likely changed over time; however, the direction and magnitude of this change during the relevant period is unclear, as is whether the number of URLs for such websites sent in Facebook messages would have changed in parallel.

2. Potential class members were unaffected due to the aggregate and anonymous nature of the data used

38. There is reason to think then there would have been no effect simply due to the lack of pertinent social plugin. However, even if a pertinent social plugin was present the nature of the data used limits the likelihood of any concrete effects. In general, the disputed practices use aggregate and anonymous statistics.[32] This was confirmed by Plaintiffs' technical expert Dr. Jennifer Golbeck in her deposition.[33]

39. Let's assume that, for a given URL shared in a message, there was a social plugin counter for the website where the URL attachment pointed. Even with this assumption it is not clear that each of the proposed class members would be adversely affected. In order to illustrate this, Figure 4 displays a message I shared through my personal Facebook account with an old friend who has reservations about the Halloween holiday. However, when I visit the actual webpage, it is unclear how I would have been adversely affected, or how this instance involves the challenged practices at issue in Plaintiffs' lawsuit.[34] In this example, there is no counter next to the "Like" button – but instead a social plugin displaying a share counter which is shown in Figure 5. Even if the share counter had been affected by the disputed practices it is not clear how an anonymous shift in the share

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[32] Furthermore, often URLs themselves were further anonymized by users. For example, Mr. Campbell [redacted]

[33] Dr. Golbeck testified as follows: [redacted] Golbeck Depo. Tr. at 311: 6-11. On page 312 of her deposition, there is clarification about what such an edge case could be: If I shared www.catherinetucker.com in a Facebook message and it had been shared elsewhere on Facebook, then it is possible that if it appeared in a friend's activity feed, they could guess that I was the person who had shared it, should the unusual combination of events occur which mean that it would ever actually appear in a Feed.

[34] Of course, this is a result of my visiting the site in late 2015. It is possible that in 2014, the website may have displayed different aspects of the social plugin and even an actual counter, but it is difficult for me to ascertain that without time-consuming inquiry, and perhaps impossible altogether.

counter from 765 to 766 would have affected me or influenced other's subsequent behavior.

40. Further, any analysis of whether there was any real effect of an increment in the social plugin counter is complicated by the set of technical circumstances that need to be met for a social plugin counter to have incremented. For example, I understand that if [redacted].[35]

Figure 4: Sharing a Story about Halloween with a Friend on Facebook

Figure 5: The story that I shared with my Friend (as of 2015)[36]

41. For the Halloween story example depicted in Figure 4, it is difficult to imagine how I would have been adversely affected if the information were used, as alleged by the Plaintiffs, in a recommendation algorithm that tried to highlight interesting content in a

[35] Declaration of Alex Himel ¶¶ 28.

[36] Fisher, Max, "Why Australia Hates Halloween," *Vox*, October 31, 2014, http://www.vox.com/2014/10/31/7137369/why-australia-hates-halloween, viewed January 6, 2016.

social plugin displaying recommendations on the Vox website should the primary system for providing such recommendations have failed.

42. It is also unclear how I would be affected if Vox had accessed the Insights tool or associated APIs, as alleged by the Plaintiffs, had learned that their audience was slightly more female, closer in age to forty, and more English-speaking than before, especially as I have visited their website on other occasions, meaning that Vox would have presumably already accessed this information and there would be no new incremental information. Of course, as this happened in 2014, rather than prior to October 2012, this could not have happened in any case.

43. In general, this second example illustrates that even if one supposes a relevant social plugin was present on the website for which the URL attachment was created, trying to identify whether or not the potential for an increment on the social plugin counter had any meaningful effect on anyone is difficult (and sometimes impossible). Furthermore, the aggregate and anonymous nature of the data collected limits effects of the other disputed practices in the time periods when the occurred.

B. Some potential class members benefited from the challenged practices

44. Plaintiffs' Motion for Class Certification suggests that Facebook "monetizes the content of these private messages for its sole benefit."[37] However, my analysis suggests that many people who use Facebook benefit directly from the usage of URL share counts to allow them and others to identify relevant and useful websites. In this section, I lay out two potential ways that people who use Facebook may benefit.

1. Some proposed class members benefited directly from incremental publicity

45. First, Plaintiffs who shared URLs in which they had a direct financial or vested interest in publicizing may have benefited directly from this practice. For example, Mr. Campbell stated that [redacted]."[38] As a consequence, [redacted]

[37] Plaintiffs' Motion for Class Certification at 1.

[38] Campbell Depo. Tr. at 45:1.

[redacted].[39] Therefore, any use of the sharing of URLs via Facebook messages which led to more prominence or publicity for [redacted] would have benefited him.[40] In terms of the other alleged practices, the potential benefit would be limited by the extent to which such a share incremented the likelihood of Facebook recommending the URL to other users on a Recommendations Feed, which in itself would have required a very fortuitous combination of events—indeed, since it seems [redacted] this would be an impossible combination of events. It is not clear there would be any effect on the demographic information shared through Insights since, as it is [redacted].

46. Additionally, many class members may have been actively seeking publicity by sharing a URL. Again, I can use my personal Facebook account for an illustrative example, such as the one depicted in Figure 6. This message exchange is between myself and the owner of a website named Boston Events Insider, in a failed attempt on my part to obtain movie tickets for Kung Fu Panda 2 for my daughters. In order to win these tickets, the gentleman asked me to follow the steps on his website which were: "Like & comment on everything on the Facebook page," "Retweet everything in the Twitter feed," and share the URL on several websites (Facebook, Twitter, Google Plus, as well as others).

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39 [redacted]." Campbell Depo. Tr. at 63:7-9.

40 For example, [redacted] It appears from his deposition that [redacted]. *See* Campbell Depo Tr. at 222:18-19 [redacted].").

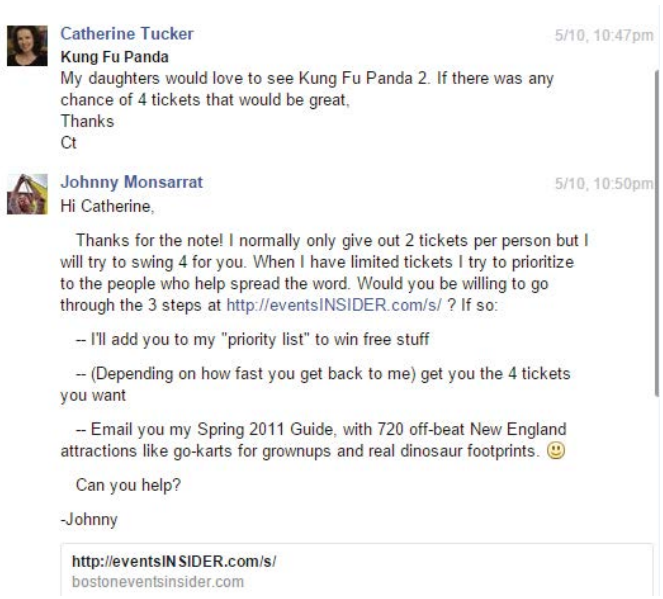

Figure 6: URL sender actively seeks Social Media Activity surrounding the URL

47. Given that the website owner was actively soliciting social media activity in order to boost the perceived popularity of his website, he would have directly (and unambiguously) benefited from any incrementing of the internal social plugin counter for the website as a result of sending me this message.[41] In a case such as Figure 6, where the owner was actively seeking publicity, anything that would boost the likelihood of his website being recommended would benefit him though at this distance the website does not appear to have a social plugin displaying either the Recommendations or Activity Feed. Furthermore, since he is presumably already constantly visiting his own website, his own demographics being shared with him make no difference to him.

48. This is not an isolated example. For example, [redacted].[42] Although [redacted]

[41] *See Events Insider*, http://bostoneventsinsider.com/subscribe html/, viewed December 17, 2015 for details. In this case it seems apparent that "Johnny" clearly benefited from the disputed practices by Facebook.

[42] *See* Plaintiff Matthew Campbell's Corrected Objections and Responses to Defendant Facebook, Inc.'s First Set of Interrogatories. This series of messages are summarized by rows messages 409, 411, and 412.

[redacted].[43] It seems likely that [redacted]. However, these messages would also qualify [redacted] to be part of the potential class.

2. Some proposed class members benefited indirectly from incremental publicity

49. Second, there is an even broader set of instances when a class member may have benefited from the incremental counting of URLs from Facebook messages when they shared a URL in a message in which they had an indirect interest in helping to publicize. For example, Figure 7 depicts a message I shared with my husband regarding the efforts our church was making regarding helping homeless people who had recently lost shelter due to the closure of Boston's largest homeless shelter. As a result of my sharing this message, my husband publicly clicked "Like" on a posting about this mission on Facebook. It is worth noting, as an aside, that by the class definition, my husband would be a class member as a recipient of the message despite clicking on "Like" after receiving the message.

50. Though I shared this with my husband through a message, it is a website that I would in retrospect welcome publicity for. Many people in Boston were unaware of the negative effects of the closure of the Long Island Shelter, and I would welcome any incremental publicity my sharing of the URL could generate for this cause, though any benefits are clearly indirect.

[43] [redacted].

Figure 7: Message where I indirectly benefited

51. Since I shared this message depicted in Figure 7 too recently for it to benefit me by potentially incrementing the social plugin counter (because Facebook ceased this practice in 2012), the main avenue of benefit would be if [redacted]. However, as of 2015, it does not seem that such a social plugin exists.[44] If my church accessed the Insights tool or associated APIs, there is a chance they would believe that their audience was (slightly) more female than before and perhaps closer to forty than before. Since I already provide far more detailed information to them as a member, and my gender and age are apparent to them every Sunday I attend, I am not sure how this would affect anything. Of course, because this is after October 2012, there is no possibility that this occurred.

52. In a similar spirit, there are examples among the Named Plaintiffs where there are potential indirect benefits. Plaintiff Hurley [redacted] which is shown in Figure 8.

[44] *See Home: Old South Church*, http://oldsouth.org, viewed January 11, 2016.

Figure 8: Message to Plaintiff Hurley, as produced by Plaintiffs[45]

53. Although I cannot be sure without viewing the content of the message that was redacted, [redacted].[46] [redacted]. Plaintiff Hurley's [redacted].

54. Similarly, Mr. Campbell [redacted].[47] Again, it seems likely that Mr. Campbell [redacted] e.

C. It is difficult to determine the effect of the at-issue practices on some potential class members

55. One issue for assessing whether proposed class members were negatively affected by the disputed practices in this case is that the Named Plaintiffs in their depositions revealed that they have divergent ideas of what negative effects they could potentially have suffered which also are not necessarily based on fact or the current class certification motion.

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45 HURLEY000001.

46 *See* Hartner Depo. Tr. at 157:18-160:7.

47 *See* Plaintiff Matthew Campbell's Corrected Objections and Responses to Defendant Facebook, Inc.'s First Set of Interrogatories, Exhibit 1.

56. For example, former Named Plaintiff David Shadpour said, "[redacted]."[48] However, the anonymous aggregate share count data at issue in this case was never sold for money.[49] Hurley states [redacted]."[50] However, URL sharing behavior in Facebook messages was not used to refine targeted advertising.[51] Plaintiff Campbell [redacted]."[52] Therefore, Mr. Campbell [redacted].

57. Both Named Plaintiffs (Mr. Campbell and Mr. Hurley) stated that [redacted].[53] [redacted]."[54] Similarly, Jeffrey Woodmansee stated [redacted]"[55] [redacted]"[56]

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48 Shadpour Depo. Tr. at 91:2-3.

49 Defendant Facebook, Inc.'s Supplemental Responses and Objections to Plaintiffs' First Set of Interrogatories at 40, 44. ("During the relevant time period (December 30, 2011 to approximately December 20, 2012), data or information derived from messages (including URLs shared in messages) was not a criterion available to advertisers in choosing the audience for their ads, and Facebook did not use data or information derived from messages (including URLs shared in messages) to match ads to users.")

50 Hurley Depo. Tr. at 162:21-24.

51 Defendant Facebook, Inc.'s Supplemental Responses and Objections to Plaintiffs' First Set of Interrogatories at 40, 44

52 Campbell Depo. Tr. at 194:5-8.

53 Campbell Depo. Tr. at 192:5-9; Hurley Depo. Tr. at 153:20-24.

54 Hartner Depo. Tr. at 171:2-8.

55 Woodmansee Depo. Tr. at 248:16-17.

56 Orsi Depo. Tr. at 157:20. [redacted] Orsi Depo Tr. at 36:9, 69:1-2, 17- 19.

58. The above testimony demonstrates the difficultly in determining if potential class members have been harmed by the challenged behavior. In order to assess harm from an economics perspective, one must have a clear definition of what is harmful, which the Plaintiffs have failed to consistently provide.

1. A "Like" button does not necessarily imply endorsement

59. Let us start with the most concrete statement of harm which was Plaintiff Campbell stating that "[redacted]."[57]

60. Underlying this argument appears to be the assumption that a "Like" is unambiguously an endorsement. However, it is not clear that Facebook or more general web users view it as such. Table 1 reports results from a marketing research survey conducted by ExactTarget where they asked people who use Facebook why they "Liked" a company's webpage.[58] What is immediately striking is that there are many different reasons why people click "Like." Table 1 shows that even in 2010, only 39 percent of users used the "Like" button to "show my support of the company to others." Instead, there are a myriad of ways that the "Like" button was being used that do not necessarily imply endorsement.[59] This multi-purpose use of the "Like" button means that users already anticipate that a count of Likes does not necessarily imply multiple endorsements, but could derive either from users wanting discounts or offers from a particular website or because they wanted to stay informed (for whatever purpose).

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[57] Campbell Depo. Tr. at 190:7-10.

[58] According to the webpage, the survey was fielded from April 9, 2010 through April 13, 2010. The survey was fielded through a MarketTools TrueSample online panel and completed by 1,506 U.S. respondents, aged 15 and older, and stratified by age so that each age bracket contained no less than 200 responses. Responses are weighted by age and gender according to U.S. Census Bureau population estimates and Pew Internet Project's online activity data to reflect the online U.S. consumer population.

[59] A recent paper by researchers from Harvard found that consumers respond enthusiastically to invitations to Like brands – popular or unpopular, new or established – and that such indiscriminate "Liking" suggests that expressing a "Like" may not reflect deep preferences. John, Leslie et al., "What are Facebook 'Likes' Really Worth?," *HBS Working Paper,* 2015, http://rady.ucsd.edu/docs/events/lesliejohn.pdf.

Table 1: Why do people click "Like" for a company, brand, or association?

Motivation	Percentage
To receive discounts and promotions	40%
To show my support for the company to others	39%
To get a 'freebie (e.g., free samples, coupon)	36%
To stay informed about the activities of the company	34%
To get updates on future products	33%
To get updates on upcoming sales	30%
For fun or entertainment	29%
To get access to exclusive content	25%
Someone recommended it to me	22%
To learn more about the company	21%
For education about company topics	13%
To Interact (e.g., share ideas, provide feedback)	13%

Source: "The Thin Line between Liking a Brand and Liking Its Social Marketing," *eMarketer*, September 8, 2010, http://www.emarketer.com/Article.aspx?R=1007912, viewed January 8, 2016.

61. Mr. Torres testified about one particularly clear example where a "Like" is not an endorsement: "Facebook has hinted at introducing other alternatives for people to express their response or reaction to posts and things like that" because, for example, "it's always been a curious thing that if somebody posts a death or reports a death in the family, that the summary way to show your, your awareness of the message, or anything else, is to click on '[l]ike.'"

62. Such variance makes it difficult to assess whether potential class members have been harmed and whether that harm is common across class members because the context in which URLs are shared varies across messages and that context cannot be known without individual inquiry.

2. Due to the use of aggregate counts it is very unlikely any single increment of the social plugin counter had a negative effect for that individual

63. As well as a Like not necessarily implying endorsement, it is unlikely that a small perturbation in the number of "Likes" displayed on a social plugin counter due to the sharing of a URL by one individual will affect outcomes substantially and any potential effect will vary substantially by website and time. Indeed, Mr. Torres explained this in his deposition by pointing that a website with "[l]ike counts of, in the order of one or two,

then it's a 100 percent increase" in the count. However, if the social plugin incremented was for "Coca Cola, and they already have 500,000 'Likes' on their third-party website, that is a miniscule less than a 1 percent, so, they won't be as influenced or as impressed by the increase."[60] In other words, even if there is an effect, the effect would not be common across potential class members and would depend on the nature of the URL shared and the date.[61]

64. Though this analysis focuses on the potential for negative effects of sharing, it also applies for the potential positive effects of sharing. In many cases, due to the small likely effects of any one potential increment of the social plugin counter, the potential for positive indirect benefits of the type discussed in Section VI.B is small. It seems more likely that there would be a positive effect in the cases described in Section VI.A, simply because an individual promoting their own website via messages is more likely to create the volume of URL attachments that could lead to a more sizable increase in the social plugin counter should it be in a context where that was a possibility.

3. It is difficult to determine potential negative effects of any sharing of a URL without intrusive inquiry

65. The facts that Likes are not necessarily interpreted as endorsements and that the potential marginal effects of any one Like on a counter is small, limit any potential negative effects from the alleged practices. However, even without these constraints, there are only very unusual and individualized circumstances where I can envisage harm. Indeed, the only circumstance I can identify when there could have been a potential negative effect on

[60] Torres Depo. Tr. at 174:3-175:4 ("Q. Why does it make it appear that the integration is more effective than it is? A. Because the like count is increasing, despite the fact that the person is not clicking on the like button on the third party website. Q. And does that opinion depend on how much the like counter is increasing, based on messages? A. Not necessarily. Q. Why not? A. Because it depends, it would depend on exactly what the proportion of the enhancement is. During some, at some point, according to some of the experiments reported on The Wall Street Journal, the like count was increasing twice, or, or, in a two-to-one ratio, to including the URLs in the messages. So, if that happens to a website, a third party website that has like counts organic like counts of, in the order of one or two, then it's a 100 percent increase. If it happens to Coca Cola, and they already have 500,000 likes on their third party website, that is a miniscule less than a 1 percent, so, they won't be as influenced or as impressed by the increase.").

[61] This is further complicated by the fact that rather taking notice of absolute numbers of social plugin counts, consumers are more influenced by the location of the link on the homepage. This is something demonstrated with my research that shows the importance of website location relative to the influence of popularity information. Tucker, Catherine, and Juanjuan Zhang, "How Does Popularity Information Affect Choices? A Field Experiment," *Management Science*, Vol. 57, No. 5, 2011, pp. 828-842.

people who use Facebook would be if the proposed class member shares a URL with a friend that they wanted to alert their friend about, but they would prefer for other people to not visit the URL. It is difficult to imagine how to determine this rather nuanced and complex set of circumstances without a great deal of individual inquiry.

66. Indeed, I found it problematic to identify a straightforward example of a URL being shared in a message that the sender would prefer not to be publicized. The closest example I can find is as follows. My husband chairs a Fourth Amendment organization called "Restore The Fourth," whose previous website was at www.restorethefourth.net, and whose current website is at www.restorethe4th.com. He shared a message over Facebook with a colleague in October 2015, regarding the former URL "restorethefourth.net". In the message, he noted that [an unknown] someone was updating that URL. It could be argued that my husband would prefer traffic where possible to not be diverted to restorethefourth.net as a result of his message, as he was questioning whether having two parallel websites was potentially confusing. However, even in this case – supposing it was affected by the alleged practices, which it was not since the message was sent in October 2015 – it is not straightforward.

Figure 9: Example of a message where a social plugin count of the URL in the message did not necessarily benefit the sharer

67. Restorethefourth.net has no apparent social plugin. From its appearance, restorethefourth.net is not advertising-supported or linked to Facebook in any way. Of course, this would have to be verified, and one issue my husband faced in managing this issue is that he is not sure who has control of this website and has been unable to find this out from the domain registrar who hosts the website.

68. If there had been an operational social plugin displaying a counter or Recommendations Feed which led to the website content being somehow boosted, it is not clear that my husband is harmed. He is not averse to the content of the website, but wants to be able to coordinate messaging for the Restore the Fourth movement better across websites. Generally, he would prefer that more people actively contact their Congress member to express support for the Fourth Amendment, which is what the reactivated www.restorethefourth.net was trying to do. Indeed, he would prefer the URL to be recommended over any other URLs (such as celebrity gossip websites), with the sole exception of the more current and comprehensive URL for restorethe4th.com. Finally, the degree of harm, if any, is likely to change over time, as his organization may be able to contact and work with the individual who revived the old URL.

69. It seems unlikely that the website in question accesses the Insights tools or related APIs from Facebook, but if they do, again it seems immaterial whether or not my husband's demographic data is included in their data, since he is representative of many of their supporters and had visited the website before emailing the URL to his colleague. And again, because the message was sent in October 2015, there was no potential for any social plugin counter or Insights to be affected.

70. Another example of this ambiguity over the potential for negative effects is the instance of Mr. Campbell sharing the URL in Figures 10-11, which is a [redacted]. Given that [redacted].

71. [redacted]

Figure 10: Message sent by Plaintiff Campbell, as produced by Plaintiffs[62]

[62] CAMPBELL000075-77.

Figure 11: Example of a message where a share count of the URL in the message did not necessarily benefit the sharer (URL from message reflected in Figure 10)[63]

[63] I understand that this website currently displays a "Recommend" button as opposed to a "Like" button. Nonetheless, the webpage remains illustrative as an example of the

72. In any case, as can be seen, this is a nuanced and complex analysis, which would be difficult to resolve without a great deal of intrusive and individualized inquiry. This can be seen by [redacted].[64,65] Furthermore, as I discussed in the prior two sections, there are reasons to think even in these highly individualized circumstances the possibility for harm is limited.

VII. REBUTTAL TO MR. TORRES'S REPORT

73. Mr. Torres's Report describes two potential methodologies for calculating damages. The first is based on extrapolating the alleged benefits to Facebook of "enhancing the Social Graph by including data intercepted in private messages."[66] It is not clear how Mr. Torres proposes to extrapolate this value, or more importantly, why the methodology should be connected with advertising revenues.[67] Mr. Torres's second potential damages methodology is a more limited analysis that focused on benefits to Facebook connected

[64] Similarly, Mr. Hurley [redacted]

[65] *See*, e.g., Mr. Campbell's [redacted]

[66] Torres Report ¶ 35.

[67] The Plaintiffs' Motion for Class Certification explains Mr. Torres's first proposal as follows: "The unlawfully intercepted private message content contributes meaningful data to the Social Graph, increasing the quality of its ability to provide predictive value, and, consequently, increasing Facebook's advertising revenue and value... A reasonable value to Facebook of the intercepted content can be assigned on a per-URL basis, and can be allocated to class members on that basis." Plaintiffs' Motion for Class Certification at 22.

with increments to the social plugin counter. This methodology reflects a measure of the costs a URL owner may have faced of obtaining the "Likes" through other means or the benefits they may have obtained. This analysis is removed from any actual harm, and also highlights the huge degree of variation and lack of commonality in the proposed methodology.[68]

74. Mr. Torres also opines in his Report that "Class membership [is] identifiable and ascertainable based upon Facebook's records."[69] However, Mr. Torres made clear during his deposition that he was not offering an opinion on ascertainability[70] and when asked about paragraph 11.a. of his Report, stated that the "technical issue as to what records to look at to identify the membership in the class, that's not, that's outside of my scope."[71] Therefore, my rebuttal of his report does not consider ascertainability; this is instead addressed in the technical Report of Dr. Benjamin Goldberg.

75. In my rebuttal to the Torres Report, I begin by observing that Mr. Torres has not calculated "damages" to putative class members, but rather alleged "benefits" to Facebook. I then consider each of the proposed methodologies in turn and whether these two methodologies can be reconciled with each other. Last, I consider whether this analysis informs underlying factors that relate to the appropriateness of statutory damages from an economics perspective.

A. Mr. Torres estimated "benefits" to Facebook, not "damages" suffered by putative class members

76. Although his report claims to describe the "Measure of Damages,"[72] both of Mr. Torres's methods for estimating damages purport to be related to the benefits received by

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[68] The Plaintiffs' Motion for Class Certification explains Mr. Torres's second proposal as follows: "In addition, Facebook generated value from its inflation of third-party Like counters. The economic benefit derived by Facebook attributable to this conduct lies between two bounds: a higher bound represented by the cost that client websites saved by not having to acquire additional Likes; and a lower bound determined by the market value of artificially acquired Likes." Plaintiffs' Motion for Class Certification at 22.

[69] Torres Report, ¶ 11.a.

[70] Torres Depo. Tr. at 34:2-3 ("Q. [Are you offering an opinion on] [a]scertainability? A. No.").

[71] Torres Depo. Tr. at 93:7-14 ("Q. And are you offering an opinion in this case that class membership is identifiable and ascertainable based upon Facebook's records? A. To the extent that's a technical issue as to what records to look at to identify the membership in the class, that's not, that's outside of my scope.").

[72] Torres Report Section IV heading.

Facebook. This is confirmed in his deposition when Mr. Torres repeatedly noted that he estimated the benefits allegedly received by Facebook, not damages suffered by putative class members. For example, Mr. Torres stated: "So my report and methodology they developed was asked to analyze the benefits to Facebook. So that's, so, it doesn't calculate the detriment to the class members, or the potential class members, because it wasn't meant to."[73] Mr. Torres reiterated this several times in his deposition.[74]

77. Therefore, Mr. Torres has not presented any method for estimating the actual damages or loss, if any, suffered by individual putative class members. Furthermore, there is no attempt to consider or evaluate any benefits enjoyed by putative class members and integrate these into an evaluation of net damages.

B. It is not clear what the proposed methodology relating to the Social Graph is or why the alleged practices are being related to advertising

1. Summary of Mr. Torres's method for estimating the alleged benefit to Facebook of enhancing the "Social Graph"

78. Mr. Torres does not present a finalized methodology for estimating the benefit he alleges Facebook received from enhancing the "Social Graph." Instead he has "[laid] out the methodology and the beginnings of the calculations that can be done with publicly-available information."[75] He states that he has not "finalized the calculations because I haven't received the precise data from Facebook."[76]

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[73] Torres Depo. Tr. at 48:11-21 ("Q. Why doesn't it examine, your methodology examine, instead of examining benefit to Facebook, why doesn't it examine detriment to the putative class? A. So, my report and methodology that I developed was asked to analyze the benefits to Facebook, so that's, so, it doesn't calculate the detriment to the class members, or the potential class members, because it wasn't meant to.").

[74] *See, e.g.*, Torres Depo. Tr. at 48:23-49:1 ("Q. So, you have not developed a methodology to calculate damages to putative class members[?] A. That, that was not my task, no."); 108:11-17 ("Q. . . . [H]ave you attempted to calculate detriment to the putative class? A. As I said, that, that's not part of my scope. My scope is to analyze the benefits to Facebook."); 279:7-11 (. . . [T]he methodology is attributing, is not measuring the effect, the detriment, for example, to the class member, so it's allocating to class members as a whole the benefits to Facebook as a whole.").

[75] Torres Depo. Tr. at 107:2-9 ("Q. And do you lay out these calculations anywhere in your report? A. Well, in the body of the report, in section 4, I lay out the methodology and the beginnings of the calculations that can be done with publicly-available information. I haven't finalized the calculations, because I haven't received the precise data from Facebook.").

[76] Torres Depo. Tr. at 107:2-9. I understand that Plaintiffs have not even requested most of this information from Facebook. Declaration of Christopher Chorba ¶ 8.

79. The methodology that Mr. Torres does present is premised on the assumption that Facebook used information gathered from messages to expand and enhance the "Social Graph," and thereby allow Facebook to enhance the "value of its own social media advertising platform."[77]

80. The most concrete statement of his methodology appears in paragraph 51: "Therefore, the economic value of the benefits Facebook derives from the unlawfully gathered user URL links is proportional to the impact of this additional information on the total information on the Social Graph. In principle, the benefit to Facebook in this respect would be measured by attributing the corresponding portion of the incremental value of the Social Graph to the accretion of the unlawfully gathered links." Mr. Torres then goes on to say that the value of the Social Graph is the "product of the number of links (L) in the Graph."[78]

81. In other words, Mr. Torres intends to calculate the *benefit* to Facebook by multiplying his estimate of the value of the Social Graph, multiplied by the percentage of links in the Social Graph obtained from Facebook messages as a percentage of all links in the Social Graph.

2. Mr. Torres's method is based on a false assumption

82. Mr. Torres's methodology is based on the assumption that Facebook uses information it obtained from Facebook messages to refine its targeting and increase advertising revenues.[79] However, Facebook did not incorporate any information from Facebook

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[77] Torres Report ¶ 36.

[78] Torres Report ¶ 52. Mr. Torres also gives an equation for damages, D, which equal $(L_{t+1} - L_t)w_t$, where L_{t+1} is the next period's number of links and L_t is today's number of links. It is unclear what is meant by "next period" and "today" in this equation. These labels may actually be intended to contrast the actual world with the "but for" world where there was no counting of aggregate numbers of any URLs in messages. However, that is not specified or clear. w_t is the value of each link. It is also unclear what is meant by links or how they relate to the storage of aggregate URL counts.

[79] Torres Depo. Tr. at 45:3-13 ("Q. And what, based on your understanding of the allegations in the complaint, and your assumption that those allegations are true, what was the benefit to Facebook, as you understand it? A. Well, the accumulation of the information gleaned from the messages, basically, the edges between members and the marketers and entities identified by the URLs, is accessible through, as part of the social graph, it's accessible to Facebook in developing the targeted advertising services that, that generate this revenue.").

messages into the Social Graph to target advertising.[80] Indeed, Dr. Golbeck confirmed at her deposition that [redacted].[81] However, in his deposition Mr. Torres reiterated his assumption that the data was used to generate targeted advertising revenue.[82]

83. Because of the assumption that Facebook incorporated information from Facebook messages into the Social Graph to enhance targeted advertising, Mr. Torres's methodology is fundamentally flawed. In fact, Mr. Torres himself acknowledged that his opinion crucially depended on how Facebook actually used the information from these practices.[83]

84. From a theoretical perspective, the value of a Social Graph[84] lies in using friendship data to help predict the relevance of products and services, as Mr. Torres notes when he cites my research in which I say that such advertising "efficacy seems to stem mainly from the ability of targeting based on social networks to uncover similarly responsive consumers."[85] This refers to the fact that if people are friends, they are more likely to

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[80] Defendant Facebook, Inc.'s Supplemental Responses and Objections to Plaintiffs' First Set of Interrogatories at 40, 44 ("During the relevant time period (December 30, 2011 to approximately December 20, 2012), data or information derived from messages (including URLs shared in messages) was not a criterion available to advertisers in choosing the audience for their ads, and Facebook did not use data or information derived from messages (including URLs shared in messages) to match ads to users.")

[81] Golbeck Depo. Tr. at 223: 3-6 ("[redacted].")

[82] Torres Depo. Tr. at 45:3-13. *See also* Torres Depo. Tr. at 102:1-2 "Q: So, the first part of your analysis works in conjunction with the second part of your analysis? A "Well they are related because, ultimately, the only benefits are from advertising.

[83] Torres Depo. Tr. at 47:12-14. "Q. And I'm saying, if the facts were as I described them, and not as you are assuming them, would it impact your expert opinion in this case.?"…A. It would still depend on exactly how Facebook would be using the information in that hypothetical."

[84] This term was used before Facebook to describe the use of graph theory to apply to social networks. *See, e.g.*, Walsh, Toby, "Search in a Small World," *IJCAI*, Vol. 99, 1999.

[85] Tucker, Catherine, "Social Advertising," February 15, 2012, SSRN (http://ssrn.com/abstract=1975897); *see also* Torres Report, note 37. This reflects the concept of homophily discussed in the Golbeck deposition. Golbeck Depo. Tr. at 100-101.

share similar interests and be interested in similar products and services.[86] However, this research highlights that it is the social connections that make Social Graph data potentially valuable.

85. However, none of the disputed practices embedded any social relationships in connection with their use of URLs in messages. It was not the case that Facebook used or could have used URL aggregate counts to identify the nature or intensity of social relationships. Indeed, the inherent value of such aggregate URL share data is hugely diminished by the fact that aggregate counts of website visitation are broadly and freely (or at least inexpensively) available from many websites and providers such as Alexa, Compete, Hitwise and comScore.[87] Therefore, even supposing there was some link, which there is not, between the alleged practices and advertising, it is unclear why a Social Graph is relevant for Mr. Torres's analysis.

86. Indeed, more generally, the Social Graph does not drive all advertising revenue at Facebook and the extent to which drives advertising revenue has changed over time. as noted by AdAge in 2013, "Facebook has since introduced its ad exchange, FBX, and has shifted its focus from social ads to more traditional web-advertising models, such as re-targeting."[88,89] that do not rely on social relations. Furthermore, since 2013, Facebook has also offered advertisers the potential to use custom audiences which offers access to an

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[86] This is a point emphasized by Dr. Golbeck in her TEDxMidAtlantic talk at minute 4:40 – the technical term which she refers to in her talk for this idea is "homophily." Golbeck, Jennifer, "The Curly Fry Conundrum: Why Social Media 'Likes' Say More than You Might Think," TEDxMidAtlantic 2013, https://www.ted.com/talks/jennifer_golbeck_the_curly_fry_conundrum_why_social_media_likes_say_more_than_you_might_think, viewed December 11, 2015. Dr. Golbeck expanded on this in her deposition: "A. Yeah, so homophily, H-O-M-O-P-H-I-L-Y, is a concept from sociology actually that basically birds of a feather flock together that we tend to be friends with people who share our traits more than people randomly pulled from the general population would share our traits." Golbeck Depo. Tr. at 101:7-13.

[87] *See* my recent paper, "Can Big Data Protect a Firm from Competition?," jointly with Anja Lambrecht, for a richer discussion of this point. Tucker, Catherine, and Anja Lambrecht, "Can Big Data Protect a Firm from Competition?" December 18, 2015, SSRN (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705530).

[88] Delo, Cotton, and Michael McCarthy, "GM Returns to Facebook Advertising after Public Split a Year Ago," *AdvertisingAge*, April 9, 2013, http://adage.com/article/digital/gm-returns-facebook-advertising-public-split/240785/, viewed January 3, 2016. This is the same trade publication noted by Mr. Torres's Report in Footnote 101.

[89] *See, e.g.*, Delo, Cotton, "Facebook Launches New Retargeting Alternative to FBX: Targeting to Use Tracking Software That Marketers Can Attach to Websites and Mobile Apps," *AdvertisingAge*, October 15, 2013, http://adage.com/article/digital/facebook-launches-retargeting-alternative-fbx/244746/, viewed January 3, 2016. This describes an advertising platform that is based on behavior outside of the Social Graph.

audience based on the audience the advertiser already has, such as email addresses or phone numbers.[90] Such analysis is further complicated by the fact that for any one click there may be several drivers which interlink in complicated ways, making identifying what drives any one piece of advertising revenue problematic. This is unsurprising given literature in economics which highlights the difficulty of measuring the economic drivers of advertising effectiveness.[91]

3. The parts of the proposed methodology where Mr. Torres does give details have several flaws

87. As discussed, Mr. Torres's proposed methodology is unrelated to how Facebook benefited from the challenged behavior, as it did not use the aggregate stores of anonymous social plugin count data to target advertising, which is the fundamental assumption of his methodology. However, even supposing that the data collected was related to advertising (which it was not), issues remain with Mr. Torres's three calculations.

88. The first calculation in Mr. Torres's description of this methodology is a table of estimated messages (Table 2 in his Report, at page 19). However, the total number of messages seem irrelevant to the key aspect of the data which is needed, which is how many of these messages had URLs that created attachments.[92] Crucially, even a count of URLs that generated a URL attachment does not reflect whether they were used in any disputed practice—that is, whether the data was used as part of a social plugin counter between 2011 and 2012, or used in the background in the provision of aggregate

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[90] "More Matching Capabilities with Custom Audiences," *Facebook Marketing Partners*, November 30, 2015, https://facebookmarketingpartners.com/partner-news/more-matching-capabilities-with-custom-audiences/, viewed January 3, 2016. Facebook offers potential advertisers a number of ways of targeting customers beyond relationships. Specifically, on its business website, Facebook offers that advertisers can target users not only through location variables such as country, state, zip code, or local area but also through demographics, user selected interests, and shopping or use behavior. *See* "Facebook Advertising Targeting Options," *Facebook for Business*, https://www facebook.com/business/products/ads/ad-targeting/, viewed January 6, 2016.

[91] Lewis, Randall A., and Justin M. Rao, "The Unfavorable Economics of Measuring the Returns to Advertising," *The Quarterly Journal of Economics*, first published online July 6, 2015 doi:10.1093/qje/qjv023.

[92] Torres Report ¶ 45. In his deposition he appeared to restate this to say, "[t]he data that I would need is mainly the number of those messages that were intercepted that contained URLs, and the total number of messages for the same time periods." Torres Depo. Tr. at 27:20-23.

demographic data to website owners, or used as part of a recommendation. Individual enquiry is necessary to make these determinations.

89. The second set of calculations surrounds the alleged presence of 15.9 billion friendship ties on the Social Graph.[93] These data come from May 2011. Mr. Torres states, "I would estimate the value of the enhancement to the Social Graph as commensurate with the ratio of (1) intercepted URLs in private messages during the Class period to (2) the total number of links on the Social Graph." However, these second set of calculations does not make sense as a denominator in Mr. Torres's proposed ratio for two reasons. First, the value of friendship ties that are used to target advertising is completely distinct from aggregate URL counts, which are not used to refine targeted advertising. Second, even supposing the aggregate link counts were used to produce advertising revenue, which they were not, the number of friendship ties would be the wrong denominator. The correct denominator, which would be orders of magnitude larger, would include not just friendship ties but every interaction between friends on Facebook—every "Like," every "share," every piece of demographic information, and the content of every public posting. Further complicating the analysis, each of these different drivers of the potential for Facebook to generate advertising revenues have different efficacy in different circumstances and at different times.[94]

90. The third set of calculations surrounds the value of the Social Graph. However, Mr. Torres has also overestimated the value of the Social Graph for at least five reasons.

91. First, there is an error in the calculation of the value of the Social Graph. The average quarterly revenue Mr. Torres based his estimate on was *total* revenue, not advertising revenue.[95] This means that the estimates also include revenues from Facebook's activities

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[93] Torres Report ¶ 49.

[94] *See, e.g.*, Tucker, Catherine E., "Social Networks, Personalized Advertising, and Privacy Controls," *Journal of Marketing Research*, Vol. 51, No. 5, 2014, pp. 546-562, where I show that different undergraduate institutions have different values for advertisers, as does the rarity of information - for example, liking Oprah Winfrey may be less informative than liking an obscure 1970s poet.

[95] Looking at slide 9, 2015 Q2 Results PowerPoint, the average of total revenues over the past four quarters equals the $1,771 figure noted by Mr. Torres in footnote 66 of his report. The average of total advertising revenues could potentially be estimated from Slide 10 of the same document, at $1,622.25.

including payments in online games.[96] Correcting this error (which Mr. Torres acknowledged in his deposition) reduces Mr. Torres's estimate of the Social Graph's value by $1.267 billion dollars.[97]

92. Second, the choice of revenue numbers appears selective and problematic. The equations in Mr. Torres report suggest that the change in value was contemporaneous with the alleged practice, suggesting the use of revenue from the span of years governed by the class definition. However, the Torres report instead uses just the most recent four quarters in 2014 and 2015 as a basis for advertising revenue. Using the span of years covering the class definition as a basis for average revenue, suggests a valuation of the Social Graph that is $7 billion lower than the one suggested in the Torres report.[98]

93. Third, Mr. Torres's allocation of costs is as follows: "the additional information collected through the accused activities has arguably zero incremental cost. Therefore, from an economic perspective, virtually all of the incremental advertising revenue generated from the enhancement can justifiably be considered incremental profit to Facebook."[99] This seems arbitrary, as it is not clear from this description to what incremental part of

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[96] This led the estimates in Table 1 in his report to be off by $1.2 billion. This error was confirmed in his deposition. Torres Depo. Tr. at 195:10-204:9.

[97] Mr. Torres initially estimated the value of the Social Graph to be $15.087 billion. Torres Report ¶ 43, Table 1. In his deposition, he stated that he intended the valuation to be $13.820 billion. Torres Depo. Tr. at 204:4-9 ("Q. So, those three corrections on page 15, is that all, Mr. Torres? A. Yes. And then that feeds into the table 1, where the annual profit numbers would be 3,459,000,000, and the discounted values in that line, for the whole line, for the full column, would be 2915, 2457, 2070, 1745, 1470, 1239, 1044, and 880, for a total of 13,820,000,000."). I understand that Mr. Torres has made corrections to the report to rectify this error but these corrections were submitted too close to the deadline for the submission of my report for me to be able to review them.

[98] The actual amount of the overstatement is $7.056 billion ($7.056 billion = $15.087 billion - $8.031 billion (*see* Exhibit HHH)). While it does not affect his estimate of the value of the Social Graph, Mr. Torres made yet another error related to his revenue estimate. He claims his revenue estimate is based on "quarterly advertising revenue from the activities of users located in the U.S. and Canada during the four quarters between April 2014 through June 2015." Torres Report ¶ 39 note 66). The period April 2014 to June 2015, however, contains *five* quarters, not four. A review of his calculations, after taking into account the $1.267 billion error identified above, indicates Mr. Torres is using quarterly advertising revenue for the four quarters between July 2014 and June 2015. Torres Report ¶ 39, n. 66, and Facebook, Inc.'s 2015 Q2 Earnings Report (July 29, 2015), slide 10.

[99] Torres Report ¶ 44.

Facebook's revenue-generating functions Mr. Torres thinks Facebook's considerable costs should be allocated.[100]

94. Fourth, Mr. Torres excludes research and development costs from Facebook's expenses when calculating Facebook's profit margin. His argument is that expenditures for research and development are intended to yield benefits in the future and are therefore not appropriate to be accounted for today to determine current period profits. Mr. Torres claims this is consistent with "accepted valuation standards."[101] However, though Mr. Torres is correct that valuation practitioners often exclude current period research and development from current period calculations of profit, they still include research and development expenses from prior periods that are resulting in benefits today.[102] In fact, the text that Mr. Torres cites as the basis for his Income Valuation Approach[103] includes research and costs as an expense in a sample income valuation case study.[104] Moreover, Mr. Torres assumes that the benefit to Facebook related to the Social Graph will accrue over eight years. In order for the Social Graph to remain a valuable asset to Facebook, it will need to continue to invest in the Social Graph. To the extent that this has historically required Facebook to invest in research and development to support and develop the Social Graph, this need will continue into the future and through Mr. Torres's eight-year time horizon. By failing to account for research and development expenses, Mr. Torres is biasing Facebook's profit margin up, which then biases his estimate of Facebook's benefits up as well. Including research and development expenses for the years Mr. Torres considered in his valuation as a proxy for historical research and development

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100 Considerable costs as defined by Mr. Torres (cost of revenue, marketing and sales, and general and administrative expenses) and outlined in Exhibit GGG have ranged from 35 percent (Q2'14) to 103 percent (Q2'12) as a percentage of revenue. Torres Report ¶ 39 and Exhibit 1.

101 Torres Report ¶ 39, note 67.

102 *See, e.g.*, Damodaran, Aswath, "Research and Development Expenses: Implications for Profitability Measurement and Valuation," *NYU Stern School of Business,* http://people.stern nyu.edu/adamodar/pdfiles/papers/R&D.pdf, in which he argues that research and development expenses should be capitalized and amortized as opposed to being charged to the quarter in which they are incurred. Importantly, in both positions it is assumed that research and development costs will be accounted for somewhere in the valuation.

103 *See* Torres Report note 63 in which he cites Smith, G.V. and R.L. Parr, Valuation of Intellectual Property and Intangible Assets, John Wiley & Sons, 2000; Reilly, R. F. and R.P. Schweihs, Valuing Intangible Assets, McGraw Hill, 1999. Mr. Torres also cites Smith and Parr in footnotes 64 and 96.

104 *See* Smith and Parr, Table 18.3 on pages 510 and 511.

expenses would reduce the Social Graph valuation by over $7 billion down from the number presented in the report.[105] In combination with the correction to the selectivity of the years used, the Social Graph valuation would drop from the $15 billion figure stated by $10 billion.[106]

95. Fifth, at a more conceptual level, Mr. Torres's decision to give the Social Graph a lifetime of eight years based on geographical mobility misses a critical fact: The nature of Internet advertising makes geography not that relevant as a targeting variable relative to friendship ties or expressed interests.[107] Furthermore, the history of social networks has shown the vulnerability of any social network site to turmoil and displacement and users leaving the site.[108] For example, it would have been wrong to assume that the Social Graph embedded in MySpace in 2008 would have a lifetime value of eight years, given that within less than a year its users had left the site in droves.[109] Mr. Torres was in fact posed with this hypothetical in his deposition and stated that in order to value the MySpace Social Graph he would have to "perform a series of due diligence and preliminary analyses."[110]

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105 The actual amount of the overstatement is $7.456 billion ($7.456 billion = $15.087 billion - $7.631 billion (*see* Exhibit III)).

106 The actual amount of the overstatement is $10.704 billion ($10.704 billion = $15.087 billion - $4.383 billion (*see* Exhibit JJJ)).

107 Indeed, my own research emphasizes that geography becomes meaningful as a targeting variable only when offline advertising channels are not available to the advertiser. *See* Goldfarb, Avi and Catherine Tucker, "Advertising bans and the substitutability of online and offline advertising," Journal of Marketing Research 48.2 (2011): 207-227.

108 Tucker, Catherine, and Alexander Marthews, "Social Networks, Advertising, and Antitrust," *George Mason Law Review*, Vol. 19, 2012, pp. 1211-1227.

109 Torkjazi, Mojtaba, Reza Rejaie, and Walter Willinger, "Hot Today, Gone Tomorrow: On the Migration of MySpace Users," Proceedings of the 2nd ACM Workshop on Online Social Networks, 2009.

110 Torres Depo. Tr. at 211:21-212:5 ("Q. If you were tasked with valuing the social graph of Myspace in 2007, would you have used a similar methodology as one that you've used here? A. Well, in that hypothetical situation, I would have to, to perform a series of due diligence and preliminary analyses. I'm not sure that Myspace had the same revenue mode, so I would have to reconsider the revenue model then, and, to see if that is sufficient.").

C. It is not clear how the proposed methodology related to allegedly inflated social plugin counters is linked to the disputed practice

1. Summary of Mr. Torres's method for estimating the alleged benefit to Facebook related to allegedly "inflated" social plugin counters

96. Mr. Torres's second proposed analysis, which is related to the "Like" button next to a social plugin counter, describes two potential bounds for damages related to each URL attachment created.[111] The first is to try and establish how much the website owner might benefit from additional "Likes." The second is to establish the market value of these "Likes" in order to determine what website owners would have needed to pay in order to acquire the "Likes." However, both of these proposed methodologies are unrelated to the claims made by Plaintiffs over the harm they suffered and seem to misunderstand the reasons why website owners value "Likes."

2. The analysis focuses on the value of "Likes" to website owners, which has no reliable link to Plaintiffs' allegations of harm

97. Mr. Torres's methodology for estimating the benefits from inflating the social plugin counter on third-party websites attempts to quantify the amount of money that third-party website owners either received from the allegedly inflated "Likes" or would have been willing to pay to acquire the allegedly inflated "Likes." Even if Mr. Torres were to measure these amounts accurately the benefit to the subset of third-party website owners willing to pay for Likes are not benefits received by Facebook.

98. Mr. Torres suggests that "In the Facebook environment, the number of 'Likes' measured is typically interpreted as an indicator of the reach of an advertising strategy and, given the particular brand/product combination, as a factor in generating sales."[112] However, since "Likes" incremented were never used on the Facebook advertising platform to measure the reach or success of a Facebook advertising strategy, this analogy is misguided. Mr. Torres then attempts to link the benefit to third-party website owners to Facebook by claiming that

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[111] Torres Report ¶¶ 62-71.

[112] Torres Report ¶ 64.

> "The amounts identified in this analysis – the cost savings to advertisers from the accrual of Likes from the intercepted messages – were, in principle, made available to spend on additional Facebook marketing campaigns. This would have been particularly true in light of the false appearance of increase [sic] Fan engagement that an inflated [social plugin] count would present. To that extent, a fraction of this benefit may have been converted to advertising revenue benefiting Facebook."[113]

99. The link is tenuous. Mr. Torres provides no method for determining if the cost savings were actually spent on Facebook advertising or, if so, how much was spent. He does not even argue with certainty that any of it resulted in incremental revenue to Facebook, just that "in principle" it was available to be spent on Facebook marketing and that it "may have been converted." In his deposition, Mr. Torres confirmed only "a fraction [of an advertiser's cost savings] would have been converted,"[114] to Facebook revenue, but was unable to state what fraction, stating, "I can't tell you because I don't have the information to determine it."[115]

100. Instead, the argument in Mr. Torres's Report is "this practice gave its clients, Marketers, an incremental impression of effectiveness of their Facebook marketing campaigns. Marketers perceiving an incremental return of their spending on Facebook campaigns were undoubtedly encouraged to allocate additional funds to these campaigns."[116] The argument is that when a third-party website observed an increase in a social plugin counter, they diverted the funds that they would have spent on incrementing the social plugin counter towards Facebook advertising. However, this argument is flawed for at least four reasons.

101. First, as discussed above, many third-party websites do not have social plugin counters. Second, among those third-party websites that have social plugin counters many do not pay to advertise on Facebook. Indeed, much advice on social media emphasizes the

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[113] Torres Report ¶ 73.

[114] Torres Depo. Tr. at 295:6-13 ("Q. And does your report assume that advertisers would have passed 100 percent of their cost savings on to Facebook? A. Is that my assumption, that they would – Q. Yes. Is that your assumption? A. No. Q. What is your assumption, then? A. That a fraction would have been converted.").

[115] Torres Depo. Tr. at 295:14-22 ("Q. Which fraction? A. I don't have the information to determine that fraction. W. Can you tell me it's more than 50 percent? A. I can't tell you, because I don't' have the information to determine it.").

[116] Torres Report ¶ 68.

extent to which it is desirable often to not spend money on advertising.[117] In his deposition, Mr. Torres agreed that his definition of "Marketers" means that the focus is on third-party websites who purchase advertising.[118] However, the class definition includes many URL messages where the website did not and would not spend money on advertising on Facebook. Indeed, some examples from Named Plaintiff Mr. Hurley [redacted].[119] Similarly, Mr. Campbell shared URLs for [redacted].[120] [redacted].[121]

102. Second, the mechanism by which Facebook allegedly benefited may in fact have had the opposite effect. Mr. Torres argues that Marketers would have concluded that Facebook marketing was more effective because of the incremental "Like" and devoted more money to Facebook advertising.[122] If the social plugin counter incremented without any extra effort or expenditure on advertising from the firm itself, the firm may take this as suggestive that its organic (or non-paid) marketing efforts were successful and be less likely to divert money to advertising.

103. Third, there are many reasons to think that website owners understood the varied providence of "Likes" displayed on the social plugin counter, especially given that the

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117 Edelman, David, and Brian Salsberg, "Beyond Paid Media: Marketing's New Vocabulary," *McKinsey&Company*, November 2010, http://www mckinsey.com/insights/marketing_sales/beyond_paid_media_marketings_new_vocabulary, viewed January 11, 2016.

118 Torres Depo. Tr. at 98:2-8 ("Q. What do you mean by, marketers? A. In this report, I mean by marketers the same thing that Facebook defines as marketers, which are their clients, the people responsible for advertising, companies, entities, organizations, and whether they are direct entities or agencies in the advertising market.").

119 *See* HURLEY000001 where the URL [redacted] was shared for example.

120 *See* Plaintiff Matthew Campbell's Corrected Objections and Responses to Defendant Facebook, Inc.'s First Set of Interrogatories.

121 For example, the IRS itself imposes a long list of restrictions on potential advertisements that anyone connected with the IRS can use. *See* "Advertising Standards," *IRS*, last updated 07-Jan-2016, https://www.irs.gov/uac/Advertising-Standards, viewed January 15, 2016.

122 Torres Report ¶¶ 68, 73.

instructions for installing the counter explicitly stated it would include "Likes" created from URL attachments.[123]

104. Without a bridge between the alleged "benefit" received by third-party website owner and any alleged "benefit" to Facebook, Mr. Torres's damage theory for the allegedly inflated social plugin counter is divorced from the way that Plaintiffs described the harm they suffered.

3. The analysis fundamentally misunderstands or distorts why website owners value "Likes"

a. The analysis focuses on the value of "Likes" that allowed a continuing relationship between the website and an individual rather than social plugin counters

105. By themselves "Likes" have little value to third-party websites. Recent research broadly contradicts Mr. Torres's assertion that "Likes can be profitable."[124] Harvard researchers found in multiple experiments that "Liking" a brand has no effect on subsequent consumer attitudes or behavior, including advertisement choice and actual purchase.[125] Indeed, it appears likely that the study that Mr. Torres cites in Table 3 of his report[126] does not actually represent anything profitable that is causally connected with a "Like." This table compares the cost of inducing a "conversion" between a "Fan" and a non-"Fan" for a variety of products.[127] However, people who have a greater tendency to become a Fan of a product are also easier to convert irrespective of whether they click a "Like" button. There is no causal relationship implied by this data or profitability that can be attributed to the "Like" button.

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123 *See* FB000000163 from March 2011 (captured by the Wayback Machine) for an example of the text available on Facebook's developer website. The text explicitly says that the count includes "Likes" deriving from the creation of URL attachments in messages. *See also* FB000000166 from October 2012 (also captured by the Wayback Machine) with similar information.

124 Torres Report ¶ 70.

125 John, Leslie et al., "What are Facebook 'Likes' Really Worth?," *HBS Working Paper,* 2015, http://rady.ucsd.edu/docs/events/lesliejohn.pdf. This is also illustrated by the wide variety of motivations for "Liking", such as the desire to receive a discount or an offer, displayed in Table 1.

126 Torres Report at 26.

127 Note that this "Fan" language represents an earlier incarnation of Facebook, where users could be "Fans" of, rather than "Like" an organization, so it is not quite certain how relevant it is for an analysis of "Likes" in any case.

106. Instead, the "value" of a "Like" to a third-party website or to a Facebook page is that it enables that organization to form a relationship with that user and share communications with them. Indeed, research shows[128] that the only value of "Likes" to advertisers is that they allow the user to subscribe to the conventional marketing communications put out by that advertiser's main Facebook page. This implies that the kind of "Like" that is an anonymous increment of a social plugin counter, and that does not allow a website to form a relationship with the user, has little worth. Therefore, trying to ascribe value to all "Likes" based on valuations of "Likes" that allowed or implied a continuing relationship between the organization and an individual is misguided.

107. In general, Mr. Torres's Report fails to distinguish between users actually clicking on "Like" buttons on third-party websites with changes in the display of counters on those third-party websites. For example, Mr. Torres cites an internal Facebook email chain for the proposition that "from [the Like button's] launch in April 2010, the impact of social plugins was significant, generating 815 million clicks on 'Like' buttons daily in the first few weeks."[129] However, the document indicates that Facebook's partners had a wide range of outcomes with respect to implementing social plugins – which are themselves broader than a social plugin counter. For example, traffic on the Rotten Tomatoes movie reviews website actually fell after implementing social plugins, suggesting that any effects are not straightforward or uniform.[130] Similarly, the document Mr. Torres uses to demonstrate "Benefits of Using Like Button Plugins" conflates the potential for anonymous incrementing of the social plugin counter with users clicking the "Like" button.[131]

108. Given this, any attempt to use a valuation for a "Like" that might include a meaningful and ongoing relationship between the website and website user is wrong.

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[128] Mochon, Daniel, Karen Johnson, Janet Schwartz, and Dan Ariely, "How much is a like worth? A field experiment of Facebook pages," *Tulane University Working Paper – Advances in Consumer Research*, vol. 42, 2015. This paper is under the review process so is not publicly available.

[129] Torres Report ¶ 29.

[130] "Partners: social plugins," Internal Facebook Email Chain, FB000011715.

[131] "Connecting Outside of Facebook," PowerPoint Presentation at Slide 4, FB000026793.

109. Mr. Torres argues that "the average cost of advertising on Facebook to encourage a user to become a Fan – Like the advertiser's Facebook page – was $1.07. This cost also varies across sectors and over time. In 2012, the cost per acquired Fan (i.e., cost per click in Fan acquisition campaigns) averaged $0.55."[132]

110. There are four things to note about these estimates. First, they refer to "Fans," not "Likes." Second, they refer to a situation where an organization will subsequently, as a result of the Fan relationship, be able to communicate with that audience via the Facebook platform and so do not reflect the market value of an anonymized +1 increase in a plugin counter on a third-party website. Third, these estimates themselves show the huge variability in potential estimates of the costs of obtaining a "Like" (which again, is distinguishable from the anonymous incrementation at issue here). Indeed, there are estimates that suggest a cost of obtaining a "Like" can via Facebook advertising is $0.08.[133] Estimates which range, depending on the study used, from $0.08 to $1.07 are not a reliable guide for damages. Fourth, as shown in the earlier example of the promotion of the BostonEventsInsider website shown in Figure 6, there are many other ways of incentivizing users to give "Likes" which might even be cheaper than paying for them – in that particular case, the website had not paid money for the movie tickets it was using to incentivize customers to "Like" their website.

111. It might be supposed that the estimates of "phony" purchases of "Likes" cited by Mr. Torres, such as the case where "Likes" were sold for $0.075, are therefore more relevant.[134] However, there are at least two issues with such numbers. First, "Likes" are often actually cheaper than the article cited.[135] One website test suggests that "Likes" can

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[132] Torres Report ¶ 70.

[133] Chieruzzi, Massimo, "Buying Facebook Likes Sucks, Here's The Data To Prove It!," *AdEspresso*, November 19, 2014, https://adespresso.com/academy/blog/buy-facebook-likes/, viewed December 12, 2015.

[134] National Public Radio, Planet Money: "For $75, This Guy Will Sell You 1,000 Facebook 'Likes,'" originally broadcast on May 16, 2012, http://www npr.org/sections/money/2012/05/16/152736671/this-guy-will-sell-you-sell-you-1-000-facebook-likes, viewed December 12, 2015.

[135] For example, http://www.buylikesandfollowers net/buy-facebook-likes-cheap html suggests that it would cost $0.03 a "Like" if you buy 10,000 "Likes." "Buy Real Facebook Likes," *Buylikesandfollowers.net,* http://www.buylikesandfollowers.net/buy-facebook-likes-cheap html, viewed December 12, 2015.

be bought as cheaply as $0.01.[136] Second, the market price of such "Likes" may reflect the potential belief among buyers (whether true or not) that "Likes" might actually translate into real people taking real actions. As such the price would be higher than for an anonymous increment of the social plugin counter where there was definitely not such a possibility.

b. The Proposed Methodology For Social Plugin Counters Does Not Address The Fact That Many Proposed Class Members Were Unaffected Or Benefited From These Practices.

112. Mr. Torres's proposed methodology does not distinguish between the many cases where the user was unaffected as there was no counter or social plug-in that displayed counts. Indeed, it seems to presume the presence of a social plugin counter on the website for every message where an attachment was created. However, many websites do not have social plugins and many social plugins do not provide a counter.[137]

113. Mr. Torres's proposed methodology also does not consider the cases where a user was invested in the website, meaning they would have welcomed or benefited from the potential for an increment of the social plugin counter, supposing the website did indeed have a plugin that contained the counter.

D. Mr. Torres's two potential methodologies cannot be reconciled with each other

114. Last, these two separate proposed methodologies cannot be reconciled with the different claims that proposed class members may have. In particular, it is not clear how the proposed methodology would avoid double-counting the benefits in instances where a message contained a URL during the period that such a share could have potentially incremented a social plugin displaying a counter. Mr. Torres has two competing suggestions for how to resolve this issue.

115. First, in his Report, Mr. Torres suggests: "the calculated effect from incremental advertising revenue during the time when the Like counters were being affected (through

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[136] Chieruzzi, Massimo, "Buying Facebook Likes Sucks, Here's The Data To Prove It!," *AdEspresso*, November 19, 2014, https://adespresso.com/academy/blog/buy-facebook-likes/, viewed December 12, 2015.

[137] Declaration of Alex Himel ¶¶ 34-35, 37.

December 2012) . . . shall be deducted from the benefits calculated for this period under the methodology described in the previous section [the Social Graph method] for affected Class Members."[138]

116. This proposal leads to conflicts in the interests of different putative class members. The following thought experiment provides an example of possible conflicts, taking as given that these methodologies are capable of producing concrete numbers and that the numbers would be relevant.

117. Suppose that between 2011 and 2015, 50 million URLs in messages were affected. Suppose that in the first year of this period (2011-2012), 10 million URL messages were affected. Suppose that the Social Graph method produced a calculation of 1 cent per message-URL. Suppose also that the "Like"-counter valuation method produced a value of five cents per message-URL in the 2011-2012 period. Under Mr. Torres's Social Graph method, the available damages to be split among class members would be $500,000. Under the "Like"-counter valuation method, the available damages to be split among affected class members would also be $500,000. However, under the reconciliation proposal in Mr. Torres's Report, that "Like"-counter total of $500,000 would need to be subtracted from the Social Graph method total of $500,000, implying zero dollars available for any class members who sent messages containing URLs after December 2012. Now that might be correct, given the negligible effects of the URL counts after December 2012, but it does suggest a conflict of interest of the proposed class members inherent in the two methodologies. Any proposed class member who sent messages mainly prior to December 2012 would have an interest in maximizing the value calculated by the "Like"-counter valuation method; any proposed class member who only sent messages after December 2012 would prefer that the "Like"-counter valuation method provided very low valuations.

118. Second, in his deposition, Mr. Torres testified that ultimately his goal was to make sure the overlap was taken into account and that "when everything is said and done . . . only

[138] Torres Report ¶ 74.

one of the two calculations will prevail."[139] In response to a thought experiment similar to the one in the previous paragraph, he said that ultimately, "you wouldn't add them together. You would just have one."[140] Similarly, Mr. Torres made clear that his methodology could not give rise to a negative number because "if the overlap overwhelms the situation, then only one of [the figures] would be appropriate."[141]

119. Mr. Torres's suggested solution during his deposition is fundamentally different than the solution proposed in his Report. Therefore, it is unclear how Mr. Torres would actually reconcile his competing damages methodologies. Further, his testimony suggests that he thinks that only one set of putative class members may recover and therefore, the conflicts in the interests of different Class Members remain unresolved.

E. Rebuttal to Mr. Torres's analysis as it pertains to statutory damages

120. I understand that the Court has discretion regarding whether to award statutory damages and, if so, the amount. I also understand that the Court may consider several factors in this determination including, among others, the actual damage to the victim and whether the Defendant profited from the alleged violation. I have no opinion regarding whether statutory damages are appropriate or not, but I note where my analysis and rebuttal to the Torres report addresses these two factors. Mr. Torres explicitly stated in his deposition he was not offering an opinion relating to statutory damages, so I emphasize that these are

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[139] Torres Depo. Tr. at 300:3-19 ("Q. But how would the net, if you are saying that you would deduct the amounts, the analysis in this section shall be deducted from the benefits calculated under the methods described in the previous section, okay, I'm saying, if the benefits were greater than the calculated – A. Now, what this means is that . . . what this means is that the overlap has to be taken into account. That overlap can be calculated, when everything is said and done, and that overlap means that only one of the two calculations will prevail. Q. One of the two, meaning A or B? A. So, if you add A and B, you would then have to take away the overlap.").

[140] Torres Depo. Tr. at 299:4-8 ("So, if it were to be the case that benefits from one perspective are the same as the benefits from the other perspective, then, yeah, the overlap with, would mean that you wouldn't add them together. You would just have one.").

[141] Torres Depo. Tr. at 299:10-23 ("Q. And what if the benefits were greater than the calculated effect from the incremental advertising revenue? That would result in a negative number? A. In, it would be a very strange hypothetical situation where that would even be the case, because of the length of the time period. Q. But, if it were the case, it would be a negative number? A. So, whatever the methodology determines for those two numbers would have to do the analysis of the overlap, and, if the overlap overwhelms the situation, then only one of them would be appropriate.").

not critiques of his conclusions but instead critiques of his analysis in terms of how it informs statutory damages.[142]

1. Factor 1: Actual damage to the victim

121. As discussed in Section VI.C, according to their depositions, several proposed class members that were deposed could not articulate the potential harms or losses they suffered as a result of the challenged behavior. Furthermore, some Named plaintiffs would have benefited directly, as in the case of Mr. Campbell when [redacted]. Mr. Torres has not provided an opinion related to the actual loss, if any, suffered by proposed class members.[143] In general, given the discussion in Sections VI.A and VI.B, there are reasons to believe that many potential class members suffered no damages or harm and in some cases as actually benefited from the alleged behaviors.

2. Factor 2: Whether the Defendant profited from the alleged violation

122. Mr. Torres claims to measure the benefit received by Facebook from the challenged behavior, but as I discuss in Sections VII.B and VII.C, he fails to do so. His first method is based on the false assumption that Facebook uses information shared in URLs contained Facebook message in the Social Graph for targeted advertising, which the plaintiff's own technical expert stated is not true.[144] His second method is based on the unsupported assumption that marketers may have shifted a fraction of their marketing budget to additional Facebook advertising, but he has no idea what fraction it would be if any. Therefore, for these and other reasons discussed above, neither of Mr. Torres's methods are a valid measure of Facebook's profits resulting from the challenged behavior.

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142 Torres Depo. Tr., at 37:4-9 Q. And are you offering an opinion in this case as to whether or not statutory damages should be awarded? A "No. That would be a legal conclusion"

143 Torres Depo Tr. at 48:11-21 ("Q. Why doesn't it examine, your methodology examine, instead of examining benefit to Facebook, why doesn't it examine detriment to the putative class? A. So, my report and methodology that I developed was asked to analyze the benefits to Facebook, so that's, so, it doesn't calculate the detriment to the class members, or the potential class members, because it wasn't meant to.").

144 Golbeck Depo. Tr. at 223: 2-6 ("[redacted]").

VIII. CONCLUSION

123. There are two flaws with the damages methodology laid out in Mr. Torres's Report. First, neither advertising revenues nor the price of incremental likes for advertisers are directly connected to the benefits that Facebook may have received from the alleged practices. Second, the proposed methodologies have technical issues which lead them to produce estimates that vary enormously in scope. In the case of the first methodology, a few simple (but reasonable) changes in assumptions lead to a reduction of $10 billion in the value attributed to the Social Graph. In the case of the second methodology, the proposed market value of likes varies from the $9.56 figure[145] cited in the Torres report to one cent.

124. Even if the second set of errors could be corrected, a central flaw remains—advertising revenues or the market value of a "Like" to an advertiser are unconnected with any profits or benefits enjoyed by Facebook.

Dated: January 15, 2016

Catherine Tucker, PhD.

[145] Torres Report ¶ 69.

EXHIBIT DDD

CATHERINE TUCKER

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EDUCATION

Stanford University, Ph.D. in Economics (Advisor: Tim Bresnahan), 2005

Oxford University, BA in Politics, Philosophy and Economics, 1999

APPOINTMENTS

MIT Sloan, Sloan Distinguished Professor of Management Science, September 2015 –

MIT Sloan, Chair MIT Sloan PhD Program, July 2015 –

MIT Sloan, Professor of Management Science, July 2015–

National Bureau of Economic Research (NBER), Research Associate, September 2012 –

MIT Sloan, Mark Hyman Jr. Career Development Professor (with tenure), July 2012 –

MIT Sloan, Associate Professor of Management Science, July 2011 –

National Bureau of Economic Research (NBER), Faculty Research Fellow, May 2011 – September 2012

MIT Sloan, Douglas Drane Career Development Chair in IT and Management, July 2006 –

MIT Sloan, Assistant Professor of Marketing, July 2005 – June 2011

Honors and Awards

2015	Erin Anderson Award
2014	Paul E. Green Award
2013	Teacher of the Year Award, MIT Sloan
2013	Jamieson Prize for Excellence in Teaching
2012	Garfield Economic Impact Award for Best Paper in Health Economics
2012	Nominated for Teacher of the Year award (Also in 2010 and 2009)
2011	WHITE Award for best paper in the Economics of Healthcare IT
2011	Public Utility Research Prize for the best paper in regulatory economics
2011	NSF CAREER Award
2011	MSI Young Scholar
2010	Management Science Distinguished Service Award
2004	Koret Foundation Scholar, Stanford Institute for Economic Policy Research Fellowship
2004	Fourth Annual Claire and Ralph Landau Student Working Paper prize

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Published/Accepted Papers

1. 'Identifying Formal and Informal Influence in Technology Adoption with Network Externalities', *Management Science*, Vol. 55 No. 12, December 2008, pp. 2024-2039

2. 'Privacy Protection and Technology Diffusion: The Case of Electronic Medical Records' with Amalia Miller, *Management Science (Lead Article)*, Vol. 55 No. 7, July 2009, pp. 1077-1093

    - Republished as part of Informs 'Healthcare in the Age of Analytics' series

3. 'How Sales Taxes Affect Customer and Firm Behavior: The Role of Search on the Internet' with Eric Anderson, Nathan Fong and Duncan Simester, *Journal of Marketing Research*, Vol. 47 No. 2, April 2010, pp. 229-239

4. 'Growing Two-sided Networks by Advertising the User Base: A Field Experiment', with Juanjuan Zhang, *Marketing Science*, Vol. 29 No. 5, September-October 2010, pp. 805-814

5. 'Privacy Regulation and Online Advertising' with Avi Goldfarb, *Management Science*, Vol. 57 No. 1, January 2011, pp. 57-71

6. 'Search Engine Advertising: Channel Substitution when Pricing Ads to Context', with Avi Goldfarb, *Management Science*, Vol. 57 No 3, March 2011, pp. 458-470

7. 'Stuck in the Adoption Funnel: The Effect of Interruptions in the Adoption Process on Usage' with Anja Lambrecht and Katja Seim, *Marketing Science*, Vol. 30 No. 2, March-April 2011, pp. 355-36

8. 'Advertising Bans and the Substitutability of Online and Offline Advertising', with Avi Goldfarb, *Journal of Marketing Research (Lead Article)*, Vol. 48 No. 2, April 2011, pp. 207-227

9. 'Can Healthcare Information Technology Save Babies?' with Amalia Miller, *Journal of Political Economy*, Vol. 119 No. 2, April 2011, pp. 289-324

10. 'How Does Popularity Information Affect Choices? A Field Experiment' with Juanjuan Zhang, *Management Science*, Vol. 57 No. 5, May 2011, pp. 828-842

11. 'Online Display Advertising: Targeting and Obtrusiveness' with Avi Goldfarb, *Marketing Science (Lead Article and Discussion Paper)*, Vol. 30 No. 3, May-June 2011, pp. 389-404

    - 'Rejoinder - Implications of "Online Display Advertising: Targeting and Obtrusiveness' with Avi Goldfarb, *Marketing Science*, Vol. 30 No. 3, May-June 2011, pp. 413-415
    - Nominated for John D. C. Little Award

12. 'Encryption and Data Security' with Amalia Miller, *Journal of Policy Analysis and Management*, Vol. 30 No. 3, Summer 2011, pp. 534-556

13. 'Paying With Money or With Effort: Pricing When Customers Anticipate Hassle' with Anja Lambrecht, *Journal of Marketing Research*, Vol. 49 No. 1, February 2012, pp. 66-82.

14. 'Heterogeneity and the Dynamics of Technology Adoption' with Stephen Ryan, *Quantitative Marketing and Economics*, Vol 10 No. 1, March 2012, pp 63-109

15. 'Shifts in Privacy Concerns', *American Economic Review: Papers and Proceedings* with Avi Goldfarb, Vol. 102 No. 3, May 2012, pp. 349-53

16. 'How does the Use of Trademarks by Intermediaries Affect Online Search?' with Lesley Chiou. *Marketing Science*, Vol 31 No. 5, September 2012, pp 819-837

17. 'Active Social Media Management: The Case of Health Care' with Amalia Miller. *Information Systems Research* Vol. 24, No. 1, March 2013, pp. 52-70

    - Republished as part of Informs 'Healthcare in the Age of Analytics' series

18. 'Paywalls and the Demand for News' with Lesley Chiou. *Information Economics and Policy* Volume 25 No. 2, June 2013, pp. 61-69

19. 'Days on Market and Home Sales' with Juanjuan Zhang and Ting Zhu. *RAND Journal of Economics* Volume 44 No. 2, pages 337-360, Summer 2013

20. 'When Does Retargeting Work? Timing Information Specificity' with Anja Lambrecht. *Journal of Marketing Research (Lead Article)* Vol. 50 No. 5, October 2013, pp. 561-576

    - Paul E. Green Award for the 'Best article in the Journal of Marketing Research that demonstrates the greatest potential to contribute significantly to the practice of marketing research.'

21. 'Health Information Exchange, System Size and Information Silos' with Amalia Miller. *Journal of Health Economics*, Vol. 33 No. 2, January 2014: pp. 28-42

22. 'Electronic Discovery and the Adoption of Information Technology' with Amalia Miller. *Journal of Law, Economics, & Organization (Lead Article)*, Vol. 30. No. 2, May 2014, pp. 217-243

23. 'Social Networks, Personalized Advertising, and Privacy Controls.', *Journal of Marketing Research*, Vol. 51, No. 5, October 2014, pp. 546-562.

24. 'Trademarks, Triggers, and Online Search' with Stefan Bechtold. *Journal of Empirical Legal Studies* Vol. 11 No. 4, December 2014

25. 'The Reach and Persuasiveness of Viral Video Ads' *Marketing Science* Vol. 34, No. 2 2015 pp. 281-296

26. 'Privacy Regulation and Market Structure' with James Campbell and Avi Goldfarb. *Journal of Economics & Management Strategy* Vol 24, No. 1, Spring 2015, pp 47-73

27. 'Standardization and the Effectiveness of Online Advertising' with Avi Goldfarb. *Management Science* Vol 61, No. 11, 2015, pp 2707-2719

28. 'Harbingers of Failure' with Eric Anderson, Song Lin and Duncan Simester. *Journal of Marketing Research (Lead Article)* Oct 2015, Vol. 52, No. 5, pp. 580-592.

29. 'The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity'. *Research Policy* Vol 45, No. 1, February 2016, Pages 218-231

Chapters in Edited Volumes and Summary Pieces

30. 'Modeling Social Interactions: Identification, Empirical Methods and Policy Implications' with Wes Hartmann, Puneet Manchanda, Harikesh Nair, Matt Bothner, Peter Dodds, David Godes and Karthik Hosanagar, *Marketing Letters*, Vol. 19 No. 3, December 2008, pp. 287-304

31. 'Search Engine Advertising - Examining a profitable side of the long tail of advertising that is not possible under the traditional broadcast advertising model' with Avi Goldfarb, *Communications of the ACM*, Vol. 51 No. 11, November 2008, pp. 22-24

32. 'Online Advertising', with Avi Goldfarb, *Advances in Computers*, Vol. 81, March 2011, Marvin Zelkowitz (Ed), Elsevier

33. 'Substitution between Online and Offline Advertising Markets', with Avi Goldfarb, *Journal of Competition Law and Economics*, Vol. 7 No. 1, March 2011, pp. 37-44

34. 'Online Advertising, Behavioral Targeting, and Privacy', with Avi Goldfarb, *Communications of the ACM*, Vol. 54 No. 5, May 2011, 25-27

35. 'Privacy and Innovation', *Innovation Policy and the Economy*, Vol. 11, 2012, Josh Lerner and Scott Stern (Eds), NBER

36. 'The Economics of Advertising and Privacy', *International Journal of Industrial Organization*, Vol. 30 No. 3, May 2012, pp. 326-329

37. 'Empirical Research on the Economic Effects of Privacy Regulation'. *Journal on Telecommunications and High Technology Law*, Vol. 10 No. 2, Summer 2012, pp. 265-272

38. 'Social Networks, Advertising and Antitrust', with Alex Marthews, *George Mason Law Review*, 2012, Vol 19 No 5., pp. 1211-1227.

39. 'Why Managing Customer Privacy Can Be an Opportunity' with Avi Goldfarb, *Spring 2013, Sloan Management Review*

40. 'The Implications of Improved Attribution and Measurability for Antitrust and Privacy in Online Advertising Markets', *George Mason Law Review*, Vol. 2 No. 2, pp. 1025-1054 (2013).

41. 'Privacy and the Internet' Chapter 11, *Handbook of Media Economics*, Forthcoming

42. 'Field Experiments in Marketing,' with Anja Lambrecht, *Handbook of Marketing Analytics*, Forthcoming

---

Policy Writing

43. OECD Roundtable on Privacy, Report on the 'Economic Value of Online Information', December 2010
44. Written Congressional Testimony on 'Internet Privacy: The Impact and Burden of European Regulation,' U.S. House Energy and Commerce Committee, September 2011

Papers under Review

45. 'How Do Restrictions on Advertising Affect Consumer Search?' with Lesley Chiou. Revise and resubmit at *Management Science*
46. 'Digital Content Aggregation Platforms: The Case of the News Media.' with Lesley Chiou Revise and resubmit at *RAND Journal of Economics*
47. 'Social Advertising'. Revise and resubmit at *Management Science*
48. 'Patent Trolls and Technology Diffusion: The Case of Medical Imaging' Revise and resubmit at *RAND Journal of Economics*
49. 'Should You Target Early Trend Propagators? Evidence from Twitter' with Anja Lambrecht and Caroline Wiertz. Revise and resubmit at *Marketing Science*
50. 'Privacy Protection, Personalized Medicine and Genetic Testing' with Amalia Miller. Revise and resubmit at *Management Science*
51. 'Government Surveillance and Internet Search Behavior' with Alex Marthews Revise and resubmit at *Management Science*
52. 'Guns, Privacy and Crime' with Alessandro Acquisti Revise and resubmit at *Information Systems Research*
53. 'Conducting Research with Quasi-Experiments: A Guide for Marketers' with Avi Goldfarb.

Work in Progress

'Spillovers from Product Failure' with Amalia Miller

'The Choice of Privacy Policy: The Case of Educational Software' with Amalia Miller

'Third-Party Certification: The Case of Medical Devices' with Cristina Nistor

'Big Bad Data: The Case of For-Profit College Advertising' Avinash Gannamaneni and Avi Goldfarb

Invited Seminars

Universities

1. June 2015, Marketing Group, University of Cambridge, UK
2. May 2015, Marketing Group, University of Texas at Dallas, TX
3. March 2015, Health Policy Group, Georgia State University, GA
4. March 2015, Marketing Group, University of Colorado, CO
5. February 2015, Strategy Group, University of North Carolina, NC
6. January 2015, Marketing Group, Emory University, GA
7. December 2014, OPIM, Wharton School of Management, PA
8. October 2014, Economics Department, Yale University, CT
9. September 2014, Marketing Group, Boston University, MA
10. March 2014, Technology Group, University of California at Berkeley, CA
11. January 2014, Marketing Department at Texas A&M
12. November 2013, Marketing Group, University of California at Berkeley, CA
13. October 2013, Marketing Group, Tulane University, LA
14. October 2013, Marketing Group, University of Houston, TX
15. May 2013, Tuck School of Management, Dartmouth University, NH
16. March 2013, Economics Department, University of Toulouse
17. March 2013, Marketing Group, Rotterdam University
18. March 2013, Economics Department, University of Zurich
19. March 2013, Marketing group, Georgia Tech
20. January 2013, Anderson School, UCLA
21. January 2013, Marketing Group, CMU
22. October 2012, Marketing Group, Stanford University
23. October 2012, Marketing Group, Columbia University
24. October 2012, Marketing Group, University of Texas at Austin
25. September 2012, Marketing Group, Harvard Business School
26. June 2012, Strategy Group, London Business School
27. March 2012, Marketing Group, Cornell
28. February 2012, IS Group, Indian School of Business
29. February 2012, Marketing Group, Wharton

30. January 2012, Marketing Group, UCLA
31. November 2011, Marketing Group, University of Rochester
32. October 2011, Marketing Group, University of Zurich
33. October 2011, Department of Law and Economics, Swiss Federal Institute of Technology, Zurich
34. May 2011, Marketing Group, National University of Singapore
35. May 2011, IS Group, National University of Singapore
36. May 2011, Strategy Group, LMU Munich
37. May 2011, Marketing Group, New York University
38. March 2011, Marketing Group, Florida University
39. February 2011, IS Group, New York University
40. November 2010, European School of Management and Technology
41. October 2010, Marketing Group, Yale University
42. October 2010, Networked Business Group, Harvard Business School
43. September 2010, TIES Group, MIT Sloan
44. July 2010, Department of Economics, University of Mannheim
45. March 2010, Marketing Group, Wharton School, University of Pennsylvania
46. January 2010, Marketing Group, University of Michigan
47. November 2009, Marketing Group, University of California at Berkeley
48. October 2009, Digital Business Seminar, MIT Sloan
49. December 2008, Marketing Group, MIT Sloan
50. November 2008, Marketing Group, Rady School of Business, UCSD
51. September 2008, Strategy Group, MIT Sloan
52. May 2008, Digital Strategy Group, Tuck School of Business, Dartmouth University
53. April 2008, Kellogg Management and Strategy Group, Northwestern University
54. March 2008, Marketing Group, Duke University
55. March 2008, Strategy Group, Chicago GSB
56. July 2007, Marketing Group, London Business School, London, UK
57. April 2007, Marketing Group, Chicago GSB
58. March 2007, Marketing Group, Rotman School, University of Toronto
59. November 2005, Economics Department, Harvard University
60. October 2004-February 2005 (Job Market): NYU Stern, University of Michigan, University of Arizona, University of British Columbia, Federal Reserve Board, Federal Reserve Bank of New York, Harvard Business School, Kellogg, MIT Sloan, Federal Reserve Bank of Chicago, Stanford Economics Department

Other

61. April 2015, Federal Communications Commission
62. November 2014, Office of Research at the Consumer Financial Protection Bureau
63. April 2014, Big Data Working Group, The White House.
64. February 2014, Main Street Patent Coalition, Panel hosted at the Senate by Senator Orrin Hatch
65. July 2013, Federal Communications Commission
66. August 2012, DG Competition, European Commission, Brussels
67. August 2012, Technology Policy Institute Conference, Aspen

68. December 2011, Havas Digital, New York
69. June 2011, Eneca
70. September 2010, Federal Trade Commission
71. September 2010, Google European Public Policy Unit, Paris
72. July 2009, Information Technology and Innovation Foundation, Washington DC

Presentations of Research at Conferences

1. July 2015, NBER Law and Economics (co-author presented), Cambridge, MA
2. July 2015, NBER Economics of Digitization, Cambridge, MA
3. June 2015, 'The Future of Research in the Digital Society', French Ministry of Culture and Communication âĂŞ Toulouse School of Economics, Paris, France
4. June 2015, Marketing Science, Baltimore, MD
5. June 2015, Doctoral Consortium, Baltimore, MD
6. March 2015, IP Leadership Conference, Washington, DC
7. February 2015, Patents in Theory and Practice, Washington, DC
8. June 2014, Marketing Science, Atlanta, GA
9. May 2014, Boston College Social Media Workshop, Boston, MA
10. January 2014, American Economic Association Meetings
11. July 2013, Marketing Science, Istanbul, Turkey
12. June 2013, Searle Center Conference on Internet Search and Innovation, Chicago, IL
13. April 2013, Brown University Mini-Networks Conference
14. February 2013, WSDM 2013 Conference (Keynote Speaker), Rome, Italy
15. January 2013, American Economic Association Meetings, San Diego, CA (Co-author presented)
16. December 2012, New York Computer Science and Economics Day
17. November 2012, Search and Competition Conference, Melbourne Australia
18. October 2012, Economics of Personal Data, (Keynote Speaker), Amsterdam
19. August 2012, Amsterdam Symposium on Behavioral and Experimental Economics
20. July 2012, Fudan University Marketing Research Symposium, China
21. June 2012, Searle Center Conference on Internet Search and Innovation, Chicago, IL
22. June 2012, Innovation, Intellectual Property and Competition Policy Conference, Tilburg, Netherlands
23. June 2012, Marketing Science, Boston, MA
24. June 2012, Social Media and Business Transformation, Baltimore, MD
25. May 2012, The Law and Economics of Search Engines and Online Advertising, George Mason University, Arlington, VA
26. February 2012, NBER Economics of Digitization (co-author presented), Cambridge, MA
27. January 2012, Symposium on Antitrust and High-Tech Industries, George Mason University, VA
28. January 2012, Patents, Standards and Innovation, Tucson, AZ
29. January 2012, Econometric Society Meetings, Chicago, IL
30. January 2012, AEA Meetings (2 papers), Chicago, IL

31. December 2011, Economics of Privacy Workshop, Boulder, CO
32. November 2011, Economics and Computation Day, Cambridge, MA
33. November 2011, HBS Strategy Research Conference, Boston, MA
34. November 2011, The Law and Economics of Internet Search and Online Advertising Roundtable, George Mason University, Arlington, VA
35. November 2011, Patents Statistics for Decision Makers, Alexandria, VA
36. October 2011, Workshop on Health IT and Economics, Washington, DC
37. October 2011, Innovation, Organizations and Society, University of Chicago, IL
38. October 2011, Direct Marketing Research Summit, Boston, MA
39. September 2011, Invited Session 'Economics and Marketing', EARIE, Stockholm, Sweden.
40. July 2011, NBER Economics of Digitization, Cambridge, MA
41. July 2011, SICS, Berkeley, CA
42. June 2011, The Law and Economics of Search Engines and Online Advertising, George Mason University, Arlington, VA
43. June 2011, Workshop on the Economics on Information Security, Washington, DC
44. June 2011, Marketing Science (3 papers), Houston, TX
45. June 2011, Searle Center Conference on Internet Search and Innovation, Chicago, IL
46. May 2011, Boston College Social Media Workshop, Boston, MA
47. May 2011, Technology Pricing Forum, Boston, MA
48. April 2011, NBER Innovation Policy and the Economy, Washington, DC
49. April 2011, International Industrial Organization Conference (3 papers), Boston, MA
50. March 2011, Technology Policy Institute, Washington, DC
51. February 2011, NBER Economics of Digitization (co-author presented), Palo Alto, CA
52. January 2011, Sixth bi-annual Conference on The Economics of Intellectual Property, Software and the Internet (2 papers, plenary speaker), Toulouse, France
53. January 2011, MSI Young Scholars Conference, Park City, UT
54. December 2010, Workshop on Information Systems and Economics, Washington University of St. Louis (co-author presented), St. Louis, MO
55. December 2010, OECD Economics of Privacy Roundtable, Paris, France
56. November 2010, Net Institute Conference, New York, NY
57. October 2010, Workshop on Media Economics and Public Policy (co-author presented), New York, NY
58. October 2010, Workshop on Health IT and Economics, Washington, DC
59. September 2010, ITIF and CAGW Privacy Working Group Meetings, Washington, DC
60. September 2010, Medical Malpractice Conference, Mohegan, CT
61. September 2010, Search and Web Advertising Strategies and Their Impacts on Consumer Workshop, Paris, France
62. July 2010, NBER Meetings (IT), Cambridge, MA
63. July 2010, NBER Meetings (Healthcare and IT), Cambridge, MA
64. July 2010, SICS, Berkeley, CA
65. July 2010, Keynote Speaker, 8th ZEW Conference on the Economics of Information and Communication Technologies, Mannheim, Germany
66. June 2010, American Society of Health Economists Conference, Cornell, NY
67. June 2010, Marketing Science (2 papers), Koeln, Germany
68. June 2010, Workshop on the Economics of Information Security (2 papers), Harvard, MA

69. January 2010, AEA Meetings, Atlanta, GA
70. December 2009, Workshop on Information Systems and Economics, Scottsdale, AZ
71. November 2009, WPP/Google Marketing Awards, Cambridge, MA
72. July 2009, NBER meetings (IT), Cambridge, MA
73. June 2009, IHIF Debate on Privacy, Washington, DC
74. June 2009, Marketing Science, Ann Arbor, MI
75. April 2009, International Industrial Organization Conference, Boston, MA
76. January 2009, Information Security Best Practices Conference, Philadelphia, PA
77. January 2009, Modeling Social Network Data Conference, Philadelphia, PA
78. July 2008, NBER Meetings (Productivity), Cambridge, MA
79. July 2008, SICS, Berkeley, CA
80. July 2008, Fourth Workshop on Ad Auctions, Chicago, MA
81. June 2008, Marketing Science, Vancouver, BC
82. May 2008, International Industrial Organization Conference, Richmond, VA
83. April 2008, Net Institute Conference, New York, NY
84. November 2007, NBER Health Meetings (Co-author presented), Boston, MA
85. July 2007, SICS, Berkeley, CA
86. June 2007, Workshop on the Economics of Information Security, Pittsburgh
87. June 2007, Choice Symposium, Philadelphia, PA
88. May 2007, eCommerce Research Symposium, Stamford, CT
89. April 2007, Net Institute Conference, New York, NY
90. April 2007, International Industrial Organization Conference, Savannah, GA
91. March 2007, Health Economics Conference, Tucson, AZ
92. February 2007, NBER Winter Meetings, Palo Alto, CA
93. January 2007, Economics of the Software and Internet Industries (2 Papers), Toulouse, France
94. October 2006, QME Conference, Stanford University, CA
95. June 2006, Marketing Science, Pittsburgh, PA
96. April 2006, International Industrial Organization Conference, Boston, MA
97. October 2005, NEMC Conference, Boston, MA
98. October 2005, TPRC Conference, Washington, DC
99. June 2005, CRES Industrial Organization Conference, Washington University in St. Louis, MO
100. July 2002, Payment Systems Conference, IDEI, Toulouse, France

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GRANTS

2013	MSI research grant 4-1840	$10,200
2012	Google Australia	$50,000
2011	Tilburg Law and Economics Center (TILEC) IIPC grant	$21,000
2011	Google Grant	$50,000
2011	Junior Faculty Research Assistance Program	$30,000
2011	Net Institute Grant	$6,000
2011	NBER Digitization Grant	$20,000
2011	NSF CAREER Award	$502,000
2010	Time-Warner Research Program on Digital Communications	$20,000
2010	Net Institute Grant	$6,000
2009	Net Institute Grant	$6,000
2009	The James H. Ferry, Jr. Fund for Innovation in Research Education	$50,000
2009	Google/WPP Grant	$55,000
2008	Net Institute Grant	$15,000
2007	Net Institute Grant	$8,000
2006	Net Institute Grant	$8,000

PROFESSIONAL SERVICE

- **Associate Editor:** Management Science, International Journal of Research in Marketing
- **Associate Editor:** Information Systems Research, Special Issue on Social Media and Business Transformation
- **Departmental Editor:** Quantitative Marketing and Economics
- **Editor:** Journal of Network Economics
- **Editor:** The Economics of the Internet, Palgrave Dictionary of Economics
- **Co-Editor:** NBER: The Economics of Digitization - An Agenda
- **Co-Editor:** Information Economics and Policy, Special Issue on Economics of Digital Media Markets
- **Editorial Review Board:** Journal of Marketing, Journal of Marketing Research, Marketing Science, ISR Special Issue on Managing Digital Vulnerabilities
- **Advisory Board:** Future of Privacy Forum

- **Conference Program Committees**
  - 2015 Scientific Committee: Competition, Standardization and Innovation
  - 2015 Scientific Committee: Intellectual Property Statistics for Decision Makers
  - 2015 Associate Editor: ICIS 2015, Healthcare track
  - 2015 Scientific Committee: European Association for Research in Industrial Economics
  - 2015 Program Committee: ACM Conference on Economics and Computation
  - 2015 Program Committee: Workshop on the Economics of Information Security
  - 2015 Chief-Organizer: Quantitative Marketing and Economics Conference

- 2015 Scientific Committee: ZEW Conference on the Economics of Information and Communication Technologies
- 2014 Scientific Committee: European Association for Research in Industrial Economics
- 2014 Scientific Committee: Conference on the Economics of Information and Communication Technologies
- 2014 Program Committee: International Conference on Big Data and Analytics in Healthcare
- 2013 Program Committee: Quantitative Marketing and Economics
- 2013 Scientific Committee: European Association for Research in Industrial Economics Conference
- 2013 Scientific Committee: Conference on the Economics of Information and Communication Technologies
- 2013 Program Committee: Workshop on the Economics of Information Security
- 2013 Associate Editor of Personal Data Markets Track: ECIS 2013
- 2012 Program Committee: European Association for Research in Industrial Economics Conference
- 2012 Program Committee (Conference Organizer) NBER: The Economics of Digitization Pre-Conference, June 2012
- 2012 Scientific Committee: Conference on the Economics of Information and Communication Technologies
- 2012 Senior Program Committee: 13th ACM Conference on Electronic Commerce
- 2012 Program Committee: Workshop on the Economics of Information Security
- 2011 Scientific Committee: European Association for Research in Industrial Economics Conference
- 2011 Scientific Committee: Conference on the Economics of Information and Communication Technologies
- 2011 Program Committee: Ad Auctions Workshop
- 2011 Program Committee: Workshop on the Economics of Information Security
- 2010 Program Committee: Workshop on IT and Economic Growth
- 2010 Program Committee: Conference on Health IT and Economics
- 2010 Program Committee: Workshop on the Economics of Information Security
- 2009 Program Committee: Workshop on the Economics of Information Security
- 2008 Program Committee: Workshop on the Economics of Information Security
- 2008 Program Committee: Ad Auctions Workshop

MIT Service

- 2015 EMBA Committee
- 2014 MIT Sloan Gender Equity Committee
- 2013-2014 Group Head, Marketing Group
- 2013-2014 Chair, Marketing Faculty Search Committee
- 2013-2014 MIT Committee on Undergraduate Admissions and Financial Aid
- 2011 North East Marketing Conference Coordinator

- 2011 MIT Sloan Marketing Conference, Panel Moderator
- 2011 Sloan Women in Management Conference, Panel Moderator
- 2005, 2008, 2012 Marketing Faculty Search Committee

ADVISING

- 2014: Abhishek Nagaraj, PhD Thesis advisor
- 2012: Cristina Nistor, PhD Thesis advisor
- 2010: Katherine Molina, Masters Thesis
- 2008: Dinesh Shenoy, Masters Thesis
- 2007: James Kelm, Masters Thesis

EXPERT ADVICE

- Cleary Gottlieb Steen & Hamilton LLP: Deposed and testified as Expert Witness in Bankruptcy Proceedings
- Gibson Dunn: Deposed as Expert Witness in Civil Litigation Proceedings.

TEACHING

- 15.818, Pricing (MBA Elective) 2006-
- 15.732, Marketing Management for Senior Executives 2012-
- 15.s07, Pricing (EMBA Elective) 2012-
- 15.838, Doctoral Seminar, Spring 2006, Fall 2007, Fall 2013
- Guest Lecturer: HST.936: Health information systems to improve quality of care in resource-poor settings, 2014
- Executive Education: Strategic Marketing for the Technical Executive, 2012-
- Executive Education: Systematic Innovation of Products, Processes, and Services, 2013-
- Executive Education: Platform Strategy: Building and Thriving in a Vibrant Ecosystem, 2014-
- Executive Education: Global Executive Academy (multi-language), 2013-
- Executive Education: Entrepreneurship Development Program, 2012-

EXHIBIT EEE

Exhibit EEE: List of Testimony
Catherine Tucker

GO Computer, Inc. et al. v. Microsoft Corporation, Superior Court of the State Of California for the City and County of San Francisco, Case No. CGC-05-442684

- Deposition Testimony (2015)

Queen's University at Kingston and PARTEQ Research and Development Innovations, v. Samsung Electronics Co., Ltd., et al., Civil Action No. 2:14-cv-53-JRG-RSP

- Deposition Testimony (2015)

In re: Chapter 11, Nortel Networks, Inc., et al., Debtors, U.S. Bankruptcy Court, District of Delaware, Case No. 09-10138(KG) (Jointly Administered), Re Dkt No. 13208

- Deposition and Trial Testimony (2014)

Angel Fraley, et al., Plaintiffs, v. Facebook, Inc., a corporation; and DOES 1-100, Defendants, U.S. District Court, Northern District of California, Case No. 5:11-cv-01726-LHK

- Deposition Testimony (2012)

EXHIBIT FFF

Exhibit FFF: Materials Considered

I. Court Documents and Expert Reports

Consolidated Amended Class Action Complaint, *Matthew Campbell, Michael Hurley, and David Shadpour et al. v. Facebook, Inc.*, Case No. 4:13-cv-05996, United States District Court, Northern District of California, April 25, 2014.

Defendant Facebook's Inc.'s Second Supplemental Responses and Objections to Plaintiffs Narrowed Second Set of Interrogatories, *Matthew Campbell, Michael Hurley, and David Shadpour v. Facebook, Inc.*, Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, October 29, 2015.

Defendant Facebook's Inc.'s Supplemental Responses and Objections to Plaintiffs First Set of Interrogatories, *Matthew Campbell, Michael Hurley, and David Shadpour v. Facebook, Inc.*, Case No. C 13-05996 PJH, United States District Court, Northern District of California, September 8, 2015.

Defendant Facebook, Inc.'s Supplemental Responses and Objections to Plaintiffs' Request for Production Nos. 54, 55, and 57, *Matthew Campbell, Michael Hurley, and David Shadpour v. Facebook, Inc.*, Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, October 28, 2015.

January 15, 2016, Declaration of Alex Himel.

January 15, 2016, Declaration of Chris Chorba.

January 15, 2016, Declaration of Dan Fechete.

January 15, 2016, Declaration of Michael Adkins.

Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.*, Case No. C 13-05996 PJH, United States District Court, Northern District of California, November 13, 2015.

Plaintiffs' Supplemental Initial Disclosures Pursuant to Fed. R. Civ. P. 26(a)(1), *Matthew Campbell, Michael Hurley, and David Shadpour et al. v. Facebook, Inc.*, Case No. 4:13-cv-05996-PJH, United States District Court, Northern District of California, April 27, 2015.

Report of Fernando Torres In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.*, Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, November 13, 2015.

Report of Jennifer Golbeck In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.*, Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, November 13, 2015.

Updated Report of Fernando Torres In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.*, Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, January 13, 2016.

II. Bates Stamped Documents

FB000008505

FB000006178

FB000007286

FB000000298

FB000000166

FB000000163

FB000011715

FB000026793

FB000001454

CAMPBELL000004-5

CAMPBELL000007

CAMPBELL000010

CAMPBELL000014

CAMPBELL000021

CAMPBELL000029

CAMPBELL000038

CAMPBELL000052

CAMPBELL000075-77

CAMPBELL000089

CAMPBELL000110

CAMPBELL000160

CAMPBELL000168-70

CAMPBELL000184

CAMPBELL000452

HURLEY000001-3

III. Depositions

John Orsi, III, August 10, 2015.

Michael D. Campbell, May 19, 2015.

Jennifer Golbeck, December 16, 2015.

Elisabeth Hartner, August 7, 2015.

Michael Hurley, July 9, 2015.

David Shadpour, October 1, 2015.

Fernando Torres, December 18, 2015.

Jeffrey Woodmansee, August 11, 2015.

IV. Publicly Available

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Wikipedia.org, viewed January 11, 2016.

Yahoo.com, viewed January 11, 2016.

Youtube.com, viewed January 11, 2016.

V. Articles and Books

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EXHIBIT GGG

Exhibit GGG
Facebook Quarterly Revenue and Expenses
Q1'12-Q3'15

	Revenue		Expenses as a Percentage of Revenue					
Quarter	Total Revenue, US and Canada ($ mil)	Advertising Revenue, US and Canada ($ mil)	Cost of Revenue	Marketing & Sales	General & Administrative	Research & Development	Total Expenses, Excluding R&D	Total Expenses
Q1'12	525	419	26%	14%	10%	14%	50%	64%
Q2'12	590	479	31%	33%	39%	60%	103%	163%
Q3'12	637	538	26%	13%	12%	19%	51%	70%
Q4'12	780	631	25%	12%	11%	19%	48%	67%
Q1'13	679	552	28%	14%	12%	20%	54%	74%
Q2'13	848	721	26%	15%	10%	19%	50%	69%
Q3'13	962	832	25%	12%	8%	18%	45%	63%
Q4'13	1,206	1,068	19%	11%	10%	16%	40%	56%
Q1'14	1,179	1,039	18%	13%	7%	18%	39%	57%
Q2'14	1,308	1,175	16%	12%	7%	17%	35%	52%
Q3'14	1,514	1,362	18%	12%	8%	19%	37%	56%
Q4'14	1,864	1,709	17%	16%	9%	29%	42%	71%
Q1'15	1,739	1,592	18%	17%	8%	30%	44%	74%
Q2'15	1,967	1,826	17%	15%	8%	29%	40%	69%
Q3'15	2,256	2,120	16%	16%	8%	28%	39%	68%

Sources:

1. Facebook, Inc. Form 10-K 2013-2014. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
2. Facebook, Inc. Form 10-Q 2013-2015. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.

EXHIBIT HHH

Exhibit HHH
Torres Social Graph Valuation
Q1'12-Q3'15 Facebook Revenues and Expenses

Annual Profit Calculation

Facebook Average Quarterly Advertising Revenue, US and Canada ($ mil)[1] [A]	Ratio of US to US and Canada Population[2] [B]	US Ad. Revenue per Quarter ($ mil) [C] = [A] * [B]	Average Expenses as a Percentage of Revenue[3] [D]	Annual Profit ($ mil) [E] = (4*[C]) * (1-[D])
1,071	89.96%	963	48%	2,010

Social Graph Valuation

Year	Annual Profit ($ mil)	Discount Factor[4]	Discounted Value ($ mil)[5]
1	2,010	0.8427	1,694
2	2,010	0.7102	1,427
3	2,010	0.5985	1,203
4	2,010	0.5044	1,014
5	2,010	0.4251	854
6	2,010	0.3582	720
7	2,010	0.3019	607
8	2,010	0.2544	511
		Total Value:	**8,031**

Notes:

1. Average of Q1'12-Q3'15 advertising revenue, US and Canada as presented in Exhibit 1.
2. See Torres Report, footnote 66.
3. Average of Q1'12-Q3'15 total expenses as a % of revenue, excluding R&D as presented in Exhibit 1.
4. Calculated as $1/(1+r)^n$, where r is the 18.66% discount rate calculated by Dr. Torres and n is the number of years. See Torres Report, ¶42 and Exhibit 1.
5. Annual profit ($ mil) * discount factor.

Sources:

1. Facebook, Inc. Form 10-K 2013-2014. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
2. Facebook, Inc. Form 10-Q 2013-2015. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
3. Report of Fernando Torres In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.* , Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, November 13, 2015.

EXHIBIT III

Exhibit III
Torres Social Graph Valuation
Q3'14-Q2'15 Facebook Revenues and Expenses
Including Research & Development Expenses

Annual Profit Calculation

Facebook Average Quarterly Advertising Revenue, US and Canada ($ mil)[1] [A]	Ratio of US to US and Canada Population[2] [B]	US Ad. Revenue per Quarter ($ mil) [C] = [A] * [B]	Average Expenses as a Percentage of Revenue[3] [D]	Annual Profit ($ mil) [E] = (4*[C]) * (1-[D])
1,622	89.96%	1,459	67%	1,910

Social Graph Valuation

Year	Annual Profit ($ mil)	Discount Factor[4]	Discounted Value ($ mil)[5]
1	1,910	0.8427	1,609
2	1,910	0.7102	1,356
3	1,910	0.5985	1,143
4	1,910	0.5044	963
5	1,910	0.4251	812
6	1,910	0.3582	684
7	1,910	0.3019	577
8	1,910	0.2544	486
		Total Value:	**7,631**

Notes:

1. Average of Q3'14-Q2'15 advertising revenue, US and Canada as presented in Exhibit 1.
2. See Torres Report, footnote 66.
3. Average of Q3'14-Q2'15 total expenses as a % of revenue as presented in Exhibit 1.
4. Calculated as $1/(1+r)^n$, where r is the 18.66% discount rate calculated by Dr. Torres and n is the number of years. See Torres Report, ¶42 and Exhibit 1.
5. Annual profit ($ mil) * discount factor.

Sources:

1. Facebook, Inc. Form 10-K 2014. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
2. Facebook, Inc. Form 10-Q 2014-2015. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
3. Report of Fernando Torres In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.* , Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, November 13, 2015.

EXHIBIT JJJ

Exhibit JJJ
Torres Social Graph Valuation
Q1'12-Q3'15 Facebook Revenues and Expenses
Including Research & Development Expenses

Annual Profit Calculation

Facebook Average Quarterly Advertising Revenue, US and Canada ($ mil)[1] [A]	Ratio of US to US and Canada Population[2] [B]	US Ad. Revenue per Quarter ($ mil) [C] = [A] * [B]	Average Expenses as a Percentage of Revenue[3] [D]	Annual Profit ($ mil) [E] = (4*[C]) * (1-[D])
1,071	89.96%	963	72%	1,097

Social Graph Valuation

Year	Annual Profit ($ mil)	Discount Factor[4]	Discounted Value ($ mil)[5]
1	1,097	0.8427	925
2	1,097	0.7102	779
3	1,097	0.5985	657
4	1,097	0.5044	553
5	1,097	0.4251	466
6	1,097	0.3582	393
7	1,097	0.3019	331
8	1,097	0.2544	279
		Total Value:	**4,383**

Notes:

1. Average of Q1'12-Q3'15 advertising revenue, US and Canada as presented in Exhibit 1.
2. See Torres Report, footnote 66.
3. Average of Q1'12-Q3'15 total expenses as a % of revenue as presented in Exhibit 1.
4. Calculated as $1/(1+r)^n$, where r is the 18.66% discount rate calculated by Dr. Torres and n is the number of years. See Torres Report, ¶42 and Exhibit 1.
5. Annual profit ($ mil) * discount factor.

Sources:

1. Facebook, Inc. Form 10-K 2013-2014. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
2. Facebook, Inc. Form 10-Q 2013-2015. Retrieved from SEC EDGAR website http://www.sec.gov/edgar.shtml.
3. Report of Fernando Torres In Support of Plaintiffs' Motion for Class Certification, *Matthew Campbell and Michael Hurley et al. v. Facebook, Inc.* , Case No. C 13-05996 PJH (MEJ), United States District Court, Northern District of California, November 13, 2015.