1   Robert A. Mittelstaedt #60359
    ramittelstaedt@jonesday.com
2   Craig E. Stewart #129530
    cestewart@jonesday.com
3   David C. Kiernan #215335
    dkiernan@jonesday.com
4   555 California Street, 26th Floor
    San Francisco, CA 94104
5   Telephone: (415) 626-3939
    Facsimile: (415) 875-5700
6

7   Attorneys for Defendant
    APPLE INC.
8

9   UNITED STATES DISTRICT COURT

10   NORTHERN DISTRICT OF CALIFORNIA

11   SAN JOSE DIVISION

12

13   **THE APPLE iPOD iTUNES ANTI-**   Lead Case No. C 05-00037 JW (HRL)
     TRUST LITIGATION   [Class Action]
14

15   **SUPPLEMENTAL REPORT OF**
     —————————————————————————   **DR. MICHELLE M. BURTIS**
16   This Document Relates To:

17   ALL ACTIONS

18

19

20

21

22

23

24

25

26

27

28

1   1.   In his most recent report filed July 18, 2011 ("Supplemental Noll Declaration"),

2   Professor Noll updated his "preliminary regression" analysis set forth in his March 28, 2011

3   declaration ("Noll Reply Declaration") in an attempt to account for iTunes 7.0. Counsel for

4   Apple has asked me to review the Supplemental Noll Declaration and address whether this

5   preliminary analysis demonstrates that impact and damages can be shown on a class-wide basis.

6   2.   Professor Noll's new declaration does not show that his proposed methods will

7   work. Rather than demonstrating that iTunes 7.0 resulted in any class-wide damage, his latest

8   analysis actually shows that iTunes 7.0 reduced iPod prices—the opposite of plaintiffs' theory of

9   class-wide harm. Moreover, although Professor Noll has admitted that his previous regression

10   analysis was not reliable and could not be used to show any causal effect on iPod prices, he has

11   done nothing in his current model to correct the deficiencies he previously identified.

12   **Professor Noll's Model, if Anything, Shows that iTunes 7.0 Had No Impact**

13   3.   Professor Noll asserts that his new model shows that iTunes "caused the wholesale

14   price of iPods to be elevated by $4.85."[1] He relies for this assertion on the coefficient his model

15   estimates for his new iTunes 7.0 variable. But Professor Noll misinterprets this coefficient, which

16   he obtains in a manner that is inconsistent with his treatment of other similar variables. In

17   particular, Professor Noll has specified the iTunes 4.7 variable to be "on" over the period

18   beginning with the iTunes 4.7 update in October 2004 and ending when the 7.0 update occurred

19   on September 12, 2006.[2] The specification of this variable is different from the way in which

20   Professor Noll previously specified variables associated with the iTunes 4.7 update and it is

21   different from the way that Professor Noll has specified all of the other "dummy," or indicator,

22   variables in his regressions. All of the other "dummy" variables are specified to be "on"

23   _____

[1] Supplemental Noll Declaration at p. 4.

24

[2] Professor Noll claims that he is "separating" the period affected by update 4.7 from the period

25   affected by update 7.0." Supplemental Noll Declaration at p. 2 ("Hence, the econometric model
     in my period report would need to be amended to separate the period affected by update 4.7 from

26   the period affected by update 7.0.") While the model may separate the periods, Professor Noll
     does not correctly describe the "separate" effect from 7.0. And if he had modeled a "separate"

27   effect like he modeled the effects of other variables in his model, he would have found the effect
     to be negative, not positive.

28

Supp. Burtis Expert
C 05-00037 JW (HRL)

beginning with the particular event and staying "on" throughout the remainder of the estimation period. This is true of the "Post-iTMS" variable, the "Harmony launched" variable, the "iTunes 7.0" variable, the "iTMS competitiors fully DRM-free" variable, and the "iTMS fully DRM free" variable.[3] Had Professor Noll specified the "iTunes 4.7" variable as he had in his previous regression and consistent with the other dummy variables in his previous and current regressions, the coefficient on the 7.0 update variable would have been ***negative***, and equal to -1.69. If Professor Noll's model were otherwise valid, this negative coefficient means that iTunes 7.0 caused iPod prices to decrease rather than increase as plaintiffs claim.

4.   That Professor Noll's model actually shows a price decrease from iTunes 7.0 can be seen by comparing the relevant coefficients. According to Professor Noll, the iTunes 4.7 update "caused" the price of iPods to be $6.54 higher over the period beginning with the iTunes 4.7 update and ending with the iTunes 7.0 update. The results then show that the impact of the iTunes 4.7 update fell from $6.54 to $4.85 over the period beginning with the iTunes 7.0 update throughout the rest of the class period. The difference between 4.85 and 6.54 is -1.69. Again, his regression shows that plaintiffs' theory is wrong—iTunes 7.0 caused a decline in price, not an increase. This is what his regression would show if he had specified his iTunes 4.7 consistently with his other dummy variables, and consistently with his treatment of iTunes 4.7 in his prior report.

5.   Thus, when Professor Noll asserts that iTunes 7.0 "caused the wholesale price of iPods to be elevated by $4.85," what his analysis actually shows is only that iTunes 7.0 "caused" the amount by which the price was allegedly elevated from iTunes 4.7 to decrease from $6.54 to

---

[3] Professor Noll's specification of the iTunes 4.7 variable is clearly a departure from his treatment of other variables. For example, consider the variables included in his model that attempt to capture the impact of DRM-free music on iPod prices—*i.e.*, "iTMS competitors fully DRM-free" and "iTMS fully DRM-free." Similar to his interpretation of the 4.7 and 7.0 variables, these variables could be interpreted to measure the impact of some change in the marketplace that changed over time. The first variable would measure the impact of certain suppliers offering DRM-free music and the second would measure the impact from Apple offering DRM-free music. Professor Noll models each of these variables to be equal to one (or "on") at the beginning dates and then throughout the sample period.

$4.85. Similarly, when Professor Noll claims that his specification allows him to analyze whether the iTunes 7.0 update "perpetuated" the elevation in prices caused by the iTunes 4.7 update,[4] all he is actually measuring is whether some of that increase in price (from the no longer implicated 4.7 update) continued to exist after the 7.0 update. In other words, Professor Noll is not testing, or claiming to test, whether 7.0 independently "caused" iPod prices to be higher. He is simply measuring (if his methods were otherwise valid) how much of the alleged impact of 4.7 remained after 7.0 was released. That the alleged impact from iTunes 4.7 supposedly continued after iTunes 7.0, however, does not establish that iTunes 7.0 had any anticompetitive impact.

Professor Noll's Statistical Measures Do Not Show That His Model is Valid

6. Professor Noll's claim that his proposed regression results are "highly significant and very precisely estimated"[5] is mistaken. The claim is based on Professor Noll's calculation of the "standard errors" of his estimated coefficients. Standard errors reflect that, because each coefficient is estimated, there is an "error" around the estimation. Thus, Professor Noll's finding that the coefficient on his iTunes 7.0 variable is 4.85 is, in actuality, a finding not of the single number 4.85, but of a range with 4.85 in the middle. The size of the range is determined by the standard error. The smaller the standard error, the tighter the range, and in Professor Noll's words, the more "precise" the estimate.

7. The standard errors that Professor Noll reports are artificially small because he is using observations in his data set that are not independent from one another. Standard errors are determined, in part, by the number of observations in a sample (more data, in general, means more precise estimates). But the observations must be independent. If they are not, the calculated standard errors will be artificially small unless the model is appropriately corrected. Consider, for example, a model that uses a given set of data, resulting in a set of coefficients with

---

[4] Supplemental Noll Declaration at p. 2. ("Regardless of whether the 4.7 update was anticompetitive, my prior analysis found that the 4.7 update elevated iPod prices. If the 7.0 update caused increased lock-in to iPods, the effect would have been to perpetuate at least some of the elevation in prices arising from update 4.7.")

[5] Noll Supplemental Declaration at p. 4.

Supp. Burtis Expert
C 05-00037 JW (HRL)

1 a calculated standard error. If the size of that data set is then doubled by simply duplicating the

2 original data, the standard error of the estimated coefficients using the doubled data will fall. But

3 the explanatory value of the model will not have increased because the observations in this

4 duplicated data are not independent of the previous data.

5   8.   Professor Noll's results suffer from this problem. As I described in my earlier

6 report, Professor Noll's data has very little variation.[6] For example, on a given day, Professor

7 Noll may have many price observations for a given product, but the prices are all the same and

8 they are not independent from one another. Put differently, the price one reseller pays on a given

9 day (or in a given quarter) is not independent of the price another reseller pays. Without

10 correction, this has the effect of reducing the standard errors and generating coefficient estimates

11 that Professor Noll claims are precise. But the precision has little to do with the underlying

12 variation and information in the sample, but instead is due to the number of repetitive data

13 observations. This problem, well known in empirical economics, is called clustering.[7] When

14 observations are clustered, it means that they are not independent from one another, but rather are

15 correlated with each other within groups (or clusters). In his deposition, Professor Noll

16 recognized this problem but claimed that he did not investigate it because he "ran out of time."[8]

17 Exhibit B shows the standard errors for Professor Noll's coefficients when the data is corrected to

18 account for clustering. As that exhibit shows, once corrected, the standard errors associated with

19 the iTunes 4.7 and iTunes 7.0 coefficients are not only not "highly significant," they are not

20 statistically significant at either the 1% or the 10% level. In fact, the coefficient on the iTunes 7.0

21

22 [6] 2011 Burtis Reply Report at ¶ 15.

23 [7] See for example, Larry B. Hedges and Christopher H. Rhoads, "Correcting an analysis of
    variance for clustering," *British Journal of Mathematical and Statistical Psychology*, (2011), 64,
24 pp. 20-37 at p. 20. ("A great deal of educational and social data arises from cluster sampling
    designs where clusters involve schools, classrooms, or communities. A mistake that is sometimes
25 encountered in the analysis of such data is to ignore the effect of clustering and analyze the data
    as if it were based on a simple random sample. This typically leads to an overstatement of the
26 precision of results and too liberal conclusions about precision and statistical significance of mean
    differences.")
27

28 [8] Noll Deposition at pp. 112-113.

Supp. Burtis Expert
                                                                          C 05-00037 JW (HRL)

variable would be significant at the 70% level. This means the coefficient has very little, if any, significance and for all practical purposes can be considered to be zero.

9. Professor Noll also claims that the "fit" of the regression is "very high, with an adjusted R^2 of 0.98."[9] Professor Noll asserts that this statistic shows that "all but two percent of the variation in prices of iPod models is explained by the regression." It is well known, however, that a high R^2 may or may not be associated with capturing a true underlying relationship. Dummy variables in a model (such as used by Professor Noll) may generate a high R^2 even though they have little actual explanatory power. *See A Guide to Econometrics*, Peter Kennedy, Second Edition at p. 185.

10. That Professor Noll's purported statistical measures do not show that his model is valid is confirmed by the fact that Professor Noll made the same assertions about his previous model—*i.e.*, that the previous model had an adjusted R^2 of 0.98 and very low standard errors.[10] Despite that assertion, however, Professor Noll admitted at his deposition (as discussed in the following section) that his previous model was not reliable and could not support any conclusion that iTunes 4.7 caused any effect on prices. The same is true of his current model.

Professor Noll's Current Model Does Not Address the Deficiencies He Admitted Existed in His Previous Model

11. At his deposition, Professor Noll testified that his earlier preliminary regression analysis with respect to iTunes 4.7 was unreliable, incomplete, had omitted variables, may be biased, may be affected by spurious correlation, did not take Apple's pricing strategy into account, and should not be used to draw any inferences about issues fundamental to the case, such as the price effect of the launch of iTS, the entry of Harmony, or the disabling of Harmony.[11] Professor Noll thus acknowledged that he could not make any "causal inferences" from the

---

[9] Supplemental Noll Declaration at p. 4.

[10] Noll Reply Declaration at pp. 38-39

[11] 2011 Burtis Reply Report at ¶ 7.

Supp. Burtis Expert
C 05-00037 JW (HRL)

1 regression.[12] In other words, the regression could not, and thus did not, show that iTunes 4.7 had

2 any impact on iPod prices.

3   12. Professor Noll's new model does not address these issues. He has simply taken

4 the same model he used previously and made only a few adjustments to purportedly measure the

5 effect of the iTunes 7.0 update. He does not remedy the problems he previously identified. With

6 the exception of adding a new variable for the U2 Special Edition and a variable for iTunes 7.0,

7 he has not attempted to identify the omitted variables and try to include them in his model. He

8 has not corrected for bias or spurious correlation. He has not taken Apple's pricing strategy into

9 account. He states that he has corrected some (but not all) data problems. But the omitted

10 variable, bias, spurious correlation and other problems he identified with his model are

11 independent of the data issues to which he refers. They are problems with the model's

12 specification. And this has not meaningfully changed.

13 **Professor Noll's Model Remains Flawed for Additional Reasons**

14   13. Professor Noll's regression returns a single estimate that is an average across

15 proposed class members that buy different iPod models and who purchase iPods at different

16 times. [13] The measure of impact obtained from this model is an average amount across those

17 products that are sold in the periods both before and after the 7.0 update. He finds a single

18 estimate of price elevation (which he incorrectly interprets as $4.85), which would be applied,

19 apparently, to iPod shuffles that are priced at retail as low as $49 as well as to iPod touch models

20 that are priced at retail as high as $499. Similarly, the average will apparently be applied to all

21 iPods purchased after September 2006, whether they were purchased one week or two years after

22 the update. Impact on different products purchased by different proposed class members at

23 different times cannot be inferred based on an average.

24   14. Further, Professor Noll's model does not, and indeed cannot, be used to measure

25 impact for iPod models that were introduced for the first time after the introduction of
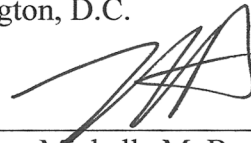
26 [12] Noll Deposition at 90, ("I drew no causal inferences from that regression.")

27 [13] 2011 Burtis Reply Report at ¶ 11. Professor Noll admitted the result was an average. See Noll

28 Deposition at p. 142.

Harmony.[14] This is demonstrated by attempting to implement Professor Noll's model for the iPod touch. The iPod touch was introduced on September 5, 2007, almost a year after the 7.0 update.[15] So, iPod touch prices do not exist both before and after the 7.0 update and Professor Noll's model cannot be used to find the impact of 7.0 on proposed class members that purchased the iPod touch. Exhibit A shows what happens when Professor Noll's model is applied to iPod touch prices.[16] As the Exhibit shows, there are no results for the "iTunes 7.0" variable (among others). This is because the model depends on a comparison of prices before and after the 7.0 update. If there are no prices before the update, then no comparison is possible and the model cannot return an estimate for the iTunes 7.0 variable. Professor Noll would attribute the measure of impact he obtains from one set of products—i.e., those products that are sold both before and after the update—to products that are only sold after the update. Importantly, this problem with Professor Noll's proposed method cannot be solved with new or different data obtained from Apple. The problem is inherent in the structure of the proposed model and the fact that it relies on a before-and-after comparison, when certain products were not sold in both periods.

15. The preliminary regression found in the Supplemental Noll Declaration continues to not be a model for retail customers. I discussed this in Section VI in 2011 Burtis Reply Report. Professor Noll has not offered anything new to address this omission.

I declare under penalty of perjury that the foregoing is true to the best of my knowledge and belief. Executed on July 22, 2011 in Washington, D.C.

_____
Michelle M. Burtis, Ph.D.

SFI-703949v2

_____

[14] See 2011 Burtis Reply Report at ¶¶ 4, 9-13.

[15] "Apple Unveils iPod touch," Apple, Inc. Press Release, September 5, 2007.

[16] Because Professor Noll has not turned over his updated data, I utilize the data he turned over with the Noll Reply Declaration. I then create "iTunes 4.7" and "iTunes 7.0" variables using the descriptions found in the Supplemental Noll Declaration. I do not create and include a "U2 Special Edition Variable" because without Professor Noll's database and associated work-product it is not precisely clear how he has manipulated his data to incorporate the U2 models (Professor Noll did not include the U2 model transactions in his prior analysis).

Professor Noll's Regression with Clustered Standard Errors

Dependent variable   iPod transaction price
Adjusted R2   0.9762
Number of Observations   2,098,663

Variable	Coefficient Estimate		Standard Error
Intercept	301.65	***	70.58
Classic	-47.41	***	9.19
Mini	-62.81	***	14.44
Nano	-35.58	***	10.25
Shuffle	-49.23	***	14.22
Capacity 512MB	-206.39	***	39.01
Capacity 1024MB	-139.68	***	36.81
Capacity 2048MB	-119.62	***	37.10
Capacity 4096MB	-94.52	***	34.91
Capacity 5120MB	-194.62	***	40.59
Capacity 6144MB	-131.18		119.69
Capacity 8192MB	-94.41	***	31.77
Capacity 10240MB	-123.57	***	43.53
Capacity 15360MB	-39.10		26.90
Capacity 16384MB	-0.14		36.27
Capacity 20480MB	-48.13		38.45
Capacity 30720MB	-5.88		25.74
Capacity 32768MB	201.09	***	69.06
Capacity 40960MB	-19.16		37.50
Capacity 61440MB	32.99		98.69
Capacity 81920MB	63.49		39.96
Capacity 122880MB	-183.99	***	52.09
Time trend	-0.26		1.04
Time Trend * Capacity 512MB	4.16	**	1.77
Time Trend * Capacity 1024MB	0.34		0.92
Time Trend * Capacity 2048MB	-0.07		0.95
Time Trend * Capacity 4096MB	-0.17		1.02
Time Trend * Capacity 5120MB	12.09	**	5.62
Time Trend * Capacity 6144MB	4.00		8.49
Time Trend * Capacity 8192MB	0.36		0.89
Time Trend * Capacity 10240MB	3.52		3.42
Time Trend * Capacity 15360MB	-5.17	***	1.89
Time Trend * Capacity 16384MB	-1.81		1.13
Time Trend * Capacity 20480MB	-0.06		2.09
Time Trend * Capacity 30720MB	-2.03	**	0.98
Time Trend * Capacity 32768MB	-7.10	***	2.10
Time Trend * Capacity 40960MB	2.69		2.74
Time Trend * Capacity 61440MB	-1.64		5.74
Time Trend * Capacity 81920MB	-3.99	**	1.72
Time Trend * Capacity 122880MB	5.70	***	1.77
Medium volume purchaser	-0.50		0.45

High volume purchaser	-0.75		0.62
1 to 5 units purchased	2.94	***	0.61
1st quarter	5.01	**	1.97
2nd quarter	13.73	***	2.41
3rd quarter	5.10	**	2.32
Photo capability	9.73		7.02
Video and photo capability	-6.34		5.17
Post-repricing transaction	-11.35	***	3.77
Post-end of life transaction	-19.95	**	8.32
Post-iTMS	-50.49	***	14.73
Harmony launched	-31.07	***	9.96
iTunes 4.7	5.50		7.31
iTunes 7.0	3.34		8.71
iTMS competitors fully DRM-free	-9.78	**	4.33
iTMS fully DRM-free	-13.79	***	4.31
Size (in^3)	-3.16		4.60
Standard cost per unit	0.80	***	0.08

Source: Noll Reply Declaration Backup

Note:

Standard errors are clustered around iPod model and the quarter during which the model was sold.

*** Denotes statistical significance at the 1% level.

** Denotes statistical significance at the 5% level.

* Denotes statistical significance at the 10% level.

Professor Noll's Regression on iPod Touch Transactions Only

Dependent variable	iPod transaction price
Adjusted R2	0.9668
Number of Observations	353,669

Variable	Coefficient Estimate	Standard Error
Intercept	807.62	0.52
Classic	-	-
Mini	-	-
Nano	-	-
Shuffle	-	-
Capacity 512MB	-	-
Capacity 1024MB	-	-
Capacity 2048MB	-	-
Capacity 4096MB	-	-
Capacity 5120MB	-	-
Capacity 6144MB	-	-
Capacity 8192MB	-245.89	0.24
Capacity 10240MB	-	-
Capacity 15360MB	-	-
Capacity 16384MB	-120.35	0.23
Capacity 20480MB	-	-
Capacity 30720MB	-	-
Capacity 32768MB	146.58	0.22
Capacity 40960MB	-	-
Capacity 61440MB	-	-
Capacity 81920MB	-	-
Capacity 122880MB	-	-
Time trend	-7.59	0.01
Time Trend * Capacity 512MB	-	-
Time Trend * Capacity 1024MB	-	-
Time Trend * Capacity 2048MB	-	-
Time Trend * Capacity 4096MB	-	-
Time Trend * Capacity 5120MB	-	-
Time Trend * Capacity 6144MB	-	-
Time Trend * Capacity 8192MB	3.39	0.01
Time Trend * Capacity 10240MB	-	-
Time Trend * Capacity 15360MB	-	-
Time Trend * Capacity 16384MB	1.02	0.01
Time Trend * Capacity 20480MB	-	-
Time Trend * Capacity 30720MB	-	-
Time Trend * Capacity 32768MB	-6.28	0.01
Time Trend * Capacity 40960MB	-	-
Time Trend * Capacity 61440MB	-	-
Time Trend * Capacity 81920MB	-	-
Time Trend * Capacity 122880MB	-	-
Medium volume purchaser	-0.32	0.18

High volume purchaser	-0.29	0.17
1 to 5 units purchased	2.97	0.52
1st quarter	9.04	0.00
2nd quarter	20.97	0.01
3rd quarter	10.67	0.01
Photo capability	-	-
Video and photo capability	-	-
Post-repricing transaction	-	-
Post-end of life transaction	-60.39	0.09
Post-iTMS	-	-
Harmony launched	-	-
iTunes 4.7	-	-
iTunes 7.0	-	-
iTMS competitors fully DRM-free	-5.86	0.02
iTMS fully DRM-free	-7.56	0.01
Size (in^3)	-81.88	0.05
Standard cost per unit	0.32	0.00

Source: Noll Reply Declaration Backup

Note:
Coefficients that are not able to be estimated are denoted by a "-".
Standard errors have been calculated using Professor Noll's methodology.