹ An adjusted R^2 of 1.0 indicates that the equation completely explains all variation in the dependent variable, and an adjusted R^2 of 0.0 indicates that the equation explains nothing.

[REDACTED]

Another test of the quality of a regression is whether the estimated coefficients are consistent with expectations derived from economic theory. For example, one expects that prices generally would fall through time due to the presence of ubiquitous learning-by-doing in information technology products, and that prices would be higher for products with greater capacity. [REDACTED]

[REDACTED] The coefficients in the regressions are consistent with these expectations.

One coefficient of interest in Exhibit 3 is unit cost, which is positive and highly significant. [REDACTED]

[REDACTED]

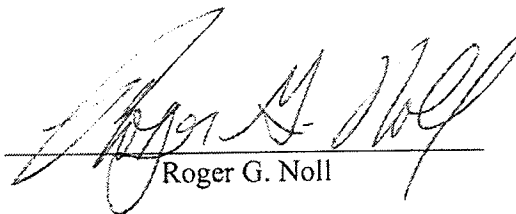
⁴¹ A property of regression analysis is that by adding more explanatory variables, one normally can explain more variance in the dependent variable, even if there is no causal relationship between the dependent variable and the additional explanatory variables. The version of R^2 that is reported here takes this phenomenon into account, as so is a more accurate measure of the explanatory power of the regression than unadjusted R^2 .

[REDACTED]

[REDACTED] All of these results are consistent with the expectation that giving iPod users the opportunity to buy downloads from sites other than iTunes/iTS and reducing the FairPlay lock-in effect should cause iPod prices to be lower.

To reiterate, these results are not damage calculations due to remaining data problems. Instead, they are provisional estimates of the average effect of various market events on iPod prices over long periods of time. The purpose is simple: to demonstrate that Apple's prices can be explained by econometric analysis that captures product features and economic conditions in the market. The high degree of explanation of these regressions and the plausibility of the coefficients, notwithstanding the remaining problems with the underlying data, demonstrate that the standard approaches to calculating damages on a class-wide basis that were outlined in my previous expert reports are feasible in this case.

I declare that the foregoing is true to the best on my knowledge. Executed on March 28,
2011, in Palo Alto, California.



Roger G. Noll

CERTIFICATE OF SERVICE

I hereby certify that on March 28, 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 March 28, 2011.

s/ Bonny E. Sweeney

BONNY E. SWEENEY

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