UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

IN RE HIGH-TECH EMPLOYEE ANTITRUST LITIGATION

THIS DOCUMENT RELATES TO:

ALL ACTIONS

Master Docket No. 11-CV-2509-LHK

EXPERT REPORT OF
PROFESSOR KEVIN M. MURPHY

Date: January 17, 2013
Time: 1:30 p.m.
Courtroom: 8, 4th Floor
Judge: Honorable Lucy H. Koh

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I. CREDENTIALS

1. My name is Kevin M. Murphy. I am the George J. Stigler Distinguished Service Professor of Economics in the Booth School of Business and the Department of Economics at the University of Chicago, where I have taught since 1983.

2. I earned a doctorate degree in economics from the University of Chicago in 1986. I received my bachelor's degree, also in economics, from the University of California, Los Angeles, in 1981.

3. At the University of Chicago, I teach economics in both the Booth School of Business and the Department of Economics. I teach graduate level courses in microeconomics, price theory, empirical labor economics, and the economics of public policy issues. In these courses, I cover a wide range of topics, including the incentives that motivate firms and individuals, the operation of markets, the determinants of market prices, and the impacts of regulation and the legal system. Most of my teaching focuses on two things: how to use the tools of economics to understand the behavior of individuals, firms and markets; and how to apply economic analysis to data. My focus in both research and teaching has been on integrating economic principles and empirical analysis.

4. Of particular relevance to the issues in this matter, I have published extensively on labor markets and the determinants of wages and compensation. My work in labor economics has addressed the market determinants of wage by skill level as well as the determination of relative wages across industries and occupations. Several of my papers have focused on the determinants of the wage structure by age, education and gender. My work on wage determination also has addressed the links between wages and labor mobility. I teach PhD-level courses on empirical labor economics with a focus on the wage structure and the determinants of relative wages across groups differentiated by age, education and skill.

5. I have authored or co-authored more than sixty-five articles in a variety of areas in economics. Those articles have been published in leading scholarly and professional journals, including the *American Economic Review*, the *Journal of Law and Economics*, and the *Journal of Political Economy*.

6. I am a Fellow of the Econometric Society and a member of the American Academy of Arts and Sciences. In 1997, I was awarded the John Bates Clark Medal, which the American Economic Association awarded once every two years to an outstanding American economist under the age of forty.[1] In 2005, I was named a MacArthur Fellow, an award that provides a five-year fellowship to individuals who show exceptional merit and promise for continued and enhanced creative work.

7. In addition to my position at the University of Chicago, I am also a Principal at Navigant Economics, a consulting firm that specializes in the application of economics to law and regulatory matters. I have consulted on a variety of antitrust, intellectual property and other matters involving economic and legal issues such as mergers, class certification, damages, labor practices, joint ventures, and allegations of anticompetitive exclusionary access, tying, price fixing, and price discrimination.

8. I have submitted testimony in Federal Court, the U.S. Senate and to state regulatory bodies, and I have submitted expert reports in numerous cases. I have testified on behalf of the U.S. Federal Trade Commission and I have consulted for the U.S. Department of Justice. A list of the reports I have filed and the testimony I have given over the past four years is provided in my CV, attached as Appendix A. Navigant Economics is being compensated at a rate of $1,250 per hour for my work on this matter.

II. ASSIGNMENT AND SUMMARY OF CONCLUSIONS

9. I have been asked by Counsel for Adobe Systems Inc., ("Adobe"), Apple Inc. ("Apple"), Google Inc. ("Google"), Intel Corporation ("Intel"), Intuit Inc. ("Intuit"), Lucasfilm Ltd. ("Lucasfilm") and Pixar (collectively "Defendants") to provide an economic analysis of claims by "individual and representative plaintiffs"[2] ("Plaintiffs") that an alleged "conspiracy among

[1] The John Bates Clark Medal was awarded biennially until 2009, but it now is awarded annually. See, http://www.aeaweb.org/honors_awards/clark_medal.php.

[2] In Re: High-Tech Employee Antitrust Litigation, Plaintiffs' Notice of Motion and Motion for Class Certification, and Memorandum of Law in Support ("Motion"), October 1, 2012, p. 1.

Defendants to fix and suppress the compensation of their employees"[3] would have a class-wide impact and would be susceptible to class-wide proof. Plaintiffs have asked the Court to certify a class of "[a]ll natural persons employed on a salaried basis in the United States by one or more" of the Defendants during part or all of the period from January 2005 through December 2009 (the "Class" or "All-Salaried Employee Class").[4] As an alternative, Plaintiffs have asked the Court to certify a "Technical Class" defined as "[a]ll natural persons who work in the technical, creative, and/or research and development fields that are employed on a salaried basis in the United States by one or more of the" Defendants during the same time periods and with the same excluded categories as identified for the All-Salaried Employee Class. In support of their claims, Plaintiffs offer the *Expert Report of Edward E. Leamer, Ph.D.* ("Leamer Report").[5] The arguments and evidence provided by Plaintiffs and Dr. Leamer typically do not distinguish between the two alternative class definitions, and in my report I also distinguish between the two potential classes only when I present evidence specific to one or the other.

10. Plaintiffs claim that there was a conspiracy among the Defendants to refrain from "cold calling" each other's employees; that cold calling "is a particularly effective recruiting method;"[6] that "cold calling has a significant impact on employee compensation in a variety of ways;"[7] and, essential to their claim of antitrust impact, that "the compensation effects of cold calling are not limited to the particular individuals who receive cold calls."[8] Plaintiffs claim that, due to the

[3] Consolidated Amended Complaint in Re: High-Tech Employee Antitrust Litigation ("*Complaint")* ¶1.

[4] Plaintiffs define the All-Salaried Employee Class as "All natural persons employed on a salaried basis in the United States by one or more of the following: (a) Apple from March 2005 through December 2009; (b) Adobe from May 2005 through December 2009; (c) Google from March 2005 through December 2009; (d) Intel from March 2005 through December 2009; (e) Intuit from June 2007 through December 2009; (f) Lucasfilm from January 2005 through December 2009; or (g) Pixar from January 2005 through December 2009. Excluded from the Class are: retail employees; corporate officers, members of the boards of directors, and senior executives of all Defendants" (*Motion*, p. 1).

[5] Expert Report of Edward E. Leamer, Ph.D., October 1, 2012.

[6] *Complaint* ¶42.

[7] *Complaint* ¶46.

[8] *Complaint* ¶50. According to Dr. Leamer, "'Cold-Calling" refers to communicating directly in any manner (including orally, in writing, telephonically, or electronically) with another firm's employee who has not otherwise applied for a job opening" (Leamer Report Footnote 3, adopting essentially the same definition as in

alleged conspiracy, the resulting "elimination of competition and suppression of compensation and mobility had a cumulative effect on *all* Class members,"[9] resulting in "lower compensation from Defendants than they otherwise would have received."[10]

11. Plaintiffs acknowledge that the alleged "conspiracy" among the seven Defendants consisted of a small number of bilateral agreements (which I refer to in my report as the "challenged agreements" or "do not cold call" ("DNCC") agreements) between certain pairs of Defendants to not cold-call each other's employees.[11] Despite the limited nature of the alleged conspiracy, Plaintiffs claim that the small number of bilateral agreements had a class-wide impact on a class that includes virtually all U.S. salaried employees at all seven Defendants during the periods identified. Plaintiffs claim that the reduction in cold calls between pairs of Defendants reduced the information available to employees about their "value."[12] According to Plaintiffs, the reduced flow of information allegedly not only affected the compensation received by employees who did not receive cold calls that they might otherwise have received, but also reduced the compensation of all other salaried employees of the Defendant firms as well – from engineers to cafeteria workers. Plaintiffs claim that all or almost all employees in their proposed

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Plaintiffs' Complaint ¶41). This definition would include conduct that was not prohibited by the challenged agreements, such as responding to inquiries by potential applicants about a particular job opening, or potential job openings in general, if those potential applicants simply were gathering information before filing an application. My understanding of the do-not cold call restrictions at issue in this case is that they generally were intended to prevent a Defendant from calling (or emailing) employees at a firm with which it had an agreement if those employees had expressed no interest in exploring employment with the Defendant or in exploring potential new employment opportunities in general – in other words, if they were a totally passive candidate.

[9] *Complaint* ¶110 (emphasis added).

[10] *Complaint* ¶123.

[11] Dr. Leamer says that he "understand[s] that Defendants entered into several additional agreements" (Leamer Report ¶22).

[12] According to Plaintiffs, "by restricting "cold-calling" (i.e., outreach to solicit applications from candidates who are not actively seeking employment) and other active competition for employees, the agreements depressed compensation by impairing information flow about compensation and job offers, reducing negotiating leverage of employees, and minimizing movement of employees between firms" (*Motion*, p. 3). Plaintiffs claim that "Dr. Leamer describes abundant evidence common to all Class members capable of showing that the Defendants' agreements would tend to suppress employee compensation generally, by preventing class members from discovering the true value of their work" (*Motion*, p. 16).

classes were affected by an amount that can be measured on a class-wide basis using conventional methods and common evidence.

12. In his report, Dr. Leamer addresses two questions: (1) whether there is "proof common to each proposed class capable of showing that the Non-Compete Agreements artificially reduced the competition [*sic*: compensation] of its members;"[13] and (2) whether there is a "reliable Class-wide or formulaic method capable of quantifying the amount of suppressed compensation suffered by each class."[14] Dr. Leamer concludes that the answer to both questions is "yes," and that "all or nearly all" members of both classes "had their compensation suppressed" by an aggregate amount that can be quantified reliably using "standard economic methods."[15]

13. Dr. Leamer's analysis has three essential steps. First, the challenged agreements must materially reduce the information available to Defendants' employees. Second, that reduction in information must cause the salaries of individual employees to be reduced. Third, the "somewhat rigid" compensation structures of the Defendants must cause the reductions in the compensation of some employees to reduce compensation on a class-wide basis. Economic theory and empirical evidence demonstrate that his analysis of each of these essential steps is critically flawed. First, the labor markets from which Defendants hire are enormous and diverse, and the recruiting practices of a small number of employers that would directly affect only a small number of employees would not meaningfully affect the information levels of employees at any Defendant. This would break the chain at the first step. Second, any effects would be highly individualized and would not be common across members of the proposed class. In particular, the same conduct that reduced the information provided to one employee likely would increase the information provided to others. This would stop the chain at the second step, since the impact on individual compensation would not be common. Finally, if the compensation structures of the Defendants are not rigid, then an impact on one individual's compensation

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[13] Leamer Report ¶10; *see*, [redacted]

[14] *Ibid*.

[15] Leamer Report ¶11.

would not increase compensation for other members of the class. This would stop the chain at the third step. None of the required links in the chain hold, let alone all three.

14. Thus, based on my analysis, I conclude that Plaintiffs' claims and Dr. Leamer's opinions are both inconsistent with economic theory and contradicted by documentary and empirical evidence. Given the lack of economic logic to their allegations, it is not surprising that Plaintiffs' claims are not supported by empirical evidence. The following are my core opinions regarding Plaintiffs' allegations, which I explain in detail in this report:

<u>Opinion 1</u>: The high level of hiring by Defendants during the class period demonstrates the implausibility of Dr. Leamer's claim that average compensation at these firms was suppressed as Dr. Leamer and Plaintiffs claim.

Collectively, between 2005 and 2009, Defendants hired an average of over 8,000 new workers per year – equal to 11 percent of their combined workforces. And their actual hiring was dwarfed by the number of applications they received. It is implausible that, for five years, these firms consistently undercompensated their employees by the large amount estimated by Dr. Leamer (see Part V.B.1, below).

<u>Opinion 2</u>: Empirical evidence of Defendants' hiring activities demonstrates that the challenged conduct had no economically significant class-wide impact on the information about labor market opportunities and compensation available to Defendants' employees.

a) Employee movements to or from other Defendants – whether resulting from cold calling or another recruiting method – accounted for only about *one percent* of Defendants' employee turnover (hires and separations) over the period 2001 to 2011. Employee movements between Defendants that had DNCC agreements was even lower. Using turnover as a proxy for underlying recruiting activity, this means that, during this period, about 99 percent of potential recruiting activity was unaffected by the challenged agreements.[16] See Table 1 below (and see Exhibits 1A and 1B for details).[17,18] Given the

[16] Given that forms of recruiting of other than cold calling were still available and used during the class period to recruit employees of Defendants subject to a DNCC agreement, the fraction of turnover accounted for by the movements to and from other Defendants will tend to overstate the actual importance of the challenged agreements.

relative unimportance of employee movement between Defendants both within and outside the class period, any restriction in that movement would not have a material effect on compensation. Moreover, during the class period, Defendants' collective hires from other Defendants ("cross hires") represented just 1.1 percent of Defendants' total hires (cross hires and separations represented 1.2 percent of their total hires and separations), a share that is not materially different than the corresponding shares from before and after the class period. The data in Table 1 clearly demonstrate that employee movements between the Defendants account for a minute fraction of the labor market activity for employees of these firms. As such, changes in those flows would have no substantial effect on the information available to Defendants' employees even if (counterfactually) those flows and the associated recruiting activity represented the only source of information available to employees.

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[17] For purpose of this discussion, I use the period from 2005 to 2009 to approximate the "class period." According to Plaintiffs, agreements involving four out of the seven Defendant companies (Adobe, Apple, Google, Intel) began in 2005. [redacted]

[18] This analysis uses one-year windows to identify hires (looking back one year between the separation date at the previous employer and the hire date at the new employer) and separations (looking ahead one year). For hires and separations between Defendants in a given year, the numbers of hires and separations may differ slightly due to the two different windows used.

Table 1

Summary of Hires and Separations at Defendant Companies

	Annual Average			
	2001-2004	2005-2009	2010-2011	2001-2011
Overall Hires	5,795	8,814	11,435	8,193
From Other Defendant Companies	35	95	159	85
From Other DNCC Defendant Companies	28	69	123	64
% From Other Defendant Companies	**0.6%**	**1.1%**	**1.4%**	**1.0%**
% From Other DNCC Defendant Companies	**0.5%**	**0.8%**	**1.1%**	**0.8%**
Overall Hires and Separations	12,182	15,985	16,525	14,700
From/To Other Defendant Companies	71	191	305	168
From Other DNCC Defendant Companies	57	139	239	127
% From/To Other Defendant Companies	**0.6%**	**1.2%**	**1.8%**	**1.1%**
% From Other DNCC Defendant Companies	**0.5%**	**0.9%**	**1.4%**	**0.9%**

Source: Based on analysis in Exhibit 1A and 1B.

b) There were many sources of labor market information available to Defendants' employees other than cold calling, including Defendants' hires and employees leaving Defendants to go to non-Defendants. During the class period, total workforce at Defendants averaged about 78,000 employees a year (see Exhibit 1A). Therefore new hires (roughly 8,800 a year based on Table 1) averaged about 11.3 percent of Defendants' total workforce during the year, while separations (roughly 7,200 a year based on Table 1) averaged about 9.2 percent of Defendants' total workforce during the year. This suggests that about 20 percent of Defendants' employees had direct contact with the labor market and the associated labor market information in a typical year. Other sources of labor market information include information from co-workers (some of whom may have been actively looking for work), friends working at other firms, dedicated internet sites such as job boards, and media and internet-based advertising, as well as cold calling from the very large number of non-Defendant employers and from Defendants where no DNCC agreement was in place. Under Plaintiffs' theory of the spread of information,

information from these other sources (which vastly exceeds any reduction in information resulting from the challenged agreements) would have been widely disseminated among Defendants' employees, even if there were no cold calling between pairs of Defendants.

c) Year-to-year fluctuations in Defendants' hiring activity vastly exceed any hiring changes that might have resulted from the challenged agreements. Over the class period, hiring by Defendants varied widely, from a high of 12,700 in 2005 to a low of 4,100 in 2009, a difference of over 8,500 hires. These aggregate changes dwarf any changes in the roughly one percent of total hires accounted for by Defendants that would be caused by the hypothesized reduction in cold calling due to the challenged agreements. Such large fluctuations in overall hiring activity are inconsistent with economically significant effects of the challenged conduct on class-wide compensation (see Part V.B.1, below).

d) There was no reduction in cross hires between Defendants during the class period. The percentage of Defendants' hiring from either (a) all other Defendants or (b) Defendants with DNCC agreements was essentially the same during 2005-2009 as during the 2001-2011 period as a whole. Thus, the data are inconsistent with Dr. Leamer's central premise that the agreements reduced information flows and consequently employee movements between Defendants.

<u>Opinion 3:</u> A reduction in inter-Defendant cold calling would not result in class-wide harm because there are many channels by which Defendants recruit employees

a) Market price (including the price employers pay for labor and thus the compensation earned by members of the proposed class) is determined by supply and demand for labor. The alleged agreements affected neither the supply of nor the demand for labor – in other words, they affected neither the number of available jobs nor the number of employees available to fill those jobs. Therefore, there is no reason why they would affect market compensation, or compensation of the class generally (see Part IV.B, below).

b) As a matter of economic theory, the alleged conspiracy to restrict a small number of employers from using a single recruiting tool when approaching employees at one or a few other firms would not lower compensation on a class-wide basis. The challenged agreements were not commitments to reduce salaries or restrict employment and would not have changed the supply of or demand for labor overall or the number of job positions Defendants had to fill. The alleged agreements only affected recruiting of certain employees through a particular method (cold calling). Even if the agreements reduced recruiting of certain employees from particular employers and potentially affected certain individuals as a result, the impact would be to increase recruiting through other unrestricted channels, which would benefit those hired by Defendants through those channels. For example, if, as a result of an alleged agreement with Adobe, Apple recruited a new employee for an open position from a non-Defendant, such as Microsoft, rather than from Adobe, the person hired from Microsoft (a member of the proposed class) benefitted (see Part IV.C, below).

c) As a matter of economics, reduced cold calling (to the extent it has an effect) could raise, rather than reduce, average compensation. If less cold calling reduced the number of potential candidates contacted by Defendants, it would reduce the pool of potential hires for those Defendants. This reduction could increase the amount of compensation that the Defendants had to offer to attract employees from the smaller resulting labor pool. Under Plaintiffs' theory of information flow, this would increase compensation of other employees as well, which is the opposite of the effect hypothesized by Plaintiffs. The fact that a reduction in cold calling affects the options available to both sides of the market (firms and workers) means that any overall impact on compensation is ambiguous (it could be positive or negative). Moreover, the fact that the reduction in cold-calling would increase demand for some individuals and reduce demand for others implies that the impact on wages would not be common across members of the proposed class (see Part IV.B, below).

<u>Opinion 4:</u> Defendants' compensation structures are not rigid.

a) Defendants had (and exercised) substantial flexibility in setting compensation of individual employees. Dr. Leamer's own model implies that employee compensation was highly individualized, with large variations even within particular job categories and between observationally similar individuals (see Part IV.D, below). As I demonstrate below, in every year and for each Defendant, there is substantial dispersion in employee compensation unexplained by Dr. Leamer's model. Dr. Leamer has shown that different jobs have different average compensation, but not that increases in an individual's compensation resulting from a cold call results in higher compensation for other employees.

b) Dr. Leamer's premise is also flawed. A rigid wage structure, even if one existed, would not imply that a change in compensation for one or more employees would shift the entire structure, because the cost of increasing compensation for one employee would be enormous (an increase for all employees), and would be resisted. Thus, Dr. Leamer's theory makes no economic sense.

c) Finally, Dr. Leamer's analysis cannot distinguish the impact he hypothesizes from an alternative hypothesis that compensation of Defendants' employees is broadly determined by competition in a vast labor market, and that adjustments for individual employee's unique circumstances (such as an attractive outside offer) are highly individualized (see Part V.D.3, below).

<u>Opinion 5</u>: Dr. Leamer's conduct regressions suffer from severe conceptual and methodological flaws and are completely unreliable and thus uninformative. His regression methodology provides evidence that is inconsistent with his conclusion of class-wide impact and damages.

a) Given the nature of Plaintiffs' allegations, the question whether the impact of the challenged conduct was common across Defendants is critical to understanding whether there is class-wide impact, and whether the impact can be measured on a class-wide basis. Data analyzed by Dr. Leamer fail to demonstrate that compensation changes during the conduct period were common across Defendants. Indeed, application of his methodology suggests that the changes were not common. Specifically, the estimated values of his so-called "conduct effects" vary substantially across Defendants, and for some of the Defendants the "effect" is actually positive (see Part V.E.2, below). Thus, Dr. Leamer's own regression specification and statistical methods (which I critique further below) show substantial variation across Defendants in the estimated impact, with some employees "overcompensated" as the result of the challenged conduct.

b) Dr. Leamer's estimated impact of the challenged agreements on compensation is highly "statistically significant" only because he ignores a critical and obvious feature of his data – that his observations are correlated, not independent. This is not only contrary to his own theory of how an individual's compensation is determined, but also a major error in statistical inference. When properly estimated, Dr. Leamer's conduct regression provides no meaningful evidence that the challenged agreements reduced compensation of members of the proposed class (see Part V.E.3, below).

c) In his conduct regression analysis, Dr. Leamer fails to account for important determinants of firm-level compensation. The existence of these factors invalidates his statistical analysis and shows that his claimed "conduct effects" are unreliable (see Part V.E.5, below). Dr. Leamer's estimated effects also are highly unstable, reflecting the imprecision with which they are estimated. For example, limiting his regression analysis to the conduct and post-conduct periods should not change his findings if Plaintiffs' theory is correct. Yet doing so completely changes his estimated "conduct effect"—the estimated "effect" is *positive* (implying overcompensation of class members) for all Defendants (see Part V.E.4, below). Similarly, simply controlling for changes in overall economic conditions and financial market performance (as measured by changes in the S&P 500 stock index) yields substantially smaller "undercompensation" or even overcompensation estimates (see Part V.E.5, below).

15. My report is organized as follows. In Part III, I provide background information on the Defendants and their recruiting, hiring and compensation practices that is relevant to my economic analysis. In Part IV, I show that there is neither economic logic nor empirical evidence to support Plaintiffs' claims that the challenged conduct would have a common impact on members of the class overall. Cold calling is only one of many recruiting tools, and other Defendants are not an important source of hires for any Defendant. These facts together refute Plaintiffs' claim that the challenged agreements would reduce compensation on a class-wide basis. Moreover, these same facts imply that some members of the proposed class will have benefitted from the same conduct that Plaintiffs allege harmed other employees, which means there is no economic basis to certify a class. Part V critiques Dr. Leamer's analysis and explains that he fails to support the economic requirements for class certification.

16. The information that I relied upon in forming my opinions includes documents and data produced by the parties in this litigation, deposition transcripts of the named Plaintiffs and of Defendants' employees, interviews that my staff and I conducted with Defendants' compensation and recruiting executives, economic literature, and other materials listed in Appendix B.

III. BACKGROUND ON THE DEFENDANTS

17. Defendants are seven companies headquartered in California. As Dr. Leamer describes in his report, the firms generally focus in different business areas.[19] While product market and labor market competition can differ, evidence that Defendants engage in different types of businesses suggests that each will need labor market skills that are not uniquely similar to the types of skills required by other Defendants.[20]

18. The Defendants also differ in their labor market needs during the class period. Exhibits 2A and 2B show that some firms [redacted]

19. Compensation philosophies and practices of the recruiting and hiring strategies used by the Defendants have certain common features, but also differ in certain ways.[21] First, the

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[19] Leamer Report ¶¶13-19.

[20] [redacted]

[21] The discussion in the remaining paragraphs of this section is based on my review of the Declarations filed by Defendants, interviews I conducted with compensation and recruiting managers at each Defendant, and my review of Defendants' data and documents.

companies subscribe to and use information obtained from third-party marketplace surveys as an input in determining compensation levels. The most commonly used source of market data is Radford. Although a subscriber can request a custom report from Radford that limits the data to particular labor market competitors or a limited geographic area, Defendants also often obtain reports that summarize responses from a broad selection of companies across the United States.[22] The Defendants use information from Radford and other market benchmarking studies, in some case targeted more closely to their particular geography or type of business,[23] as an input in making annual compensation adjustments.

20. Second, Defendants differ in how they incorporate third-party market data into their compensation decisions. [redacted] Others used the Radford and other benchmarking data more informally, but [redacted].[25]

[redacted]

21. Third, the companies use a large variety of channels for recruiting employees. [redacted] Many have formal referral programs that provide a bonus to current employees who refer individuals who ultimately are hired by the firm. [redacted] The importance of these different channels may have changed over time (LinkedIn, for example, increased in importance since the mid-2000s), but the use of many different channels has characterized the recruiting practices of these firms throughout the past decade and more.

22. From an economic standpoint, the use by Defendants of many different recruiting channels is important. It implies that a reduction in the use of one channel can and will be compensated for by increased use of (or at least reliance on) other channels. This has two critical implications. First, it implies that both employers and employees have alternative sources of information on hiring and compensation. Second, it implies that individuals (including class members) that utilize these other channels will have expanded opportunities as a result of the reduced cold calling.

IV. ECONOMIC THEORY AND EMPIRICAL EVIDENCE SHOW THAT INDIVIDUAL FACTORS PREDOMINATE OVER ANY COMMON FACTORS IN DETERMINING WHETHER AND BY HOW MUCH ANY MEMBER OF THE PROPOSED CLASS WAS INJURED BY THE CHALLENGED CONDUCT

23. The allegations in this matter concern the impact of the challenged agreements between pairs of Defendants to eliminate cold calling on compensation received by the Defendants'

[redacted]

salaried employees. The challenged agreements did not restrict other recruiting channels, prohibit hiring employees of other Defendants, limit how many employees could be hired, or fix wages or any other element of compensation.[29]

24. The five individual plaintiffs named in this lawsuit claim to represent virtually all persons who were salaried employees (or in the alternative salaried "technical" employees) of the seven Defendants at any time between 2005 and 2009. I understand that, in order to have such a class certified, Plaintiffs must demonstrate, among other things, both that common issues predominate over individual issues in determining whether class members have been injured by the alleged conspiracy, and that there is a reasonable way of quantifying the amount of damages owed to each class member without relying on individualized analyses. An economic analysis can support Plaintiffs' claims only if that analysis explains how agreements that 1) do not reference or relate directly to compensation; 2) do not affect direct determinants of an employee's compensation such as promotions or performance evaluations, and 3) do not restrict Defendants' hiring nevertheless cause class-wide changes in compensation. Thus, the relevant economic issue is whether, given how labor markets operate, an agreement that potentially limited one of many recruiting methods by which employees at one Defendant might have been made aware of specific employment opportunities at another Defendant would reduce compensation received by all members of the proposed class.

25. Dr. Leamer's theory has three essential elements. In particular, under his theory, in order for the alleged agreements to affect compensation received by members of the proposed class, 1) those agreements must materially reduce the level of information possessed by Defendants' employees; 2) that reduction in information must lead to a reduction in compensation for those individuals relative to what they would have received absent the challenged agreements; and 3) the "rigid" nature of the compensation structures at the defendant firms must then generate a class-wide reduction in compensation through the pressure for internal equity. This sequence,

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[redacted]

which underlies Dr. Leamer's "price discovery" and "internal equity" frameworks, is speculative and inconsistent with economics and empirical evidence, as I show below.

A. The Challenged Agreements Would Not Meaningfully Reduce the Supply of Information

26. As a matter of economic theory, the impact of eliminating supply to the market from one source will depend on the size of the supply restriction and the elasticity of market supply – or the extent to which supply to the market from other sources increases when supply from one source is reduced. Here, it is the supply of "information" that allegedly was reduced by the challenged agreements. In Dr. Leamer's model, the reduction in the information that cold calling provides leads to less price discovery and lower compensation for all (or almost all) class members.[30] In effect, Plaintiffs and Dr. Leamer equate recruiting activity with information flow, and claim that reduced cold calling results in less information available to employees.

27. Class-wide impact of the challenged agreements on information possessed by employees at Defendant A would depend on the combined impact of (1) the importance of cold calling relative to other recruiting channels[31] and (2) the importance of other Defendants with which Defendant A has a DNCC agreement as a source of potential recruiting.[32] If (outside the class period) cold calling accounts for 25 percent of Defendant A's hires, while employees of other Defendants with which Defendant A has DNCC agreements account for one percent of Defendant A's hires, then the share of Defendant A's hiring potentially affected directly by the

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[30] Dr. Leamer assumes that *all* price discovery raises, rather than reduces, compensation, an assumption he neither acknowledges nor explains. It is possible that information gained by cold calling could reveal to recruiters (or employees) that current compensation is either above or below market.

[31] Cold calling is not clearly identified in the Defendants' data, [redacted]

[32] [redacted]

agreements during the class period is only 0.25 percent (assuming that cold calling is as important in hiring from the Defendants with which Defendant A has DNCC agreement(s) as from firms in general). Even this likely would overestimate the effect, because it assumes that Defendant A did not expand its recruiting efforts by utilizing other recruiting channels more heavily. As explained below, the impact if Defendant A avoids cold calling employees of Defendants with which it has DNCC agreements is to make it more likely that another company's employee was hired (either someone from a Defendant with which Defendant A did not have a no cold call agreement, a non-Defendant, or even one of the Defendants with which Defendant A had a cold call agreement if that employee was recruited without a cold call), a process by which "lost" information is replaced.

1. Evidence Shows that Employees of Other Defendants are not an Important Source of Recruits and Hires

28. The likelihood that the challenged agreements affected employee compensation by reducing information depends on the relative importance of other Defendants' employees in a Defendant's recruiting efforts. Using Defendants' data, I summarized the former employer of Defendant's new hires.[33] The loss of cold-call opportunities from an agreement between Defendants A and B could not have a meaningful impact on the information available to and compensation earned by employees of either company if cross hires between Defendant A and Defendant B would have accounted for a very small fraction of their total hiring anyway.

29. Exhibit 3 shows the top 20 previous employers of new hires at each of the Defendants (based on recruiting data provided by Defendant).[34] A striking observation from this exhibit is that no single firm (not just the Defendant firms) accounts for more than six percent of hires at any Defendant, and that the top 20 firms combined typically account for less than 20 percent of

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[33] Despite the availability of this information (which I understand was provided by the Defendants in response to *Plaintiffs' First Set of Requests for Document Production*, October 3, 2011**)**, [redacted]

[34] My staff standardized employer names in the recruiting databases to the extent possible (the prior employer field in the Defendants' data typically was self-reported by the applicant and was entered as free-form text**).**

total hires. Other Defendants account for at most three of the top 20 former employers at any Defendant, and collectively other Defendants typically accounted for less than three percent of total hires. Thus, even a policy that eliminated all hiring from other Defendants – which is much stronger than the limitation on a single recruiting channel from certain Defendants during certain periods that Plaintiffs challenge here – would not meaningfully affect the flow of information to class members. In fact, measured over all Defendants, hiring from other Defendants accounts for only about one percent of total hires.

30. Theoretically, these aggregate numbers could mask a narrower time period or narrower group of employees where other Defendants accounted for a substantial share of hires (and thus particular employees that might have been affected by the alleged conduct). But the extremely low level of hiring by one Defendant of employees of other Defendants (even outside the class period) implies that any reduction in cold calling because of the challenged agreements would not have any significant class-wide economic effect on the proposed class. Thus, even if there were an effect for individual employees or small groups of employees, an individualized analysis of the importance of other Defendants and of cold calling as a recruiting channel would be needed to identify those individuals, and quantify any damages they suffered.

31. The number of Defendant-to-Defendant labor market transitions that might have been initiated by cold calls as a fraction of all employee transitions to and from Defendants provides a way to summarize the amount of "information" and potential price discovery that could conceivably be lost by restrictions on cold calling among Defendants. Exhibit 4A shows the total number of hires and separations as a percentage of total employees at the seven Defendants, broken out by movements between Defendants versus between Defendants and other firms. Exhibit 4B shows these same figures for the Technical, Creative, and R&D class. As can be seen from these exhibits, the total movement of employees in and out of the Defendant firms is large and highly variable from year to year. At the same time, movements between the defendants are miniscule by comparison regardless if one looks before, during or after the class period. If hiring by one Defendant of employees from another Defendant were economically important in the price-discovery process, then employee movement between Defendants should account for a

substantial part of the overall movement of workers.[35] The exhibit shows that exactly the opposite is true. Even if *all* hires and separations to and from Defendants were initiated by cold calls, the amount of information lost and the potential impact on compensation received by members of the proposed class would be extremely limited both in terms of its magnitude and relative to other market level fluctuations, even before taking into account the incentive for recruiters to compensate by using other recruiting channels more intensively.

B. Restrictions on Recruiting Methods Would Not Affect Market Compensation

32. Market price (including the price employers pay for labor and thus the compensation earned by members of the proposed class) is determined by supply and demand for labor. The alleged agreements affected neither the supply of nor the demand for labor – in other words, they affected neither the number of available jobs nor the number of employees available to fill those jobs. Therefore, there is no reason why they would affect market compensation, or compensation of the class generally.

33. Even if, contrary to the evidence presented above, the decline in cold calling was sufficient to cause a meaningful decline in overall recruiting efforts, that effect would not necessarily reduce overall compensation and certainly would not reduce compensation on a class-wide basis. While a reduction in cold calling would reduce the number of firms contacting some employees, that same reduction in recruiting reduces the pool of potential hires for those firms by that same amount. The reduction in potential hires would raise the level of recruiting of other individuals and the level of compensation required to fill the open positions, which would put *upward* pressure on compensation at Defendants, the opposite of the effect hypothesized by Plaintiffs. The fact that the reduction in cold calling affects the options available to both employers and employees makes the overall impact on compensation ambiguous, even if it were material. Moreover, in this scenario, the fact that there would be more demand for some

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[35] Hiring should be a reasonable proxy for the price discovery process given that information on compensation is most commonly provided to candidates only at the later stages of the recruiting process (once the number of candidates has been reduced to a small group that then is interviewed for a job or job opening) [redacted]

individuals and less demand for others implies that the impact on compensation would not be common across members of the proposed class. Workers who remain in the pool of potential hires would stand to benefit, while those who are left out potentially would be harmed.

34. One job category common to all Defendants (and a large portion of both proposed classes) is software engineers. Employment opportunities for software engineers (and other types of employees) are widespread geographically and across industries, with any single employer, or even the seven Defendants collectively, accounting for only a small fraction of employment. As shown in Exhibit 5, Defendants accounted for two percent or less of employment of software engineers in the United States, and only about 10 percent of employment of software engineers in the industries in which the Defendants operate.[36]

35. The economics of labor mobility provides an additional reason why compensation of Defendants' employees will not be influenced meaningfully by changes in Defendants' recruiting and hiring practices. Employees are more willing to change jobs and to relocate geographically when they are young,[37] and the labor forces of several Defendants are very young. [redacted]

36. Exhibits 1A and 1B show that turnover of employees at Defendants (i.e., employees leaving or joining) [redacted]

[36] I performed this comparison for software engineers and limited the analysis to industries in which Defendants compete (based on CapIQ information for the Defendants) simply to show that even this conservative calculation (focusing on software engineers because that is the profession of the named Plaintiffs and restricting total employment to firms engaged in businesses of the type (in a general sense) in which Defendants engage) demonstrates that Defendants account for only a small share of job opportunities.

[37] Robert H. Topel and Michael P. Ward, "Job Mobility and the Careers of Young Men," 107 *The Quarterly Journal of Economics* 2 (1992), p. 440.

[38] Details by Defendant are shown in Appendices 1A through 2D.

[redacted] The exhibit also shows that employee movements (or cross hires) between Defendants accounted for an extremely small fraction of total hires and separations of employees at Defendants**.**

37. Thus, data show that Defendants compete for employees against a large number of other companies. The competition may be more immediate with some firms than others, but the tendency is for compensation of employees with the same skills and experience to equalize across employers, because the labor markets in which these firms recruit and hire is broad and employees are mobile. The movement of employees into and out of Defendants and other firms means that Defendants' employees have access to a vast flow of information about market opportunities and compensation.

C. The Alleged Conspiracy Would Benefit Some Members of the Proposed Class Even if it Harmed Others

38. Even if the alleged conspiracy reduced the compensation received by some members of the proposed class because they did not receive information or a job opportunity because of a lost cold call, the necessary corollary is that it increased compensation of other members of the proposed class by opening up opportunities that they otherwise would not have received or, under Plaintiffs' theory, providing them with information that they otherwise would not have obtained. Thus, Plaintiffs' and Dr. Leamer's own arguments imply that the impact is neither uniform across class members, nor even harmful to all, but rather a mix of benefits to some caused by the same conduct that could, at least in principle, have injured others.

39. Defendants generally follow the same process for filling open jobs.[39] [redacted]

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[39] [redacted]

[redacted]

40. Understanding the recruiter's role and incentives is important in evaluating whether Plaintiffs' claims make economic sense, and whether the impact that Dr. Leamer claims to estimate has a logical magnitude given the relevant institutional framework. The decision whether there is a job to fill and selection of who to hire generally is made by the manager, and the decision how to fill that job is led by the recruiter. The alleged agreements challenged by Plaintiffs affected only the methods used to find qualified job candidates. Since the role of a recruiter is to identify candidates to fill open positions, recruiters would find candidates through other channels if they were constrained from cold calling employees at certain companies by the alleged agreements (including by cold calling employees at other companies, such as Defendants with which there was no DNCC agreement, or recruiting employees at firms with which they have DNCC agreements through other channels). The net effect of the challenged agreements would be to *increase* the likelihood that candidates would be recruited, interviewed, offered a job, or hired through channels other than cold calling employees of a DNCC Defendant

[redacted] [redacted].

(including cold calls or other channels directed at non-DNCC Defendants). Through that process, these other individuals would obtain the "information" about their value allegedly denied to the employees who did not receive the cold call (and possibly the benefit of a better job with one of the Defendants). The pool of such potential hires is vast; [redacted] while it is reported that Google received two million resumes in 2011.[42]

41. The consequence is that there could not be class-wide harm. Instead, some members of the class would benefit even if some were harmed, and distinguishing the two could not be done with common evidence such as that offered by Dr. Leamer. The class member who gets hired has benefited, according to the Plaintiffs' logic, from the conduct that Plaintiffs claim harmed the class member who did not receive the cold call. [redacted]

42. The probability that one of those other candidates is called or hired increases with any reduction in potential hires through cold calls to a Defendant's employees. The fact that the person hired (wherever he previously worked) accepted the job means that he was made better off by doing so. If he was previously employed by a non-Defendant, that person becomes a member of the class and (thus according to Plaintiffs' claims) has been injured, even though he was able to obtain a better position *only because of the challenged conduct*.[44] Thus, under the

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[redacted]

[42] *See* http://online.wsj.com/article/SB10001424052970203750404577173031991814896.html.

[redacted]

[44] In Plaintiffs' but-for world, this person would not have been hired; for him, it is irrelevant whether compensation for the position that he would not have received would have been higher.

very theory put forward by Plaintiffs, the challenged conduct would benefit some class members even if it harmed others. There is no class-wide harm, even if some individuals are injured.

D. Employee Compensation is Highly Individualized and Therefore Determining Which (if any) Employees were Injured and By How Much Would Require Individualized Analysis

1. There is Tremendous Variation in Compensation Paid to Individual Employees

43. The tremendous variation in annual compensation for members of the proposed classes at each Defendant shown in Exhibits 7A and 7B is at odds with a central tenet of Plaintiffs' theory – that a rigid compensation structure necessitates that changes in compensation for individual employees resulting from cold calls would be transmitted across the class.[45,46] In each year, the range of total compensation changes differs substantially across Defendants. [redacted]

44. Thus, compensation does not move in lock step across the Defendants.[48] In any year during the alleged conspiracy period, some employees at a particular Defendant received a 10 percent raise, while others received no raise. This implies that, under Plaintiffs' theory, the

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[45] The data presented by Dr. Leamer supports this same conclusion. As I point out in my critique of Dr. Leamer's analysis below, his data show substantial differences in compensation even for individuals in one of the over 4,000 narrow job categories he analyzes. Even this understates the level of pay variation, since there is no reason individuals cannot be moved *across* job classifications in response to external pressure (e.g., promoted from Software Engineer 2 to Software Engineer 3).

[46] As I discuss below (and show in Exhibits 14A and 14B), this variation is not explained by individual characteristics – age, job tenure, sex – that Dr. Leamer takes into account in his regression analyses.

[47] Changes in base salaries also show very large variations (see Appendix 3A and Appendix 3B). I also show in Appendix 4A through 4D the distribution of compensation levels, which also show substantial variations.

[48] Company-specific performance also affects changes in employee compensation at a particular Defendant; for example, Pixar's bonuses are tied to the success of individual films (*see,* McAdams Depo. at 42:2-43:3).

propensity for salary changes for an individual employee to be propagated across his or her coworkers would vary substantially across members of the proposed class. In Dr. Leamer's terms, these data show that the requirement of "internal equity" and the degree to which employees received similar percentage compensation increases annually differ substantially across Defendants. His theory would have to be tested and evaluated for each Defendant separately to understand the source of the variation. In order to understand whether a cold call would have affected any employee's compensation and, if so, by how much, it is necessary to understand first why one employee received a much larger raise than the other.

2. The Composition of Total Compensation Differs Across Employers and Employees

45. Exhibits 8A and 8B summarize the composition of compensation received by employees at the Defendants. These exhibits show that Defendants differ in their relative reliance on three components of employee compensation: base salary, bonus and equity (or options). [redacted].[49] This implies that the validity of the Plaintiffs' theory would have to be evaluated separately for each of the Defendants.

46. The composition of compensation also varies substantially across job titles within each Defendant. Exhibits 9A and 9B show the composition of total compensation for the jobs [redacted]

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[49] [redacted]

[50] Corresponding exhibits for other Defendants are in Appendices 5A through 5E.

[redacted] This variation implies that the validity of Plaintiffs theories would need to be established separately for each group of employees. Plaintiffs and Dr. Leamer have failed to do so.

47. The impact of differences in the composition of total compensation extends to the individual level as well. The difference in the share of compensation provided in base salary, bonus and equity means that the value to an employee of a cold call and any potential resulting job offer will depend on his preference for receiving compensation in different forms. A highly risk-averse employee or one who expects to change employers frequently may place little value on stock options, and may value expected bonus much less than a corresponding amount of base salary. Thus, an offer of substantially greater expected total compensation may be worth less to him if it consists of a large expected bonus and stock options than lower compensation from another company that provides almost all its compensation in base salary. These same factors will affect how an employer might respond when an employee receives an outside offer that he asks his employer to match; if the outside offer is heavily weighted toward stock options, then "matching" that offer might require only a small increase in base compensation.

48. The reliance on stock options by some Defendants creates another individualized inquiry, because the impact of the challenged agreements will depend on how soon an employee's options will vest, and how many options he holds. All else equal, the same outside compensation offered to an employee without stock options at his current employer that would vest (allowing them to be exercised) in the near future will be more likely to interest a potential hire than when the same compensation is offered to an employee that holds substantial options that are unvested.[51] Consequently, the response by the employee's current employer (if the employer wants to match the outside offer) also will likely differ.

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[51] [redacted]

V. DR. LEAMER PROVIDES NO ECONOMIC SUPPORT FOR PLAINTIFFS' CLASS CERTIFICATION REQUEST

49. Plaintiffs support their class certification motion with the Leamer Report, which they claim demonstrates that the challenged agreements suppressed the compensation of all or nearly all Class members[52] and so provides the required support for class certification. However, Dr. Leamer's analysis and the evidence he offers demonstrate neither that there was an average or "generalized" reduction in compensation of class members nor that "all or nearly all" members of the proposed class were undercompensated.[53] Dr. Leamer has not provided a class-wide method for proving impact or the amount of damages.

A. Summary of Dr. Leamer's Opinions

50. Dr. Leamer divides his analysis into three parts. First, he argues that "class-wide evidence is capable of showing that the non-compete agreements suppressed compensation *generally*,"[54] by which he appears to mean that, *on average*, members of the proposed class received lower compensation because of the challenged conduct. In support, he offers three types of evidence: (1) economic theory, which he says is supported by economic literature, of a link between (a) the amount of cold calling and (b) information flows about compensation and job opportunities, employees' "negotiating leverage," and movement of employees between firms; (2) Defendants' internal documents, which he claims demonstrate their concern about the impact of cold calling on compensation; and (3) empirical evidence that job "movers" receive higher compensation than "stayers," which he claims supports his conclusions that cold calling leads to "price discovery" that raises compensation. [redacted]

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[52] *Motion* p. 2-3.

[53] In his report, Dr. Leamer does not provide a clear definition of what he means by "all or nearly all." [redacted]

[54] Leamer Report ¶65(heading IV.A, emphasis added).

[redacted].[55]

51. Second, Dr. Leamer claims that "class-wide evidence is capable of showing that the non-compete agreements suppressed the compensation of *all or nearly all members* of the all-salaried employee class and technical class,"[56] which I interpret as an opinion that the "average" impact that he claims to establish through his first set of analyses reflects undercompensation of "all or nearly all" individual members of the proposed class, and not just harm to some members. To support this part of his argument, he again offers three types of evidence: (1) "economic theory" that, he claims, demonstrates that concerns with "internal equity" results in "somewhat rigid salary structures;" (2) Defendants' internal documents, which he claims confirm concern with internal equity and "more specifically demonstrat[e] the broad effects on compensation of the Non-Compete Agreements;"[57] and (3) multiple regression analysis that, he claims, shows that compensation earned by individual class members is determined "largely by common factors and that Defendants maintained rigid salary structures such that one would expect Non-Compete Agreements to have widespread effects on compensation."[58]

52. Finally, Dr. Leamer opines that "standard forms of econometric analysis are capable of computing the *aggregate* amount of compensation suppression" to members of the proposed

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[55] [redacted]

[56] Leamer Report ¶100(heading IV.B, emphasis added).

[57] Leamer Report ¶101.

[58] Leamer Report ¶101.

class "caused by the Non-Compete Agreements."[59] [redacted]

53. As I now explain, none of Dr. Leamer's opinions are supported by proper economic analysis. Empirical evidence, including evidence he ignores as well as proper analysis and interpretation of evidence that he offers, contradicts his opinions and demonstrates that class members have not been injured "generally" and that there has been no harm to "all or nearly all" members of the proposed class.

B. Economic Analysis Does not Support Dr. Leamer's Claim that the Challenged Agreements would Reduce Information Flows, Limit "Price Discovery" or Affect Compensation "Generally"

54. Dr. Leamer's economic "theory" does not fit the facts of the labor market at issue here – one that is characterized by many ways of recruiting employees, a vast amount of information available to employees on available jobs and market compensation, mobile employees, and tremendous density of employers and employees in small geographic areas (where Defendants account for only a small fraction of employment and employee movement). In order to be useful, an economic model must fit the key characteristics of the industry or market that is being modeled, and Dr. Leamer has not attempted to match his "price discovery" framework and theory of compensation impact to available evidence on the amount of available information and the competitive nature of the environment in which Defendants and their employees operate.

1. Evidence Shows that the Flow of Information and thus "Price Discovery" Would Not be Reduced by the Challenged Agreements

55. Dr. Leamer relies on economic theory to link the challenged agreements to the widespread effect on compensation claimed by Plaintiffs. He claims that "[t]here are three economic frameworks that are particularly useful" in evaluating the impact of the agreements, and that these frameworks "explain various mechanisms by which anti-Cold-Calling agreements can suppress worker compensation generally." He focuses primarily on the "market price

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[59] Leamer Report ¶135 (emphasis added).

[60] [redacted]

discovery" framework, arguing that labor markets can have "very sluggish price discovery," and that the "expensive and time-consuming task of uncovering and valuing the unique features of workers slows down the price discovery process."[61] Consequently, Dr. Leamer claims, "many transactions …occur at prices far from equilibrium levels."[62] According to Dr. Leamer, "Cold-Calling is an important channel of information about outside opportunities" and "[a]bsent Cold-Calling, many labor contracts are negotiated in unequal bargains between informed and uninformed employees."[63] The consequence, he concludes, is that the challenged agreements restrict price discovery by members of the proposed class and cause employees to be undercompensated. However, Dr. Leamer's argument about "price discovery" is invalid, and the "logic" that he claims supports a link between reduced cold calling and class-wide reduced compensation is inconsistent with assertions that he makes to support that link.

a. Dr. Leamer Exaggerates the Loss of "Information" from the Challenged Conduct

56. [redacted].[65]

57. Exhibits 4A and 4B, which I discussed above in Part IV.A.1, showed that movements between Defendants accounted for a very small fraction (roughly one percent) of the overall employee flows at Defendants, including during the periods before and after the challenged

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[61] Leamer Report ¶73.

[62] Ibid.

[63] Leamer Report ¶75.

[redacted]

conduct. Thus, any reduction in information flow from the challenged agreements would be extremely small relative to the level of the overall flow of information or to the natural year-to-year fluctuation in the flow of employees.

58. Plaintiffs and Dr. Leamer allege that the information flow that was lost to members of the proposed class occurs as a part of the hiring and recruiting process. The number of cross-Defendant hires is a good indicator of the importance of such reduced information flows, and data show that these were extremely small. This does not mean that, under certain circumstances, an employee could not benefit from additional information and opportunities obtained through a cold call. Some employees may have below-market compensation, may become aware of this only because of a cold call, and may then use the information gained to obtain greater compensation. However, even if the loss of cold calls resulted in lower compensation for some employees, it would not create class-wide harm. Indeed, under Plaintiffs' theory, that same conduct would benefit some members of the proposed class as I explained above.

59. Dr. Leamer also ignores the incentive of both employers (and their recruiters) and employees to compensate for restrictions in information flowing through one channel by increasing the information flow through other channels. As a matter of economics, the restriction on cold calling *among* the Defendants need not even reduce the total use of cold calling in their recruiting processes. For example, if recruiters at Intel did not cold-call employees at Google during certain periods, they likely increased cold calling to employees at the vast number of other firms from which Intel recruits (including other Defendants). They would also use other channels (e.g., job boards) more intensively if the restriction on cold calling employees at Google meaningfully restricted their ability to hire good candidates. Other firms, including both Defendants and non-Defendants, also would be expected to change their behavior and make additional cold-calls to the would-have-been targeted employees.

60. Exhibit 5 shows that the Defendants accounted for two percent or less of employment of software engineers in the United States, and only about 10 percent of employment of software engineers in the industries in which the Defendants operate (so many other employers had candidates with skills suitable for the Defendants). Consistent with results established above, these exhibits demonstrate that the reduced information flow through a limited channel would

not have a meaningful impact on the total flow of labor market information available to employees of the Defendants. Indeed, employees still would have access to the recruiting opportunities provided by firms other than the Defendants, as well as to Defendants' recruiting efforts through other channels.

61. A simple exercise illustrates the realities of this marketplace. As shown in Table 1 and Exhibit 1A, hiring from and movements to other Defendants accounted for roughly one percent of total hires over the class period. A conservative calculation to help understand how much information potentially could have been reduced by the challenged agreements could use the higher post-period (2010-2011) rate of 1.4 percent as a base of comparison, and measure the "lost" hires as the difference between the cross hire level in the post and class periods.[66] Inter-Defendant cross hires were lower by only about 0.3 percent of total hires during the class period, an annual difference in the number of cross hires of roughly 30 employees per year compared with total hires of about 8,800 per year and total departures of about 7,200 per year at Defendants, or less than two-tenths of one percent of Defendants' total labor turnover. In other words, if each of the 30 additional employees who moved from one Defendant to another provided "information" to both the firm that employee left and the firm to which it moved, there would be 60 additional "bits" of information annually to add to the total bits of information provided by employee movements of 16,000 bits of information (=8,800+7,200), or an increase of 0.38 percent in the bits of information available to Defendants' employees.[67] Since employees obtain information on market conditions through other channels (such as new hires, co-workers actively seeking work elsewhere, internet sources, friends, etc.), the actual percentage reduction in information from all sources would be even smaller. Such a small difference would have no material economic effect on overall compensation

[66] This calculation is conservative because, as I discuss above, using both the pre-class and post-class periods as a benchmark, there is no change in aggregate cross-hiring among Defendants during the class period. The slightly higher cross hiring in the post-class period may reflect the growth of Defendants and thus their increased share of employment overall.

[67] Even this percentage is much too large, because it assumes all information acquisition comes through employee movement and ignores information obtained by employees in other ways.

62. This change also is *de minimis* compared with year-to-year fluctuations in hiring and recruiting activity. [redacted] Given the degree of fluctuation in hiring due to other forces, Dr. Leamer's claims that the impact of the challenged conduct was economically significant [redacted] imply a sensitivity to incremental information flows that is simply untenable given the marketplace realities.

63. Dr. Leamer provides no evidence of the importance of the information allegedly lost because of the agreements, the evidence presented above demonstrates that any such effect would be vanishingly small. His theory and empirical analysis ignore and are inconsistent with the nature of the relevant labor market, and his claim of class-wide impact is not grounded in consideration of the specific dynamics of information discovery that apply to the proposed class.

b. Plaintiffs and Defendants Have Vast Amounts of Available "Information"

64. Even if there were some groups of employees in some markets with limited access to information about appropriate compensation, so that incremental cold calling might affect employee compensation, Plaintiffs do not represent such a group. In particular, members of the proposed "Technical Employee" (and at least a large portion of the All-Salaried Employee) class are poster children for an informed labor force. [redacted]

[redacted]

65. Dr. Leamer implies that the labor market from which Defendants hire (and where Defendants' employees obtain information that they can use when they negotiate their compensation) consists of hapless and poorly informed employees who "rely mostly on 'water-cooler talk' perhaps supplemented by Internet sources"[69] to obtain scraps of information, which they then use to bargaining weakly with employers who "often hire private consulting firms to provide aggregated information about 'market compensation'."[70] But this characterization lacks credibility. The agglomeration of Defendants and a large and constantly changing number of other employers of technical and other employees located in Silicon Valley and other geographic technology centers contradicts Dr. Leamer's (unsupported) implication that members of the proposed class are employed in jobs that "involve high costs for transactions [involving labor services] including time, money and *personal dislocation*."[71] The high rates of employee turnover (hiring and separations) at Defendants shown in Exhibits 4A and 4B, with the sum of annual hires and separations as a fraction of average annual employment between 10 and 25 percent during the conduct period, demonstrates the substantial flow of information of the type that Dr. Leamer claims was restricted into and out of these firms and contradicts Dr. Leamer's claims that these employees were immobile.

c. "Lost" Information will not have Class-wide Impact if it is "Unique" to Individual Employees

66. According to Dr. Leamer, the "expensive and time-consuming task of uncovering and valuing the *unique* features of workers slows down the price discovery process."[72] But his claim that cold calling helps uncover "unique" features of potential employees is inconsistent with his claim that there would be class-wide impact from reduced cold calling through the price discovery process. [redacted]

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[69] Leamer Report ¶75.

[70] Leamer Report ¶75.

[71] Leamer Report ¶74.

[72] Leamer Report ¶73 (emphasis added).

[redacted] The lost "information" would relate to the unique features of the worker who was not cold-called, and would not have any impact on employees without those "unique" features. To the extent that the price-discovery process is employee specific, then the effect of reducing cold calling also will be employee specific. There would be no class-wide impact.

d. Dr. Leamer's Claims about "Lost Information" and "Price Discovery" are not Supported by the Economic Literature

67. Finally, Dr. Leamer claims that his information flow and price-discovery framework is "well-accepted in the economics literature."[74] Neither the cited literature nor the broader economic literature provides support for his claims. One paper he cites (by Joseph Stiglitz) argues that the full-information neoclassical model has limitations for understanding many markets, including the labor market, but that paper does not by itself show or claim that economic models that acknowledge and incorporate information imperfections demonstrate that employees are "undercompensated" as a result of information limitations.[75] The other three economic papers he cites all involve the so-called "rockets and feathers" phenomenon, according to which prices might rise faster than they fall in markets with imperfect information.[76] Dr. Leamer cites these in support of his claim that restriction of information in the labor market leads to lower wages, but the "rockets and feathers" model does not imply that a *restriction* of information in the labor market would cause a reduction in wages. Rather, these models explain only why prices rise quickly in response to *positive* information but fall slowly in response to *unfavorable* information.

[redacted]

[74] Leamer Report ¶66.

[75] Joseph Stiglitz, "Information and the Change in the Paradigm in Economics," 92 *American Economic Review* 460 (June 2002).

[76] The cited paper by Green et al. (2010) is an empirical paper documenting asymmetric price adjustment in a major over-the-counter financial market, not a labor market. The cited papers by Tappata (2006) and Yang and Ye (2006) develop theoretical models explaining asymmetric price responses.

68. The economic literature on bargaining with asymmetric information corresponds more closely to the mechanism by which Dr. Leamer hypothesizes that reduced cold calling affects negotiations and in turn results in under-compensation of members of the proposed class. Samuelson made an early contribution to this literature, showing that some mutually beneficial trades are foregone when parties have asymmetric information.[77] However, Samuelson's model does not establish that the resulting price is more favorable to the informed party than the price that would prevail with full information. Rather, he explains that an uninformed party who knows that the informed party has superior information will take this into account when formulating his strategy.[78] Similarly, more recent economic literature does not generally establish that the price that prevails with asymmetric information is more favorable to the informed party than the price that would prevail with full information, but instead demonstrates that some mutually beneficial trades are forgone when there is asymmetric information.[79] Indeed, Dr. Leamer asserts in his report that lack of information would disadvantage both employers and employees.[80]

69. Thus, the available evidence shows that the challenged agreements would not meaningfully affect information flows. Dr. Leamer's price discovery "framework" is not supported by the economic literature or by empirical evidence of Defendants' recruiting and hiring practices. Further, his argument that cold calling uncovers "unique" features of individual employees contradicts his claim that the challenged agreements had a class-wide impact.[81]

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[77] William Samuelson, "Bargaining Under Asymmetric Information," *Econometrica* 52 (July 1984).

[78] In a similar vein, Grossman and Perry (1986) study a sequential bargaining game with asymmetric information, and obtain similar results. Ibid. ("In order to calculate correctly his payoff, the uninformed player must anticipate and draw the proper inferences from the behavior of his informed opponent." p. 1004.) And see Grossman, Sanford J. and Motty Perry, "Sequential Bargaining under Asymmetric Information," Academic Press, revised February 2, 1986.

[79] Ausubel, Lawrence M., Peter Cramton, and Raymond J. Deneckere, "Bargaining with Incomplete Information," Handbook of Game Theory, Aumann, Robert J. and Sergiu Hart, eds., Vol. 3, Amsterdam: Elsevier Science B.V., chapter 50, 2002.

[80] Leamer Report ¶68-70.

[81] Leamer Report ¶73.

2. Dr. Leamer Wrongly Claims that His Empirical Analysis of Defendants' Compensation Data Shows that Restricting Cold Calling Impedes the Price Discovery Process

70. In addition to (wrongly) claiming that "economic theory" and economic literature show that reduced cold calling limited information flows and price discovery and thereby "suppress[ed] employee compensation on a widespread basis,"[82] Dr. Leamer provides empirical analysis that he characterizes as "additional *common* evidence capable of showing that restricting Cold-Calling would artificially suppress employee compensation by impeding the price discovery process."[83] However, his data show instead that there is no common evidence of suppressed employee compensation.

71. [redacted]

72. First, the economics literature on between-employer mobility shows that job changers generally receive atypically large wage increases, so the pattern shown by Dr. Leamer would occur generally and is not evidence of disequilibrium.[87] Economic theory and evidence imply

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[82] Leamer Report ¶80.

[83] Leamer Report ¶89 (emphasis added).

[redacted]

[87] Topel, Robert H. and Michael P. Ward, "Job Mobility and the Careers of Young Men," The Quarterly Journal of Economics, May 1992. Bartel, Ann P. and George J. Borjas, "Middle-Age Job Mobility: Its

that an employee who moves likely will obtain a larger increase in compensation than observably similar incumbent employees for two reasons. First, as Dr. Leamer recognizes, employers must compensate employees for the cost of moving. Dr. Leamer acknowledges that the relevant disparity for evaluating whether compensation is "suppressed" must net out movers' "moving costs." However, he provides no evidence about the magnitude of such moving costs, and what portion of their higher compensation compensates for this, rather than reflects a disequilibrium in earnings. Second, the process by which "movers" are selected means that, ex ante, "movers" and "stayers" are not equivalent.[88] Employees who move on average will be "uniquely" attractive to the hiring firm (movers are, in effect, getting "promoted" and were chosen because they are desirable to another firm, perhaps because of their "unique" features (as Dr. Leamer says)), but their movement does not affect compensation generally because it reveals nothing about appropriate compensation for "stayers" and is not evidence that stayers would have received the same compensation increase if they had moved. In other words, compensation increases of "movers" do not increase the compensation of stayers. The vast economic literature on employee-firm matching supports exactly this conclusion but does not rely on disequilibrium or undercompensation.

73. Second, and critically, evidence that movers earn more than stayers is not evidence that their movement affects the compensation of stayers. Dr. Leamer's comparison is static – it compares the compensation of movers and stayers in a particular year, but provides no evidence that the compensation of movers *affects* compensation of stayers. Yet, his price-discovery argument requires that the change in compensation for movers also changes the compensation of stayers. Without this unproven link (which he wrongly claims is closed by "internal equity" concerns that converts one person's raise into raises for all employees), there is no support for

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Determinants and Consequences," Working Paper No. 161, NBER Working Paper Series, January 1977. Borjas, George J. "Job Mobility and Earnings Over the Life Cycle," Working paper No. 233, NBER Working Paper Series, February 1978.

[88] Topel, Robert H. and Michael P. Ward, "Job Mobility and the Careers of Young Men," The Quarterly Journal of Economics, May 1992. Bartel, Ann P. and George J. Borjas, "Middle-Age Job Mobility: Its Determinants and Consequences," Working Paper No. 161, NBER Working Paper Series, January 1977.

his claim that a restriction on information that would have been obtained through cold calls to employees of other Defendants affected compensation of class members generally.

74. Thus, Dr. Leamer's Figures 6 and 7 reflect the normal operation of labor markets and do not support his claim that "price discovery" was impaired by the alleged conduct or that the alleged conduct prevented compensation from reaching "equilibrium."

3. Data do not Support Dr. Leamer's Claim that the Timing of the "Non-Compete" Agreements Prevented Increased Compensation to Members of the Proposed Class that Otherwise Would Have Accompanied Economic Expansion

75. [redacted] He claims that this "expansion" period began in 2004, and that subsequently members of the proposed class received less equity compensation than would be expected absent the challenged agreements [redacted] Dr. Leamer appears to view the timing of the challenged agreements as evidence that the Defendants' incentive to reduce information flows (equivalently, that the cost to them of informed employees) increased when their profits increased, so their incentive to enter into information-restricting DNCC agreements also increased at that time.

[redacted]

[90] Leamer Report ¶94.

[redacted]

76. [redacted] Exhibit 10 also shows that, for other Defendants as well, there is no evidence that the percentage of revenue accounted for by employee compensation declined during the conduct period, or that there was any change in trend consistent with Dr. Leamer's unfounded allegation about the Defendants' motivation or the challenged conduct's effects.

77. [redacted] But implying a causal connection between the decline in equity compensation and timing of the challenged conduct makes no sense for at least two reasons. First, many of the equity grants *received* in 2005 were made before the challenged agreements went into effect, so the decline in equity compensation in 2005 cannot result from the challenged

92 [redacted]

conduct.[94] Second, only the 90th percentile shows the effect that Dr. Leamer claims is evident – the mean and median lines for equity compensation as a percentage of compensation had declined from 2001-2003, but were virtually flat from 2003-2008 before rising in 2009 and then declining after the conduct period was over (according to Dr. Leamer's argument) in 2010.[95] In addition, the decline in equity values in earlier years may have made options and stock grants less attractive to employees than other, more certain, forms of compensation.[96]

C. [redacted] Does Not Support Plaintiffs' and Dr. Leamer's Claim of Class-Wide Evidence

78. [redacted]

[94] Moreover, any impact of the challenged conduct would not be immediate. Employees would not suddenly forget any information on outside opportunities they had accumulated prior to the implementation of the challenged DNCC agreements.

[95] In addition, he dates the "Alleged Collusive Agreements" to "Before 2000" in his Figure 1 (*See* Leamer Report ¶21), yet here he claims that the conduct began in 2005.

[96] [redacted] *See* Part V.C below. I discuss the flaws in Dr. Leamer's analysis of the [redacted] adjustment later in my report.

[97] Leamer Report, Section IV.B.1.

[98] Leamer Report at 107, 110.

[99] Leamer Report at 110.

[100] *See* Frank Wagner Declaration.

[redacted]

[redacted]

D. **Economic Theory and Empirical Evidence Refute Dr. Leamer's Claim that Defendants have "Rigid Compensation Structures"**

80. The second essential element of Dr. Leamer's analysis in support of Plaintiffs' class certification motion is evidence that, he claims, demonstrates "that the artificial suppression of employee compensation would have been widespread, *extending to all or nearly all members of the All-Employee Class*."[102] To supplement evidence (which I discussed above) that he claimed showed the link between the challenged agreements and suppressed compensation generally, he offers three additional types of analysis that he says support his claim of wide-spread impact on class members:

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[101] *See*, for example, a November 2007 online article "Facebook Stealing Googlers At An Alarming Rate" (http://techcrunch.com/2007/11/21/facebook-stealing-googlers-at-an-alarming-rate/), a May 2008 online article "Google Finds That Perks Can't Keep Some Employees From Leaving" (http://www.dailytech.com/Google+Finds+That+Perks+Cant+Keep+Some+Employees+From+Leaving/article11794.htm "President of global communications and public affairs Elliot Schrage jumped ship to work at Facebook this last week. Just two months prior Sheryl Sandberg had left to become the number two executive at Facebook."), and a May 2009 Wall Street Journal online article "Google Searches for Staffing Answers" (http://online.wsj.com/article/SB124269038041932531.html "Concerns about a talent exodus have revived in recent weeks amid the departures of top executives, including advertising sales boss Tim Armstrong and display-advertising chief David Rosenblatt. Meanwhile, midlevel employees like lead designer Doug Bowman, engineering director Steve Horowitz and search-quality chief Santosh Jayaram continue to decamp to hot start-ups like Facebook Inc. and Twitter Inc.")

[102] Leamer Report ¶101 (emphasis added).

- Economic theory "implicating firm incentives to maintain worker loyalty by adhering to principles of internal equity through a rigid salary structure;"[103]
- Defendants' internal documents that, he says, reflect adherence to internal equity principles and the impact of the challenged agreements on compensation;[104]
- Multiple regression analysis.

As I now explain, both economic theory and empirical evidence are inconsistent with Dr. Leamer's claim that common evidence demonstrates a widespread impact on compensation of members of the proposed class though a rigid compensation structure.

1. Economic Theory Does not Support a Rigid Salary Structure

81. According to Dr. Leamer, firms have incentives to maintain worker loyalty by maintaining a "somewhat rigid" salary structure to assure internal equity. However, he does not discuss the strength of this incentive relative to other compensation goals,[105] or circumstances in which a rigid salary structure promotes greater worker loyalty than would a more flexible compensation structure that emphasizes and rewards individual contributions. There is considerable difference between unionized workforces that employ seniority and other "objective" characteristics of workers in setting compensation, on the one hand, and the compensation systems of the Defendants that rely on individual performance and other individual characteristics to determine compensation and compensation changes.[106] Based on my interviews with compensation managers at each Defendant and my review of declarations

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[103] Leamer Report ¶101.

[104] [redacted]

[105] For example, in their work, Terpstra and Honoree (2003) find that procedural equity is more important than internal equity to the university faculty in their sample.

[106] Freeman, Richard B. and James L. Medoff. What Do Unions Do? New York: Basic Books, 1984. p. 135. Hirsch, Barry T. "Sluggish Institutions in a Dynamic World: Can Unions and Industrial Competition Coexist?," Journal of Economic Perspectives, vol. 22(1), Winter 2008. pp. 153-176.

filed in this matter, I conclude that there is substantial flexibility delegated to individual managers to determine employees' annual and periodic compensation adjustments, with individual merit (and relative ranking), and not just "internal equity," important in explaining compensation adjustments. [redacted] Moreover, Defendants differ in their compensation philosophies; for example, [redacted] This implies that any impact working through a somewhat rigid wage structure would require employer-specific analyses that Dr. Leamer does not conduct.

82. According to Dr. Leamer, "a secure long-term relationship can come either from commitment (emotional or financial) to the mission of the organization, or from jointly owned firm-specific assets."[109] He cites a speech by economist Gary Becker to support this argument,[110] but in that speech Professor Becker discusses commitment only in the context of the family, and not in the very different context of long-term employment relationships. In any event, Dr. Leamer does not provide evidence that commitment to "the mission of an organization" results from internal equity.

83. Dr. Leamer also asserts that "equitable" compensation practices spread wage increases or reductions across broad categories of workers, but he makes no attempt to establish the

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[redacted]

[redacted]

[109] Leamer Report ¶102.

[110] Leamer Report Footnote 123, referring to Gary Becker, "Nobel Lecture: The Economic Way of Looking at Behavior," 101 Journal of Political Economy 385 (June 1993).

importance of this effect, or even that it is present in this context. He cites an article by Alexandre Mas[111] to support his argument, but Mas does not consider changes in the dispersion of wages within an employer. Rather, he examines the effect on police union members' job performance of *across-the-board* wage cuts, a very different labor market and different event than the one at issue here. Dr. Leamer also cites an article by Albert Rees, "who describes the role of demand and the impact of market forces on salary structures of university faculty,"[112] but this article simply emphasizes the uncertainty inherent in how higher compensation received by a new or incumbent employee translates (if at all) into compensation adjustments for other employees to preserve "fairness," which does not support Dr. Leamer's claims.

84. Finally, Dr. Leamer ignores the fact that, if new hires transmit the information that results in adjustments to compensation of incumbent employees to maintain internal equity, there was no reduction in this source of information and thus no decline in any (hypothesized) pressures to adjust compensation to maintain internal equity. Plaintiffs do not claim that employment or hiring was reduced by the challenged agreements, but simply that Defendants agreed not to cold call employees of certain other Defendants for certain periods of time, resulting (according to their theory) in less employee movement between Defendants with DNCC agreements than would have occurred if those challenged agreements were not in place. However, if Apple did not cold call employees at Adobe, but instead cold called or otherwise recruited new hires from Microsoft, Yahoo! or any of the hundreds of other companies from which it obtained employees, then the same information was transmitted to Apple, and the same adjustments to maintain "internal equity" would have had to be made. [redacted]

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[111] Leamer Report Footnote 126, referring to Alexandre Mas, "Pay, Reference Points, and Police Performance," 121 Quarterly Journal of Economics 783 (2006).

[112] Leamer Report Footnote 126. *See*, Albert Rees, "The Role of Fairness in Wage Determination," 11 Journal of Labor Economics 243 (1993).

[113] [redacted]

[redacted]

2. **Compensation Adjustment Practices at Several Defendants Necessitate that in Some Circumstances Increased Compensation of Some Employees Results in Reduced Compensation of Others**

85. Based on my review of the compensation structure and practices of Defendants, I find no evidence of a rigid compensation system that would link together compensation changes within a Defendant, let alone at all Defendants. [redacted] Nothing in the compensation adjustment procedures causes salaries of everyone in a particular position to increase if a new employee is offered a higher salary than others receive; and nothing in the compensation adjustment procedures provides that an employee's coworkers receive a salary increase if the employer increases one employee's compensation in response to an outside offer. Further, the Defendants' compensation practices would not prevent them from promoting a worker and changing his job classifications in response to external information that demonstrated the individual's unique talents.

86. The common practice used by Defendants to make annual compensation adjustments is to use input from the third-party benchmark studies, such as Radford, as an important part of the

114 [redacted]

information considered in setting an overall budget for salary increases for the companies' employees. [redacted]

87. Given this system, a manager would have only limited ability to increase the compensation for a group of employees when one of those employees received a cold call.[116] Assume a manager at one Defendant learns that one of his engineers received a cold call from another Defendant, and that the engineer received a job offer with a 20 percent salary increase. Assume that the manager wants to match that salary increase, both for the individual who received the job offer and for other engineers with similar skills and responsibilities. This is an implication of Dr. Leamer's claim that cold calls provide information not only that the individual receiving a job offer is "undercompensated," but that "market" compensation generally is too low. If the manager's salary increase budget that year is five percent, he manages 25 employees, and he wants to give five of his employees a 20 percent "market adjustment," then his other 20 employees will receive much smaller increases than five percent (the exact amount depends on the salary distribution among those 20 employees). Thus, the budgeting process that drives compensation changes at Defendants essentially creates a system where granting above average salary increases to some employees may require that other employees receive below average increases, rather than the above average increases implied by Dr. Leamer's theory.

88. [redacted]

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[115] [redacted]

[116] Based on my discussion with compensation managers at the Defendants and my review of Declarations filed in this matter, I understand that Defendants infrequently counter outside offers because they consider an employee's willingness to pursue outside opportunities as evidence that the employee is disaffected for other reasons, and would remain so even if he received an increase in pay.

[redacted] The information each Defendant receives from Radford and similar firms is derived from data on salaries paid in a marketplace much broader than the Defendant firms and that information is specific to types of jobs at the Defendant, which then are matched with the same positions at the firms against which the Defendant benchmark employee compensation. An individual employee might be able to obtain a raise by threatening to move to another Defendant, but his ability to do so will not provide a basis on which the Defendant would decide to ignore market intelligence in favor of increasing salaries throughout the company. Due to the fixed budgeting process, it may even lead to smaller compensation increases for other employees, at least in the short run.

3. Dr. Leamer's Analysis Wrongly Assumes that if Individuals' Compensation is Affected by *Some Common Factors* then *Only Common Factors* Potentially Affect Compensation

89. Dr. Leamer claims that changes in compensation of a small number of employees (those who would have received a cold call from another Defendant but-for the challenged conduct) would have class-wide impact – that "Cold-Calling and related practices would be expected to increase compensation across the board rather than be narrowly focused on the skills that are most in demand at any point in time."[118] To support this claim, he provides an empirical "common factors" analysis to show that compensation paid by Defendants to individual employees can be explained in part by common factors, such as experience, job title, and education. However, his analysis does not demonstrate that changes in compensation of a subset of (let alone a small number of) individuals because they received a cold call would affect compensation class-wide. His analysis cannot distinguish the impact he hypothesizes from an alternative hypothesis that the level of compensation of Defendant's employees is broadly

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[117] [redacted]

[118] Leamer Report ¶120.

determined by competition in a vast labor market for similar employees and that adjustments for unique circumstances of particular employees are highly individualized.

90. Dr. Leamer's claim to be able to demonstrate that generally "the compensation of class members tended to move together over time"[119] is neither surprising nor informative about his claim of class-wide impact. Such movement is the hallmark of a competitive marketplace. As I explained above, the labor market in which Defendants compete for employees and in which members of the proposed class seek employment is broad and characterized by rapid and extensive flow of information through a variety of channels and high employee mobility. Thus, it is not surprising that "common" factors explain much of the variation in average compensation across employers and jobs. An employer who offered compensation that is not competitive with the market would have difficulty attracting and keeping good employees. At the same time, compensation varies across employees because each possesses unique characteristics that makes that individual more or less attractive to any given employer. Dr. Leamer never even examines pay variation within these job categories. [redacted].[120,121]

91. Dr. Leamer claims that "Defendants had highly structured compensation systems built on a two dimensional matrix with several grades and many titles,"[122] and that "high level management established ranges of salaries for grades and titles which left relatively little scope for individual variation."[123] He provides a regression analysis that he claims shows that "about

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[119] Leamer Report ¶130.

[120] The degree of variation with job categories will understate the ability of employers to differentiate pay across individuals, since it ignores the ability of employers to move individuals across job categories in response to "cold calls" or other events.

[121] [redacted]

[redacted]

[redacted]

90 percent of the variability in a class member's compensation can be explained" in each year by age, tenure, gender, location, job title, and employer.[124] [redacted] The statistic on which he bases this conclusion is the "R-squared," a statistic that measures the fraction of the variance in the dependent variable that is explained by the independent variables and that lies between zero (no explanatory power) and one (perfect explanatory power). As used by Dr. Leamer, an R-squared of 0.9 or so means that the regression equation has a good "fit" and the independent variables (an individual's job title (which is employer specific), age, tenure, gender and location) do a good job of explaining the person's compensation.

92. Exhibit 12 compares R-squareds reported in Dr. Leamer's Figures 11 and 13 with the values when only the employer-specific job title variables are included, but not the employee-specific factors of age, tenure, gender and location. The exhibit shows that the "fit" of the regression is almost the same with or without the employee-specific variables. Dr. Leamer has not demonstrated, as he claims, that he has "controlled" for important employee-specific factors that even he would acknowledge affect an employee's compensation, but only that variation in compensation among employees is largely explained by employer-specific job titles, because employees with different employer-specific job titles have different levels of average compensation and there is wide variation in average pay across job categories.[126] However, the fact that job titles explain a large fraction of the firm-wide variation in compensation does not mean that there is not substantial variation in compensation within job titles in addition to the

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[124] Regression analysis is a statistical tool to measure the impact on a "dependent" variable (here, a class member's annual compensation) of changes in one or more "independent" or "control" variables (here, age, tenure, etc.), identifying the impact of the independent variables on the dependent variables by using data for many different individuals with different characteristics and/or different time periods with different values for the variables. For example, regression analysis can be used to understand the relationship between the amount of rainfall, sunshine and fertilizer (the independent variables) and crop yields (the dependent variables).

[redacted]

[126] The wide variation in pay across job categories is a consequence of the broad definitions of the Plaintiffs' proposed classes. Hence, Dr. Leamer's finding of a high R-squared to a large extent reflects the heterogeneity of the Plaintiffs' class rather than any homogeneity.

variation across titles. In fact, the data used in Dr. Leamer's regression analysis show exactly the opposite.

93. A simple test of the ability of Dr. Leamer's regressions to explain compensation of individual employees is shown in Exhibits 13A and 13B. I use regression estimates from his Figures 12 and 14 to predict the compensation that would have been earned by each named Plaintiff in each year that he was employed by one of the Defendants. Two conclusions can be drawn from this table. First, for the most part, the named Plaintiffs were *overcompensated* relative to their predicted compensation based on Dr. Leamer's models [redacted] Second, there is considerable variation across years and individuals in the difference between their predicted and actual compensation, which is inconsistent with a rigid compensation system.

94. [redacted]

[127] Exhibit 14B shows the distribution of differences based on Dr. Leamer's Figure 14.

[redacted].[129] Therefore, contrary to Dr. Leamer's claims of a relatively rigid compensation structure, his regression model demonstrates that there is substantial variation in compensation earned by employees who have the identical values of the characteristics (including being in one of over 4,000 specific job titles in a typical year) included in Dr. Leamer's regression model.[130] This evidence shows that the Defendants did not have the type of formulaic compensation structure that would support Plaintiffs' claim that there would be class-wide impact from the challenged conduct.[131]

95. Even within a given job title, there is large variation in the amount of compensation unexplained by Dr. Leamer's regression model. Exhibits 15A and 15B show the distribution (based on Dr. Leamer's Figure 12 regression model) of the differences between the actual compensation and the compensation that Dr. Leamer's regression model predicts for the top ten Apple and Google jobs.[132] [redacted]

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[128] The regression "fits" Intel data better simply because observations from Intel's employees constitute such a large portion (about 60 percent) of the regression data.

[129] This, of course, ignores the firm's ability to differentiate compensation across employees by moving high-performing and otherwise potentially "undercompensated" employees into new jobs with higher average compensation.

[130] According Dr. Leamer's data, between 2005 and 2009, the proposed All-Salaried Employee Class includes over 100,000 employees in about 7,000 different job titles, and the proposed Technical Class includes over 60,000 employees in about 2,400 job titles.

[131] As I noted above, even these figures understate the flexibility that the Defendants had to differentiate compensation in response to external pressure, because they ignore Defendants' ability to move individuals across job titles.

[132] The distributions of the of differences in actual and predicted compensation for the other five defendants are shown in Appendices 7A through 7E.

[redacted]

96. Together, the evidence on compensation means that individualized analysis would be necessary to determine the extent to which any individual was under- or overcompensated (relative to the assumed rigid wage structure) because of the challenged conduct rather than because of other factors, and to avoid paying damages to members of the proposed class who were not harmed by (and indeed could have benefited from) the challenged agreements.

4. Dr. Leamer's Model Does not Demonstrate his Hypothesized Price Discovery Process Because it Cannot Explain Compensation Changes

97. In Section V.D of my report, I discuss in detail the regression analysis (which I refer to as his "conduct regression") that Dr. Leamer offers as evidence that the challenged conduct affected aggregate compensation of members of the proposed class and that he uses to estimate the amount of undercompensation and damages allegedly suffered by the Class. That analysis, and the conclusions that Dr. Leamer draws from it, are inconsistent with his claim that there is a rigid compensation structure that allows him to infer that the (assumed) loss of information and reduced price discovery, combined with Defendants' commitment to "internal equity," causes localized price discovery to affect all members of the proposed class in a common way. Using his conduct regression estimates, I simulate the change in compensation over time of otherwise identical individuals based on the empirical distribution of "unexplained" compensation in each year for each Defendant.[133] The result shows how dramatically compensation can diverge over

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[133] I perform the following experiment. Assume that there are two individuals who are comparable in all characteristics in 2004. I randomly draw residuals (or the unexplained portion of their compensation) for each person, so that the only difference in their 2005 compensation is the difference in their residuals. I do the same in subsequent years and thereby predict the difference in their compensation in each subsequent year taking into account the persistence effects from the prior two years (based on Dr. Leamer's model) and the new randomly drawn residuals. I performed the same experiment 50,000 times to obtain a distribution of resulting compensation for individuals who were identical in 2004. The resulting distributions show how compensation of otherwise similar people (identical in all characteristics that Dr. Leamer claims explain an individual's compensation) can diverge over time.

time for otherwise comparable individuals due to the portion of an individual's compensation that remains unexplained by Dr. Leamer's conduct regression each year, the effect of which cumulates over time.

98. Compare, for example, two employees who, as of 2004, are identical in every characteristic controlled for by Dr. Leamer in his conduct regression (age, gender, company tenure, and location as well as current (i.e., 2004) and prior (i.e., 2003) compensation). By 2006, Dr. Leamer's conduct model implies that these two employees would, on average, have salaries that differed by 24 percent. By 2009, the difference between the compensation of the two individuals would be around 37 percent.[134] Such results, shown in Exhibits 16 and 17, demonstrate that otherwise identical employees can rapidly end up with tremendously different compensation. Thus, Dr. Leamer's conduct regression model contradicts his claim of a rigid compensation schedule. His own model estimates imply that he has no basis to conclude that individual changes in compensation would translate to class-wide effects through his claimed "somewhat rigid" wage structure. Empirical evidence shows wide variation in both the levels and rates of growth of employee compensation, even within job categories. As such, Dr. Leamer's results provide no support for Plaintiffs' claims that the amount of harm to members of the proposed class could be determined on a class-wide basis.

5. Dr. Leamer's "Constant Attribute Compensation Ranking" Analysis is Misleading

99. Exhibits 18A and 18B show that Dr. Leamer's evidence of "relatively stable" compensation trends within and across job titles masks substantial variation. I have converted his Figures 15-17 into annual changes in compensation, and expanded the analysis to include the

[134] I excluded Lucasfilm and Pixar because of missing data for those two firms. Exhibit 16 shows the mean and the 90th percentile differences both by firm and overall. The 90th percentile figures indicate that ten percent of the pairs of employees would have compensation that differed by at least 56 percent after two years and by at least 86 percent after five years. Exhibit 17 shows the entire distribution of differences in each year from 2005 through 2010. In both exhibits, the numbers assume the two employees have the same job title in each year. If the two identically situated employees were promoted at different rates, then the compensation differences would likely be even larger.

top 25 job titles for each Defendant, rather than just the top 10 job titles for Apple and Google.[135] Dr. Leamer's claim that his Figures 15-17 imply that compensation increased in a "parallel" fashion across groups is highly misleading. The fact that the ordering of compensation across job titles is relatively "stable" over time does not imply that changes in compensation are in any way linked across job categories through concerns about internal equity or other forces. [redacted] Moreover, the maintenance of a roughly stable ordering does not even mean that changes in compensation are correlated, let alone causally related across groups.

100. Exhibits 18A and 18B examine the limited claim that changes in compensation are similar for the different job categories (which, even if true, would not be sufficient to establish a causal link of the form required by Dr. Leamer's theory). Changes in compensation are more relevant than compensation levels, because they more closely proxy Dr. Leamer's claims that changes in compensation for one group drive changes in compensation for others. If Dr. Leamer were correct that compensation across job titles was relatively stable, then one would expect that changes in average compensation for different job titles also would be similar in a given year. But Exhibits 18A and 18B show substantial variation across Defendants, and across job titles within Defendants, in "constant attribute compensation" changes, with large positive and negative changes in compensation across titles in a year and from year to year. The scale of his figures and the overall upward trend in compensation (which would be driven by market forces independent of any internal equity concerns) mask this variation.

6. One Cannot Conclude that Because Some Defendants had Policies and Even Formulas for Annual Compensation Adjustments that a Limited Number of Additional Cold Calls Would Move the Structure

101. Dr. Leamer's logic implies that a small number of "movers" hired at a compensation level that substantially exceeds that of current employees (e.g., 20 or 30 percent higher according to his Figure 7) ripples through the rigid compensation structures of Defendants to cause an

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[135] I show charts for the top 10 jobs in Appendices 8A and 8B.

[136] [redacted]

equivalent (or similar) increase in compensation of current employees. But, it is economically unreasonable to expect this to occur. A firm considering whether to offer employment to a candidate identified through a cold call who demands 25 percent greater compensation than earned by a "constant attribute" current employee would not make the hire if it required increasing compensation of *all* salaried employees by 25 percent (or even by a substantially lesser amount). In effect, hiring the cold-called employee would cost the firm not only 25 percent more than was earned by the person who previously performed the job, but higher compensation for *all* employees in the proposed class. An employer would be willing to offer a mover a substantial compensation increase (compared with current employees) only if any impact were limited to similar employees, or to only employees who directly gain information from the new hire, and not if it required a substantial increase in compensation of all employees.

102. One way in which an employer can respond when a valued employee receives an outside offer of higher compensation is by countering with a promotion to a position that provides higher total compensation. Because Dr. Leamer's regression focuses on compensation *within* a job title, it would not be able to identify this type of effect, which occurs even if the firm's wage structure is "rigid." To explain, assume a firm has only two job titles: a junior software engineer position that pays $75,000 and a senior software engineer position that pays $125,000, and a junior software engineer receives an outside offer (as the result of a cold call) with compensation of $110,000. The firm can respond by promoting the junior software engineer to senior software engineer with $125,000 in compensation, without causing a "ripple" effect on compensation of other junior software engineers. Using data such as this, Dr. Leamer's regression would show a perfectly rigid compensation structure (his R-squared would be 1), yet there is no ripple effect and the rigid structure reflected in the fixed relationship between compensation of junior and senior software engineers provides no information about whether the challenged conduct had any impact, let alone a class-wide impact.

E. Dr. Leamer's Econometric Model of "Undercompensation" Fails to Show Common Impact Because it is Flawed Both Conceptually and in its Implementation

103. The third issue addressed by Dr. Leamer is whether "standard econometric analysis" can be used to demonstrate that the challenged agreements "generally" suppressed the compensation of members of the proposed class. He first presents a simple analysis of the change in total

compensation for Defendants [redacted] He claims that this is "suggestive" evidence that there was undercompensation during the class period.

104. Dr. Leamer then performs a "conduct regression" to attempt to quantify the aggregate undercompensation from the alleged agreements. [redacted]

105. Thus, Dr. Leamer's conduct regression is not only offered to demonstrate that "standard forms of econometric analysis are capable of computing the aggregate amount of compensation suppression to the All-Employee Class and Technical Employee Class caused by the Non-Compete Agreements,"[138] [redacted] but also as empirical support for his "conceptual framework" of information reduction and price discovery for which he has no other independent empirical evidence. His conduct regression is the lynchpin in his chain of logic; it links the "possibility" that the challenged agreements reduced cold calling and information and thereby hampered "price discovery" to a measurable impact on compensation both on average for the proposed class and, through his claimed "somewhat rigid" compensation structure, to each (or almost each) member of the proposed class.

106. However, Dr. Leamer's conduct regression is also flawed in multiple ways. First, his implementation masks the fact that he has no evidence of common impact, but rather that the "undercompensation" effect he estimates is not common to all Defendants. When disaggregated

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[redacted]

[138] Leamer Report ¶135.

[redacted]

by Defendant, his own conduct regression model would show that some Defendants *overcompensated* their employees during the conduct period. Second, Dr. Leamer's statistical assumptions regarding his model are demonstrably false. In particular, his analysis assumes that compensation received by each of a Defendant's employees is determined independently, which is inconsistent with his claim of a "somewhat rigid" compensation structure. The lack of independence implies that his model estimates are highly imprecise, and are not reliable estimates or proof of class-wide impact. Third, Dr. Leamer's regression model is "fragile," and fails simple sensitivity tests. For these reasons, Dr. Leamer's conduct regression provides no support for Plaintiffs' claims that "class-wide methods and evidence are capable of showing that …suppression of compensation affected all or virtually all Class Members."[140]

1. Dr. Leamer's [redacted] Demonstrates No Common Impact

107. Before presenting his proposed "standard econometric analysis," Dr. Leamer provides in his Figure 19 "[a]n estimate of the effect of the Non-Compete Agreements on employee compensation [calculated by] contrasting compensation during the periods when the Agreements were in effect with compensation before and after the Non-Compete Agreements."[141] [redacted]

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[140] *Motion* p. 3.

[141] Leamer Report ¶136.

[redacted]

[144] Leamer Report ¶140.

[redacted]

108. [redacted] a fundamental problem with his regression analysis can be illustrated by an expanded version of his Figure 19 analysis. In Exhibit 19, I perform the same "before and after" comparisons as Dr. Leamer did in his Figure 19. The only change is that I perform the analysis for each Defendant individually rather than simply pooling them together. [redacted] Plaintiffs' claim of "common impact" implies, at a minimum, suppression of compensation at each individual Defendant that allegedly participated in the conspiracy.

109. However, as shown in Exhibit 19, Dr. Leamer's Figure 19 methodology masks substantial underlying differences in estimated "undercompensation" at each Defendant. Indeed, according to his methodology, [redacted] and Pixar's employees by more than 70 percent. This suggests that Dr. Leamer's Figure 19 shows an overall average result that *blends together opposite effects* at individual Defendants – he estimates an average negative effect only because two out of seven

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[145] Leamer Report ¶140.

[146] Dr. Leamer assumes that there would have been no change in compensation in 2008 and 2009 because of the weak economy.

[redacted]

Defendants show a negative impact, and one of the two Defendants (Intel) accounts for about 60 percent of the employees in the All-Salaried Employee Class.[149]

110. This "warm up" exercise (when disaggregated by company) should have raised a red flag for Dr. Leamer and caused him to consider whether his regression is capable of determining whether there is "common impact." The large magnitudes of the effects also should have given him pause about the ability of his methodology to identify the effects of the challenged conduct, rather than reflecting the impact of other factors that differ between the conduct and non-conduct periods.

2. Dr. Leamer's Common Impact across Defendants is Assumed, Not Demonstrated, in his Regression

111. [redacted] He constructs a regression model that attempts to explain total annual compensation of individual employees (his Figures 20 and 23).[151] Using this model, he calculates annual "undercompensation percentages" by Defendant and year (his Figures 22 and 24).

112. As suggested by his Figure 19 analysis, the approach underlying Dr. Leamer's regression analysis is fundamentally flawed because it *assumes* rather than establishes or demonstrates that the challenged conduct had common impact (lower compensation) at all Defendants (and for all or virtually all employees of the Defendants). Once disaggregated by Defendant, Dr. Leamer's regression analysis completely fails to demonstrate common impact and implies instead that the alleged impact is not common across Defendants.

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[149] *See* Dr. Leamer's Figure 3.

[150] [redacted].

[151] [redacted]

a. Summary of Dr. Leamer's Model of Compensation

113. Dr. Leamer's regression model uses real annual compensation of each employee in each year as the dependent variable, and includes the following independent variables:

- An indicator variable for when the challenged agreements were in effect (the "conduct variable"). This variable is essentially a dummy (or zero-one) variable that is turned "on" for a particular Defendant during the period when that Defendant allegedly participated in any of the challenged agreements.[152] Dr. Leamer also includes variables that represent the interaction[153] between the conduct variable and employee age (and age squared) and the hiring rate at a given Defendant;[154]
- "Persistence" (or lagged compensation) effects, which he claims reflect "how the effects linger over time;"
- Employee characteristics, industry characteristics, a time trend, and employer indicator variables. He includes these to control for "normal" variation in compensation across employees, within the industry over time, and across Defendants.[155]

114. Dr. Leamer's claims that his conduct variable alone and interacted with age and hiring rate together identify the immediate undercompensation caused by the challenged agreements. He uses the coefficient estimates on these variables (along with average employee age and hiring rate at a given company) to calculate "initial" annual undercompensation by company. Since his persistence variables purport to measure the extent to which undercompensation in one year remains in subsequent years, Dr. Leamer then combines his initial undercompensation estimates

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[152] Because 2005 and 2009 were not full "conduct" years, he assigns a value of 0.5 and 0.25 to the conduct variable in those two years, respectively.

[153] In a regression model, an "interaction" of two explanatory variables measures the multiplicative, or "joint" effect of the two variables on the independent variable.

[154] The hiring-rate variable is measured as the log of the ratio of new hires to the number of employees at the firm in the previous year.

[155] Leamer Report ¶ 142.

and the persistence effects to calculate total annual undercompensation by company (his Figures 22 and 24).[156]

115. At his deposition, Dr. Leamer acknowledged that the conduct variable in his model measures the *average* impact of the conduct across all Defendants, but claimed that the regression allowed for Defendant-specific measurement of the impact because he interacted his conduct variable with variables measuring the age of employees and hiring rate at each Defendant. Thus, he claims that, to the extent that employees at one Defendant are younger or their employer has a slower hiring rate than at another Defendant, the aggregate impact of alleged conduct will differ at the two Defendants. However, it is important to note that any commonality of the effect across firms is still assumed rather than demonstrated by his model, since his model forces the impact to be the same for two individuals of the same age as long as the hire rate is the same, even if those individuals are employed by different Defendants. He makes no provision for a Defendant's unique characteristics to affect the potential impact of the challenged conduct, even though his theory says that he should.

b. Once Disaggregated, Dr. Leamer's Regression Does Not Show "Undercompensation" for All Defendants

116. Given the nature of Plaintiffs' allegations, the question whether the impact of the challenged conduct was common across Defendants is critical to understanding whether there is class-wide impact and whether the impact can be measured on a class-wide basis. Thus, I have used the regression framework offered by Dr. Leamer to address this question. [redacted]

[156] Figure 22 presents his results for the all-salaried employee class while Figure 24 presents his results for the technical employee class. I will focus my analysis on his results for that putative class (his exhibits Figures 20 and 22). The central conclusions are the same for the technical employee class though some of the individual results differ.

[157] [redacted]

[redacted] Therefore, in order to test whether the effect of the challenged conduct was similar across Defendants, I use a version of his regression that includes separate conduct variables for each Defendant (and also includes separate Defendant-specific interactions with age and hiring rate). By nature of the regression analysis, Dr. Leamer's estimate of the aggregate conduct effect reflects a combination of these disaggregated Defendant-specific estimates.

117. In Exhibit 20, I show results from the disaggregated model and compare them with Dr. Leamer's Figures 22 and 24 results.[159] In stark contrast to Dr. Leamer's "undercompensation" estimates (negative percentages) for all Defendants in every year between 2005 and 2009, the disaggregated analysis does not suggest common impact from the alleged conduct. In fact, for both the All-Salaried Employee Class and Technical Class, two Defendants (Lucasfilm and Pixar) show no "undercompensation" but instead "overcompensation" estimates (positive percentages) throughout the period. [redacted] Thus, once disaggregated by Defendant, results from the conduct regression not only differ substantially from Dr. Leamer's reported "undercompensation" results in both magnitude and the *sign* of the estimated impact, but also vary greatly across companies and over time.[160]

[158] Dr. Leamer's conduct regression includes many variables that only vary by year (for example, change in IT sector employment in San Jose) or by company by year (for example, the new hire ratio variable). As a result, the model becomes "overspecified" when estimated using annual data from a single company for the nine-year period (2003-2011) over which the regression is estimated.

[159] Detailed regression outputs from the disaggregated model are provided in Appendices 9A and 9B. In order to estimate a Pixar-specific conduct effect, I have included in my regression Pixar's revenue data after 2005 which were unavailable to Dr. Leamer. *See* "Pixar revenues 2005 - 2011.xlsx". Pixar was acquired by Disney in 2006. As a result its 2006 revenue was reported for only nine months. I annualized the 2006 number by multiplying the reported number by 12/9.

[160] Results of disaggregating by Defendant can also be illustrated using a simplified version of Dr. Leamer's regression. In Appendices 10A to 10C, I provide regression details and "undercompensation" estimates from an "aggregated" regression specification that includes a single conduct variable, and excludes interactions

118. Dr. Leamer should not be surprised by the finding of "uncommon" impact across Defendants if, as he believes, the challenged agreements had an actual impact (and was not just spurious or unrelated to those agreements). [redacted]

119. [redacted]

between conduct and age and hiring rate. Comparison with Dr. Leamer's Figures 22 and 24 shows that the results are very similar for the All-Salaried Employee Class. While the results differ somewhat from Dr. Leamer's for the Technical Class, the simplified version still shows "undercompensation" for all Defendants throughout the period. This suggests that results using the simplified specification will be informative as to the impact of disaggregation. In Appendices 11A to 11C, I provide regression details and "undercompensation" estimates from the simplified model, except that I now disaggregate the model by interacting company indicators with the single conduct variable (so now there are seven Defendant-specific conduct variables). As shown in Appendix 11C, there is large variation in the size and even the *sign* of the estimated effects. Three of the seven Defendants (Pixar, Lucasfilm, and Adobe) had no undercompensation, but rather the estimated impact of the challenged agreements was to *increase* compensation. [redacted]

[redacted]

120. Thus, Dr. Leamer's own regression specification and statistical methods (which I critique further below) show substantial variation across Defendants in the estimated impact, with some employees "overcompensated" as the result of the challenged conduct.[164]

3. The Statistical Framework Underlying Dr. Leamer's Analysis is Improper

121. In his Figures 20 and 22, Dr. Leamer reports standard errors and t-values to test the statistical significance of his estimated coefficients (and thus to test his hypothesis that the conduct reduced employee compensation). In calculating these values, Dr. Leamer assumes that the compensation of each individual employee is independent of those of other employees. However, the estimated impact of the challenged agreements on compensation are highly "statistically significant" only because Dr. Leamer ignores a critical and obvious feature of his data – that his observations are correlated, not independent, especially under his own theory of how an individual's compensation is determined. This is a major error in statistical inference.

122. All else equal, a regression model provides more statistically reliable estimates the larger the amount of data with which the coefficients are estimated. However, if the data, although voluminous, largely reflect a common impact, then the number of individual observations (in this case, the number of employee-years for the Defendants) is a highly misleading measure of the ability to evaluate statistically whether the regression is identifying an underlying relationship

[164] Even the disaggregation by Defendant is insufficient to capture variation in the impact of the challenged agreements (if there were any impact), because that effect would differ by job type. Analyses disaggregated across Defendants are informative only under the (unsubstantiated and wrong) assumption of a rigid compensation system that imposes formulaic adjustments across all types of jobs, locations, etc. within a firm, an assumption that is not consistent with the evidence.

between the variables. This problem is widely recognized in the econometrics literature generally and the labor empirical labor economics literature in particular.[165,166]

123. Dr. Leamer's regression suffers from a severe version of this problem. Dr. Leamer's sample contains over 500,000 individual observations, but fewer than 60 unique combinations of employer and year (and thus effectively fewer than 60 observations from which to estimate his conduct variable).[167] This means that Dr. Leamer has almost 10,000 observations per group (per employer-year), so his statistical analysis greatly overstates the effective sample size and the resulting precision of his estimates.

124. Dr. Leamer treats each Defendant's employees as if he or she provides completely independent information about the underlying structure by which compensation is determined at an employer. But the supposed rigid compensation structure (and thus lack of independence) is a critical feature of the economic framework on which he relies for his conclusion that the challenged agreements to reduce cold calling reduced price discovery, which rippled through the compensation of all members of the proposed class because of the Defendants' rigid compensation system. He failed to take into account when performing his statistical test that, aside from the challenged agreements, employees at a firm are affected by common factors that influence their compensation – e.g., a highly successful movie at Pixar can result in large and unusual bonuses for all Pixar employees, or a short-term reduction in the demand for PCs and the

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[165] This problem is well known in the econometric literature. In their econometrics textbook, Russell Davidson and James MacKinnon describe the potential error of ignoring the correlation between across observations within a given dataset: "If it is thought that the within group correlation ρ is small, it may be tempting to ignore it and use OLS estimation, with the usual OLS covariance matrix. This can be a serious mistake unless ρ is actually zero, since the OLS standard errors can be drastic underestimates even with small values of ρ … The problem is particularly severe when the number of observations per group is large…. The correlation of the error terms within groups means that the effective sample size is much smaller than the actual sample size when there are many observations per group" Davidson, Russell and James G. MacKinnon. *Econometric Theory and Methods*. Oxford University Press, Inc. 2004, p. 305.

[166] Greene, William H. Econometric Analysis: 6th Edition, Chapter 9.3.3 New Jersey: Pearson Prentice Hall, 2008. Angrist, Joshua D. and Jörn-Steffen Pischke. Mostly Harmless Econometrics, Chapter 8.2. New Jersey: Princeton University Press, 2009.

[167] Dr. Leamer's conduct regression includes data for seven companies over nine years (2003-2011). However because he lacks revenue data for Lucasfilm and Pixar for some years, his regression includes only 55 employer-years.

microprocessors that power them can cause a decline in Intel's revenue and profitability and lead Intel to impose a wage freeze such as occurred in 2009.

125. Dr. Leamer's independence assumption is inconsistent with his claims of a rigid compensation structure and with Plaintiffs' claim that compensation of all members of the proposed class would move together. According to Plaintiffs and Dr. Leamer, a "shock" such as an increase in information about compensation obtained through cold calling would affect compensation generally, and the impact would not be limited to only the employee who receives the cold call. Statistically, this means that compensation of individual employees – within a Defendant and within a year – are related or correlated in a way that must be accounted for in making statistical inferences. Put differently, although Dr. Leamer's regression estimates are based on over 500,000 individual observations on employee compensation, the information that is informing his estimates is much more limited, and any statistical inference from the regression estimates must take this into account.

126. A generally accepted method to take into account the fact that observations used to estimate a regression contains "groups" of observations that are affected by certain common factors (such as those affecting a particular company or present in a single year) is commonly referred to as "clustering" the standard errors. Dr. Leamer not only failed to implement this (or any other) methodology to address the underlying nature of his data, but he did not even acknowledge in his report that his reported standard errors and resulting t-statistics (used for testing whether the estimated impacts of variables hypothesized to affect compensation were statistically significant, and unlikely to result from chance) were not meaningful. It is as if Dr. Leamer had estimated a regression to explain the price of milk per ounce by state using data on the price per ounce of pints, quarts, half gallons and gallons sold at grocery stores in each state and treating the various package sizes at a store as if they provided completely independent information. A proper analysis would have to recognize that a store that sells high priced gallons likely sells high priced pints as well, and if the price of gallons rises at that store (say, because it is far from the dairy and there is a spike in the cost of gasoline needed to deliver the milk to the store), then the price of all package sizes will increase. The "power" of the regression to identify the impact of gasoline price, distance from a dairy, store quality, etc. is not enhanced by

including individual observations on prices of four different package sizes at a particular store, because all reflect the same underlying information.

127. [redacted]

128. "Clustering" standard errors is commonly used in studies of labor markets and widely accepted as necessary in analyses such as this.[170] In Exhibits 21A and 21B, I show coefficient estimates and other details from Dr. Leamer's Figure 20 and 23 regressions, except that the standard errors are now clustered on employer-year. The conduct variable (line 4 in the table) is not statistically significant under these proper standard errors. In Exhibits 22A and 22B, I further show t-statistics and p-values (which are used to determine statistical significance) calculated for Dr. Leamer's "undercompensation" estimates in his Figures 22 and 24.[171] This exhibit shows that *none* of Dr. Leamer's "undercompensation" estimates for any employer or year is statistically significant at conventional levels under the properly computed standard errors. The p-values imply that Dr. Leamer's estimates are completely consistent with there being no true effect of the desired conduct and his estimates resulting entirely from random factors unrelated to that conduct. Thus, once properly analyzed, Dr. Leamer's conduct regression provides no meaningful evidence that the challenged agreements reduced compensation of members of the proposed class.

[redacted]

[170] Angrist, Joshua D. and Jörn-Steffen Pischke. Mostly Harmless Econometrics, Chapter 8.2. New Jersey: Princeton University Press, 2009 pp. 308-315 and Greene, William H. Econometric Analysis: 6th Edition, Chapter 9.3.3 New Jersey: Pearson Prentice Hall, 2008, p. 188.

[171] Standard errors for the annual "undercompensation" estimates are calculated using a bootstrap method..

4. Dr. Leamer Does not Report any Sensitivity Tests from which to Evaluate Whether his Results are Robust or Fragile

129. Dr. Leamer wrote many years ago that "[t]he econometric art as it is practiced at the computer terminal involves fitting many, perhaps thousands, of statistical models. One or several that the researcher finds pleasing are selected for reporting purposes." As a consequence, he wrote, "[i]t is . . much more efficient for individual researchers to perform their own sensitivity analyses, and we ought to be demanding much more complete and more honest reporting of the fragility of claimed inferences."[172]

130. [redacted]

[redacted]

[172] Edward E. Leamer, "Let's Take the Con Out of Econometrics," 73 *The American Economic Review* 1 (1983).

[redacted]

131. [redacted]

132. The results I provided above – allowing the impact of the conduct to differ across Defendants – clearly show the fragility of the single regression specification that Dr. Leamer reported. Another common way of testing the robustness of a regression specification, and of the conclusions that can be drawn, is to verify that the results are robust to changes in the time period for which the regression is estimated. Dr. Leamer bases his conclusion that the challenged agreements reduced compensation on a regression that compares compensation during the class period (essentially 2005-2009) to the combined periods before (effectively, 2003 and 2004) and after (2010 and 2011). An alternative specification to test robustness is to use only the before period, or only the after period, as the "control" or benchmark period in the regression and test whether the challenged agreements affected compensation of members of the proposed class.

133. Exhibit 23 shows that Dr. Leamer's model fails a test of whether it is robust to differences in the estimation period.[179] Using only the pre-period as the benchmark, Dr. Leamer's conduct regression implies generally substantial, but very different, estimated undercompensation percentages than reported in his Figures 22 and 24 – almost twice as large

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[redacted]

[179] Detailed regression outputs are provided in Appendices12A to 12D.

for several Defendants but substantially lower for Intel. Using only the post-period as the benchmark, Dr. Leamer's conduct regression implies virtually no undercompensation, but instead overcompensation of roughly the same magnitude (though opposite in sign) from the effects he reports in Figures 22 and 24.

134. Another sensitivity test of Dr. Leamer's model is to first estimate his conduct regression using data outside his conduct periods, and then use the coefficient estimates to predict compensation during the conduct period. If Dr. Leamer's model is robust, one would expect the predicted compensation to be generally higher than actual compensation during the conduct period. However, as Exhibit 24 shows, the predicted compensation levels are in fact lower than actual compensation (and therefore implying "overcompensation") at two Defendants in all years, and five Defendants in at least some of the years.[180] Dr. Leamer's model again fails the sensitivity test.

5. Dr. Leamer's Regression Model Does Not Explain Changes in Compensation Over Time

135. The analysis presented above showed that the statistical conclusions that can be drawn from Dr. Leamer's regression model are fundamentally different once we account for the correlated nature of his data. That correlation implies that there are important factors that drive firm-level compensation that are not accounted for in his model. Given that his methodology relies on comparison of the actual level of compensation to the level that his model would predict, obtaining a reliable prediction of compensation absent the challenged agreements is critical to estimating the impact (if any) of those agreements.

136. Exhibits 25A and 25B show that the factors that Dr. Leamer does not account for are quantitatively important. I plot the difference, by company and year, between the average compensation earned by a firm's employees and the average level of compensation predicted by Dr. Leamer's conduct regression (Figures 20 and 23). The exhibit shows that these prediction

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[180] Detailed regression outputs are provided in Appendices 13A and 13B.

errors are substantial [redacted] and are not evenly distributed across years and Defendants (as would be expected if the model were capturing virtually all the factors that explain an individual's compensation – one of which, according to Dr. Leamer, is whether the Defendant had a challenged agreement with another Defendant). Rather, the model predicts very poorly in some years for some companies, which means that important factors that are unique to compensation outcomes at different Defendant companies in different years have been left out of the regression. [redacted]

137. I performed a standard statistical test for whether there are important factors explaining firm-level compensation that are omitted from Dr. Leamer's regression model. This test essentially examines the average residuals from his regression by company and year (the variation in compensation not explained by his model) and asks whether those average residuals are too large to be explained solely by sampling error. The test resoundingly rejects the hypothesis that there are no such omitted firm-specific factors, and establishes the need to use "clustered" standard errors (or correct for that correlation in other ways).[182] Critically, the average residuals are economically, not just statistically, significant, which implies that, contrary to his claims, Dr. Leamer has not controlled for important factors that determine compensation at the Defendants over time.

138. A consequence of omitting important determinants of firm-level compensation is that Dr. Leamer's estimated conduct effects will capture the impact of variables (other than the

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[redacted]

[182] The test (F-test) results are F(39, 504771)=1319.6 for Dr. Leamer's Figure 20 regression, and F(39,292367)=832.09 for his Figure 23 regression. P-values for both tests are virtually zero.

challenged agreements) that differ systematically between the conduct and non-conduct periods. To illustrate the potential problem, I considered what would happen if I simply add a variable measuring the performance of the stock market from his regression, which potentially would measure general economic and financial performance in the economy that Dr. Leamer acknowledges likely affect compensation (see his Figure 8 and related discussion).[183] Exhibit 26 shows the results from adding the change in the S&P 500 index as an explanatory variable in his conduct regression.[184] [redacted] Thus, the existence of economically significant factors not captured by his model causes Dr. Leamer's Figure 20 and 23 regression estimates to be unreliable measures of damages and unreliable as a method of demonstrating common class-wide impact.

6. Dr. Leamer's Conduct Variable Cannot Capture the Impact of the Challenged Agreements

139. Dr. Leamer's conduct variable reflects challenged agreements between pairs of Defendants to avoid cold calling each other's employees for a period of time. Although Dr. Leamer refers to these throughout his report as "non-compete" agreements, I understand that Plaintiffs do not claim (in their Complaint or in their Motion for Class Certification) that these agreements prevented a Defendant from hiring applicants from another Defendant,[185] as long as that applicant was not identified or recruited through a cold call. Evidence I presented above

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[183] Leamer Report ¶98.

[184] Appendices 14A and 14B show detailed regression outputs. The coefficient estimate on the change in S&P 500 shows the expected positive sign, and is statistically significant under Dr. Leamer's assumption (independent observations).

[185] [redacted]

(and that underlies Dr. Leamer's analysis of compensation earned by "movers" in his Figure 7) demonstrates that, during the period of the challenged agreements, Defendants hired employees of other Defendants even when they had agreed not to cold call those employees, and that the amount of hiring from other Defendants did not decline during the conduct period as would have occurred if cold calling were an important way of recruiting from other Defendants (leading to hiring from other Defendants) and cold calling activity were eliminated or substantially reduced by the challenged agreements.

140. Dr. Leamer can identify and measure the impact of the challenged agreements only if the variable in his regression that represents the impact of those agreements properly represents the conduct that he is trying to evaluate. His conduct variable cannot do so for several reasons. First, evidence I reviewed (some of which Dr. Leamer cites to support his Figure 1) shows that cold-call restrictions typically were not limited to the other Defendant identified in Figure 1, but extended to other firms as well.[186] In part, this reflects the fact that the motivation for these agreements generally does not appear to be holding down compensation of (or "undercompensating") a firm's employees, but instead arose from concerns about conflicts-of-interest (potential or perceived) from membership on one company's Board of Directors of senior executives of another, commercial arrangements, or concerns about the impact of cold calling on the willingness of partners to collaborate.[187] If unchallenged DNCC agreements or unilateral policies involving a non-Defendant existed during the same period as the challenged agreements, but not during the non-conduct periods, then the effect estimated by Dr. Leamer would include the impact of those other policies, biasing his estimated effect upwards. If (as Dr. Leamer claims) DNCC agreements between firms lead to undercompensation, he can measure the impact of the challenged agreements only if he can separate their impacts from the corresponding impact of unchallenged policies.

[redacted]

141. The Consent Decrees that the Defendants signed with the U.S. Department of Justice made clear that restrictions on recruiting other companies' employees are legal under certain circumstances, including when they are "the function of a legitimate collaboration agreement, such as joint development, technology integration, joint ventures, joint projects (including teaming agreements), and the shared use of facilities."[188] The Consent Decrees state further that "[n]othing in Section IV shall prohibit a Defendant from unilaterally deciding to adopt a policy not to consider applications from employees of another person, or to solicit, cold call, recruit or hire employees of another person, provided that Defendants are prohibited from requesting that any other person adopt, enforce, or maintain such a policy, and are prohibited from pressuring any other person to adopt, enforce, or maintain such a policy."[189]

142. Under the Plaintiffs' theory of how compensation is determined, any less-restrictive and legal alternative to the challenged agreements (e.g., limiting cold calling and hiring prohibitions only to employees involved in actual collaborations) still would have affected opportunities and compensation of employees involved in those collaborations. Thus, the but-for world for purposes of measuring impact and loss has some employees affected (by legal restrictions) and others not, requiring an individual determination of which employees were involved in collaborations where restrictions on recruiting the other Defendant's employees would have been permissible as, on balance, procompetitive.[190] This requires individualized analysis to understand what collaborations existed during the class period, which employees were involved, the likelihood that there would have been legal restrictions on cold calling, etc.

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[188] *Final Judgment* in United States of America v. Adobe Systems Inc. et al, 3/17/2011, p. 6 and *[Proposed] Final Judgment* in United States of America v. Lucasfilm Ltd., 5/9/2011, p. 5.

[189] *Final Judgment* in United States of America v. Adobe Systems Inc. et al, 3/17/2011, p. 7 and *[Proposed] Final Judgment* in United States of America v. Lucasfilm Ltd., 5/9/2011, p. 6.

[190] Similarly, nothing prevents an employer from implementing a unilateral policy to avoid cold calling another Defendant's employees (for example, when a member of the Board of Directors is CEO of a competitor). If there were unilateral policies at Defendants during the Class period to not cold call employees of non-Defendants, then, under Dr. Leamer's theory, the price discovery process would have been affected in the same way it was affected by the challenged agreements, and the impact and loss from the challenged agreements would only be the incremental amount above that caused by legal agreements.

143. Second, Dr. Leamer's conduct variable cannot measure the intensity of restrictions on cold calling, but treats any agreement between pairs of Defendants as having the same impact as multiple agreements between a Defendant and other Defendants. [redacted] Dr. Leamer's price-discovery framework does not imply that the amount of information that is restricted is irrelevant to the process of price discovery. Rather, such models would show (where they apply) that more information results in better and more rapid price discovery than less information, and thus that multiple agreements should have a larger impact than a single agreement.

7. Estimated Persistence Effects are Inconsistent with Dr. Leamer's Price-Discovery Model and his Claim that Defendants had Rigid Compensation Structures

144. Dr. Leamer describes his persistence estimates as follows:

> The persistence variables are the levels of total compensation in the previous year and the year before that, two for each employer. The fact that these numbers sum to around 90 percent indicates very persistent effects, meaning when a worker gets a bump up in compensation in some year that makes him or her better off than comparable coworkers, that effect lingers on for many years.[191]

145. However, this finding is inconsistent with the price-discovery and internal equity frameworks on which he relies as the theoretical basis for why the challenged agreements and resulting reduced flow of information to employees would cause a significant and wide-spread impact on all or virtually all class members. Dr. Leamer claims that economic theory combined with Defendants' rigid compensation structures shows that new information on appropriate compensation levels gained by one Defendant's employees from cold calls from another Defendant affects all employees' compensation. If this were true, however, then there should be only a weak "persistence" between past compensation levels and current ones; a "mover" who is

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[191] Leamer Report ¶144.

induced to move to Defendant A from Defendant B by a cold call from Defendant A and receives a 30 percent increase in compensation should cause a change in all Defendant A's employees' compensation irrespective of those other employees' previous compensation. Yet, Dr. Leamer's regression rules out such an impact by demonstrating that an individual's compensation is determined in any year largely by his previous two-years' compensation, and that any increase in an individual's compensation relative to others in the firm generates a highly persistent increase in that individual's compensation.

146. Dr. Leamer's model and his estimates of damages imply that any effect of the reduced information flow persists strongly for an extended time, even after employees have obtained more information. Yet, he provides no reason why aggregate compensation of members of the proposed class would remain depressed so long after the information flow has been fully resumed. [redacted] The flow of information in Dr. Leamer's model is not just slow, it is glacial. [redacted]

8. Summary

147. Dr. Leamer's regression model of undercompensation and his derived estimates of annual undercompensation percentages by company and year are invalid. When necessary corrections are made to permit a test of his theory, there is no evidence of common impact from the challenged conduct, no evidence of average impact across members of the proposed class, and no basis for his estimates of undercompensation.

Kevin M. Murphy

Kevin M. Murphy

November 12, 2012

Exhibits 1A through 26 filed under seal

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1988 – 1989: Associate Professor of Business Economics and Industrial Relations, University of Chicago

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1983 – 1986: Lecturer, Booth School of Business, University of Chicago

1982 – 1983: Teaching Associate, Department of Economics, University of Chicago

1979 – 1981: Research Assistant, Unicon Research Corporation, Santa Monica, California

Honors and Awards

2008: John von Neumann Lecture Award, Rajk College, Corvinus University, Budapest

2007: Kenneth J. Arrow Award (with Robert H. Topel)

October 2005: Garfield Research Prize (with Robert H. Topel)

September 2005: MacArthur Foundation Fellow

1998: Elected to the American Academy of Arts & Sciences

1997: John Bates Clark Medalist

1993: Fellow of The Econometric Society

1989 – 1991: Sloan Foundation Fellowship, University of Chicago

1983 – 1984: Earhart Foundation Fellowship, University of Chicago

1981 – 1983: Fellowship, Friedman Fund, University of Chicago

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Publications

Books

Social Economics: Market Behavior in a Social Environment with Gary S. Becker, Cambridge, MA: Harvard University Press (2000).

Measuring the Gains from Medical Research: An Economic Approach edited volume with Robert H. Topel, Chicago: University of Chicago Press (2003).

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Appendix B &
1A through 14B
filed under seal