# EXHIBIT B

IN THE UNITED STATES BANKRUPTCY COURT
FOR THE DISTRICT OF DELAWARE

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| In re: | : | Chapter 11 |
| | : | Case No. 01-01139(JKF) |
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| W. R. GRACE & CO., et al., | : | (Jointly Administered) |
| | : | |
| Debtors. | : | |

**OFFICIAL COMMITTEE OF EQUITY SECURITY HOLDERS' MEMORANDUM IN SUPPORT OF DEBTORS' MOTION TO EXCLUDE CERTAIN EXPERT OPINIONS RELATING TO CURRENT AND FUTURE ASBESTOS PERSONAL INJURY LIABILITY**

The Official Committee of Equity Security Holders (the "Equity Committee") of W.R. Grace & Co. ("Grace") submits this memorandum in support of Grace's Motion to Exclude Expert Opinions in Connection with the Estimation of its Current and Future Asbestos Personal Injury Liability (the "Grace Motion").

**Preliminary Statement**

> **"*Daubert* explains that the language of Rule 702 requiring the expert to testify to *scientific knowledge* means that the expert's opinion must be based on the 'methods and procedures of science' rather than 'subjective belief or unsupported speculation.'"**[1]

The Equity Committee applauds and joins the Grace Motion in its entirety. Through the Grace Motion, Grace has for the first time brought logic and clear thinking to the historically muddled issue of estimating asbestos personal injury liabilities for purposes of bankruptcy reorganization. In particular, new light has been cast upon two pivotal questions: (1) ***what*** should the Court be estimating?; and (2) ***what methods*** should

[1] *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 742 (3d Cir. 1994) (quoting *Daubert v. Merrell Dow Pharmaceuticals*, Inc., 509 U.S. 579 (1993) (emphasis in original)).

the Court accept as competent evidence in making that estimation? Grace's memorandum is comprehensive, and the Equity Committee does not wish to subject the Court to undo repetition. We therefore write separately only to make some brief observations pertinent to these two points.[2]

The Equity Committee represents the innumerable holders of more than 70 million shares of common stock of Grace. Grace stock is publicly traded and highly liquid, with average daily volume of more than 900,000 shares. At the current market price of about $26 (the price has ranged between $24 and $30 over the past three months), the market capitalization of Grace's equity is more than $1.8 billion. If there is any truth to market efficiency and the "wisdom of the crowd" – and there assuredly is – there can be no question about Grace's solvency. *See VFB LLC v. Campbell Soup Co.*, 482 F.3d 624, 633 (absent evidence of market distortion, market value of equity is the best evidence of solvency). Every day, hundreds of people make investments expressing their confidence that Grace's assets massively exceed its liabilities, including Grace's aggregate exposure for present and future asbestos personal injury liabilities.

Each dollar included in the Court's estimation of Grace's asbestos personal injury liabilities comes out of the equity holders' pockets. To the extent that the liabilities are real, legitimate obligations of the company, this is as it should be. Evidence presented to the Court in the forthcoming estimation trial will demonstrate that, as a matter of logic and epidemiological science, the number of individuals who could realistically have developed true asbestos-related disease from Grace products is diminishingly small.

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[2] The Revised and Amended Case Management Order of the Estimation of Asbestos Personal Injury Liabilities allows the Equity Committee's memorandum to be 40 pages long; however, this memorandum is only 13 pages long. The Equity Committee has agreed to allow the Debtors to make use of the remaining 27 pages for the Grace Motion.

While the equity holders fully understand the requirement that they bear the economic burden resulting from legitimate asbestos-related liability, the estimated liability should be consistent with this reality.

However, value should not, and must not, be taken away from Grace shareholders on the basis of the sort of arbitrary, wholly unscientific and result-oriented extrapolations by the claimants' purported experts, based on historical settlements that were entered into under the duress of the unmanageable pressures of a litigation system out of control. These settlements invariably stated on their terms that no liability was being admitted and include a vast number settlements of claims that were, it is now clear, legally meritless.

Thus, the Equity Committee respectfully submits that the answers to each of the two questions posed above are clear. ***First***, the Court should estimate Grace's *real* liability on *legitimate* claims of asbestos-related injury *caused by Grace product*. To do otherwise, to blink reality by engaging in the claimants' chimerical enterprise of guessing what would have happened in a fictitious world "but for the bankruptcy," would merely perpetuate the unprincipled shakedown from which Grace entered bankruptcy to seek protection.

***Second***, in making its estimation the Court should rely only upon *legitimate and scientifically defensible* methods, a standard that claimants' estimation experts – in particular, Dr. Peterson and Ms. Biggs -- utterly fail to satisfy. To illuminate the numerous scientific shortcomings of these purported experts, the Equity Committee has obtained the expert report of Dr. James Heckman, a Nobel laureate economist who has devoted his career to studying and improving scientific methods for modelling human behavior. (The "Heckman Report," a copy of which is attached as Exhibit 1.)

Having analyzed Dr. Peterson's and Ms. Biggs' estimation reports in detail, Dr. Heckman concludes that neither has "use[d] a reliable methodology." Rather, both "employ simple extrapolation of trends and *ad hoc* adjustments," which do "not meet the criteria of the scientific method." (Heckman Report ¶8). That Dr. Peterson and Ms. Biggs disagree between themselves by $2 billion (a variance of more than 50%) alone speaks volumes. Their estimates are meaningless numbers supported by "subjective belief [and] unsupported speculation." *Daubert v. Merrill Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 590 (1993). Such estimates should not be the basis for taking billions of dollars away from Grace's stockholders.

I.

**The Court Should Estimate the Value of Legally Meritorious Claims, Not What Grace Would Supposedly Have Paid to Settle Claims – Meritorious and Otherwise -- in a Fictitious "But For the Bankruptcy" World**

Grace filed for Chapter 11 bankruptcy protection on April 2, 2001. That historical fact can never be altered. Yet both of the claimants' estimations are predicated entirely upon the counterfactual assumption that the Grace bankruptcy petition *never occurred*. This "but for the bankruptcy" assumption is not the result of any expert opinion; rather it is an integral aspect of the sole question that claimants' counsel chose to put to its experts. *See, e.g.,* Peterson Dep. at 267 ("It's a legal argument."). As explained in the Grace Motion, this question is wrong as a matter of law. The claimants' experts therefore fail the "fit" prong of the *Daubert* test. We further note that, by design, the claimants' experts' specific application of the "but for the bankruptcy" assumption leads to palpably absurd results.

The sole and express reason for the bankruptcy filing was Grace's inability to achieve fair resolution of the flood of asbestos claims being asserted against it in state

courts. "We believe that the state court system for dealing with asbestos claims is broken, and that Grace cannot effectively defend itself against unmeritorious claims." April 2, 2001, Press Release (quoting Grace Chairman Paul J. Norris). Subsequent events have entirely vindicated both aspects of this assertion. The state court system has been shown to be in fact broken, as legislatures and courts have recognized in a continuing series of tort reform measures. Moreover, a vast portion of the claims against Grace (and other defendants) were unmeritorious, the product of disreputable mass screenings and usually supported entirely by diagnoses from a small group of doctors who have now been utterly discredited, most notoriously by Judge Janice Jack in the Silica Multidistrict litigation. There is no need to recount of these facts at length, most of which are well known to the Court and will be explored at trial. It will suffice to observe that even Dr. Peterson and Ms. Biggs acknowledge that, through these events, the asbestos litigation environment has been fundamentally changed since the date of Grace's bankruptcy petition. *See, e.g.,* Mark A. Peterson, W.R. Grace Projected Liabilities for Asbestos Personal Injury Claims as of April 2001 (the "Peterson Report") at 12; Jennifer L. Biggs, Expert Estimation of Asbestos Personal Injury Liabilities of W.R. Grace as of April 2, 2001, Supplemental Report ("the Biggs Supp. Report"), at 17, 61.

Grace was thus completely justified in seeking bankruptcy protection from the massive losses it was suffering from the unrelenting flood of *claims* being asserted against it in a broken legal system, and seeking a fair resolution of its legitimate asbestos-related *liabilities* in an orderly process through the Court. The claimants "but for the bankruptcy" assumption would directly deprive Grace of this very benefit, by guessing what would have happened if Grace had continued in the broken system. This approach

would render the bankruptcy process meaningless, with startlingly inequitable implications.

For example, Ms. Biggs' estimation assigns value to a host of claims that by her own analysis lack merit. Imagine that a company files for bankruptcy the day before trial is to commence on a seemingly powerful multimillion dollar lawsuit against it. A year later, evidence is uncovered demonstrating that the claim was fraudulent, and based upon forged documents. But the plaintiff persists, arguing that because Bankruptcy Code § 502(b) requires that its claim be valued "as of the date of the filing of the petition date," the exculpatory evidence not available until after the petition date must be ignored. The contention would obviously be absurd.

The "but for the bankruptcy" assumption leads Ms. Biggs to take precisely the same palpably absurd position. Ms. Biggs admits that "scrutiny of claims originating from mass screening activities has shown that many of the B-readings are suspect," and concludes that the exposure of these practices will lead to a "significantly higher dismissal rate" for non-malignant claims against Grace going forward. Biggs Supp. Report at 61. But she nonetheless applies Grace's historical dismissal rate to the claims she believes *would have* been settled through 2003, reasoning that, if Grace had not filed for bankruptcy, it would have continued to pay on bogus claims until "increased scrutiny of mass screening activities" in 2004. *Id.* at 61.[3] Ms. Biggs' estimate thus attributes value to thousands of meritless claims that she thinks Grace would have been forced to settle, "but for the bankruptcy," before the true nature of these claims came to light.

[3] Specifically, Ms. Biggs assumes that Grace would have paid to settle more than 80% of the nonmalignant claims resolved before 2004, but barely one-third of such claims resolved thereafter. Biggs Supp. Report at 62, Table 17.

Dr. Peterson, by contrast, applies a decreased "payment rate" (i.e., an increased dismissal rate) to all claims resolved after the Petition Date. Peterson Report at 21. But his application of the "but for" assumption has other, equally unjustifiable implications. Among other things, Dr. Peterson is oddly selective about which bankruptcy he assumes out of existence: his "but for" world entirely excludes the Grace bankruptcy, but expressly includes – and places great weight upon -- the bankruptcy of other asbestos defendants. In Dr. Peterson's view, the prospect of bankruptcy filings by other major asbestos defendants causes an increase in both the number of claims filed against Grace and the value of claims. *See, e.g.,* Peterson Report at 25-26; Peterson Dep. at 268-69. On this basis Dr. Peterson increases his liability estimate for Grace. In similar fashion, Dr. Peterson has used the fact of Grace's bankruptcy to increase his asbestos liability estimates in other bankruptcies, such as Owens Corning. Peterson Dep. at 271. Thus, through Dr. Peterson's selective interpretation of the "but for" assumption, every defendant's liability is increased by the bankruptcy (or potential bankruptcy) of every other defendant. The aggregate liability of all asbestos manufacturers is thereby magically increased through the bankruptcy process, a result that makes no logical sense -- but has obvious benefits for the asbestos committees that repeatedly hire Dr. Peterson.

II.

**Dr. Peterson's and Ms. Biggs's Estimations Are the Product of Arbitrary Judgments, "Speculative Belief" and "Unsupported Speculation", Not Defensible "Methods and Procedures of Science" as Required by *Daubert***

The estimation exercises of Dr. Peterson and Ms. Biggs are the result of two distinct elements: (1) predictions about medical processes that will lead to future occurrences of asbestos-related diseases, and (2) predictions about human behavior, including decisions to bring claims against Grace (legitimate or otherwise), whether to

settle such claims, and for how much. The former task is a matter of epidemiology, which is not within either of these individuals' areas of expertise but is not a major area of controversy in this case. The latter, far more important human volitional element is a matter of economics. *See* Heckman Report at 7 ("Methods for predictions of outcomes that are based on decision-making at individual and organizational levels and interactions among these participants are at the heart of economic science.").

It would be difficult to imagine anyone more qualified to speak to this topic than James Heckman. Dr. Heckman is one of the world's foremost experts on the methods for modelling and predicting human behavior. In the words of the Nobel Prize Committee, Dr. Heckman (and his co-award winner Daniel McFadden) has developed methods that "are now standard tools, not only among economists but also among other social scientists." *See* http://nobelprize.org/nobel_prizes/economics/laureates/2000/_press.html, attached as Exhibit 2. Dr. Heckman's detailed critique of the work of Dr. Peterson and Ms. Biggs is set forth in his attached expert report, and need not be repeated here in their entirety. We touch only upon a few salient points.

Science is the enterprise of *understanding* what is going on in the world, and *applying* that understanding for practical purposes. At the heart of the scientific endeavor is "the formulation of hypotheses as to causes and effects and the testing of these hypotheses against empirical evidence." Heckman Report ¶ 11. To merely describe what has happened, or to assume that what has happened in the past will continue into the future, is not science. Nor is it science to adjust extrapolations from history on the basis of off-hand and unsupported "judgments" – even "informed judgments" – that are not the product of any articulated and tested method. *Daubert*, 509 U.S. at 590. For all of their

charts and tables, Dr. Peterson and Ms. Biggs offer nothing to the Court beyond "simple extrapolation of trends and *ad hoc* adjustments." *Id.* at 5.

Dr. Heckman charitably observes that there are situations where decisions may reliably be made on the basis of the simplistic assumption that the future will continue to be like the past. This is so where the environment is so stable that it is not necessary to understand the underlying dynamics of cause and effect, because they do not change. For example, if one lives in the tropics where the weather never changes, there is no need to understand the complex meteorological factors at play to reliably predict what the weather will tomorrow: same as today. This is not science, though, and offers no help in making predictions in a dynamic environment where important factors are changing. *See, e.g.,* Heckman Report ¶¶ 20, 34.

Beyond question, the asbestos litigation environment is highly dynamic. Developments of recent years have effected fundamental shifts, with more undoubtedly to come. Dr. Peterson and Ms. Biggs acknowledge as much, purporting to address the impact of these fundamental changes through sizeable adjustments that, though undoubtedly correct as to direction (tending to reduce their estimates), lack any methodological justification. *See generally* Heckman Report ¶¶ 65-74, 83-86. "[T]o be reliable, expert testimony must be based on sufficient facts or data and it must be the product of reliable principles and methods properly applied." *Lippe v. Bairnco Corp.*, 288 B.R. 678, 686 (S.D.N.Y. 2003). The size of Dr. Peterson's and Ms. Biggs' *ad hoc* adjustments, and how they were applied (*e.g.*, Will tort reform result in decreased filing rates, or increased dismissal rates, or both? How will settlement values be affected? When will these impacts occur?), are not the result of any systematic analysis or

calculation; they are pure speculation. Even Dr. Peterson concedes that "some of these adjustments, while informed by the research that I've done, are not, themselves, scientific decisions." Peterson Dep. at 248.

Furthermore, before applying their arbitrary adjustments Dr. Peterson and Ms. Biggs do *not* simply assume that the future will simply be like the past. Instead, both of their estimates are dramatically increased by projecting that future settlement values will rise, on the basis of purported historical "trends" they assume will continue. *See, e.g.,* Peterson Report at 34; Biggs Supp. Report at 63-67. These extrapolated trends are not the basis of any empirically established relationship of cause and effect, and hence lack any scientific justification.

In technical terms, a "trend" is a monotonic relationship between time and an observed variable. A historical trend is merely an observation that in the past the variable – here, average settlement values – has tended to move in a certain direction and calculating the average rate of that movement. *See* Peterson Dep. at 246, 248-49. This is not science, it is measurement. Absent plausible and empirically tested hypotheses as to *why* time would cause the variable to increase, there is no basis to expect the historical trend to continue. For example, someone observing a baseball leaving a bat at a 45% upward angle will observe that the height increases -- for a while. This observation establishes a historical trend, but the trend tells absolutely nothing about cause and effect. Time does not cause the ball to rise, the force initially imparted does, and there are other factors (friction, gravity) at work. Without an analytical model of cause and effect, the historical trend is useless in predicting the ball's future position – indeed, worse than useless, it is positively misleading. Similarly, one might observe the amount of coal

being removed from a mine increasing over time, but this historical trend would be the result of numerous underlying forces. Without understanding and quantifying those forces, the trend is no basis for reliably predicting the future output of the mine. The only thing one can say for certain is that a simple forward projection of the trend will be wrong: the mine will be exhausted.

The fact that settlement values generally (although by no means exclusively) increased in the years prior to the Grace bankruptcy filing that gives no insight into cause and effect – it tells one nothing about *why* those values increased – and therefore provides no basis whatsoever to predict what will happen in the future. Neither Dr. Peterson nor Ms. Biggs has even attempted to build an analytical model of the causes underlying their observed historical data, and to test that model on the data.

When asked whether he had any hypothesis as to why time would result in an increase in settlement values, Dr. Peterson appeared to be considering the question for the first time. He began to spin theories about increasing "public knowledge about asbestos," "more trial lawyers around than there were before," and "the increase in skill" of the plaintiffs' bar – and then admitted that there are similar factors that would tend to decrease settlement amounts, such as tort reform and increasing publicity about suspect claims practices. Peterson Dep. at 250-53. By identifying this non-exhaustive panoply of factors, Dr. Peterson tacitly admits that the notion of a unitary "trend" is simplistic and useless. There is no single force moving settlement values upward over time. Instead, there are many factors tending in different directions, the strength of which will vary over time. It is difficult to imagine, for example, that the already substantial public knowledge about the dangers of asbestos could continue to increase; on the other hand, information

about the extent of suspect claims practices and plaintiff abuses of the tort system is only beginning to come to light.

In his report, Dr. Heckman explains that a scientifically valid forecast of future asbestos liabilities in the tort system requires the creation of a model identifying at least the major factors at play and making hypotheses about the cause and effect relationships. "The next step is then to empirically specify and test the model with data to validate and quantify the hypothesized relationships." Heckman Report ¶ 11. Once these empirically tested relationships are established, informative predictions can be made about the future – and, importantly, the range of error of the forecast can be quantified. *Id.* ¶ 71; *see Daubert*, 509 U.S. at 594 (noting that "the court should ordinarily consider the known or potential rate of error" in considering admissibility of expert testimony).

In his deposition testimony described above unpacking what he believed might underlie the historical "trend" in settlement values, Dr. Peterson demonstrated that he would have no trouble identifying the factors that should be incorporated into a true model of asbestos claiming behavior. Peterson Dep. at 250-53. A review of such factors is merely the starting point for a scientifically valid estimation. As Dr. Heckman explains,

> The[] complexities and underlying interrelationships among the outcomes that determine Grace's future asbestos claims and claim values make the development of reliable forecasts a challenging but not insuperable task. Armed with modern econometric tools and powerful computing capabilities, economists have formulated and estimated models of comparable complexity. These models are regularly applied to policy decision-making that affects tax policy and the like.

Heckman Report ¶ 36; *see also id.* Appendix B (describing examples of such models). Neither Dr. Peterson nor Ms. Biggs, nor any other expert put forward by claimants, has

even attempted to create such a scientifically defensible model for predicting Grace's future asbestos personal injury liability.

## Conclusion

For the reasons set forth above, as well as the reasons set forth in Grace's memorandum, Grace's *Daubert* motion should be granted.

Dated: December 7, 2007

Respectfully submitted,

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# Exhibit 1

# Rebuttal Report of
# James J. Heckman
# to the Reports of Mark A. Peterson
# and Jennifer L. Biggs

September 25, 2007

# I. INTRODUCTION

## A. Qualifications

1. I am the Henry Schultz Distinguished Service Professor of Economics in the Department of Economics at the University of Chicago. I also have part-time appointments at University College Dublin and Peking University, China. I have served on the faculties of the Department of Economics at Columbia University and Yale University, where I was the A. Whitney Griswold Professor of Economics. I received my B.A. (summa cum laude) in mathematics from Colorado College in 1965 and my M.A. and Ph.D. in economics from Princeton University in 1968 and 1971, respectively.

2. I specialize in the fields of Labor Economics, Applied Microeconomics and Econometrics, which is the application of statistical techniques to economic problems. In 1983, I received the John Bates Clark Medal awarded biannually by the American Economics Association to the most distinguished economist under the age of 40. In 2000, I was awarded the Nobel Prize in Economics. I am a Member of the National Academy of Sciences, a Fellow of the American Academy of Arts and Sciences, a Fellow of the Econometric Society, a Fellow of the American Statistical Association, a Fellow of the Society of Labor Economics, and a Senior Research Fellow of the American Bar Foundation. I also am a Research Associate of the National Bureau of Economic Research and I direct the Economics Research Center at the Department of Economics at the University of Chicago. I also direct the Center for Social Program Evaluation at the Harris School at the University of Chicago.

3. I have published over two hundred articles in scholarly journals and compendia and have written or edited five books. I currently serve as an Associate Editor of the Journal of Labor Economics, Econometric Reviews, and the Journal of Population Economics. I have previously served as Co-Editor of the Journal of Political Economy and as an Associate Editor of Evaluation Review, the Journal of Econometrics, the Review of Economic Studies and the Journal of Economic Perspectives. In addition to my academic experience, I have served as an advisor to the World Bank, the Inter American Development Bank, the United States Department of Labor, and the Ministry of Fiscal Equity of Argentina, and government agencies in Brazil, Taiwan, South Korea, Germany, Scotland and Ireland. I also have presented testimony before committees of the United States Congress. In the past four years, I have offered expert testimony in *Blue Cross and Blue Shield of New Jersey, et al. v. Philip Morris, Inc.*, *Falise, et al. v. American Tobacco Co., et al.* and *United States v. Philip Morris, et al.* A copy of my curriculum vitae is attached as Exhibit A to this report. A list of materials considered is included as Exhibit B. I am being compensated at the rate of $1800 per hour.

4. The central issue addressed by Dr. Peterson and Ms. Biggs in this matter is the estimation of future asbestos-related claims and claim values faced by Grace. At the heart of this issue is human choice – choices by individuals and plaintiffs law firms to file and settle claims and choices by defendant firms in response to these behaviors. Economists have long studied and modeled the factors driving human choices – at various levels of human organization – e.g., individual and firm levels, and have developed accepted methods for the statistical analysis of economic data. This field is generally referred to as econometrics. In fact, a focal point of my work has been the development of scientific bases for policy evaluation, applying sound economics and econometric methodology to the study of human choice. I have studied outcomes

produced by human behavior in a number of different areas, and have analyzed the implication of changes in factors driving choice (e.g. incentives, costs) for predictions of future outcomes.[1] My work has placed special emphasis on models of individuals (or disaggregated groups, such as organizations or firms), and the problems and possibilities created by heterogeneity, diversity, and unobserved counterfactual states.

5. This vast and growing econometric literature has focused on developing tools, grounded in scientific methods, to identify relationships that can be used to make reliable forecasts in changing environments. This literature emerged in response to recognized shortcomings in forecasting techniques, specifically those techniques that naively extrapolate from simple historical relationships among variables. These simple extrapolation techniques have led to many recognized failures in reliable predictions and subsequent policies based on those predictions. These failures have been observed in stock market predictions, regulation of monetary supply, predictions of the effects of educational policies, and a host of other programs designed to promote equality and economic prosperity. The evaluation and development of predictive approaches and their application to policy analysis have been the central focus of my research.

**B. Summary of Tasks and Conclusions**

6. I have been asked by counsel for W.R. Grace's Equity Committee to evaluate the reliability of the methodology and estimates presented by Dr. Mark A. Peterson in his Report of June 2007 ("Peterson Report") and Ms. Jennifer Biggs in her report of June 2007 ("Biggs Report"). In their reports, Dr. Peterson and Ms. Biggs attempt to estimate W.R. Grace's ("Grace's") future asbestos-related liabilities, assuming a counter-factual, "but-for" world in which Grace had not entered bankruptcy. I understand that liability is

[1] For example, see Heckman and Ashenfelter "Measuring the Effect of an Anti-Discrimination Program" (1974); Heckman "Shadow Prices, Market Wages and Labor Supply" (1974); and Heckman, Lochner and Taber "Tax Policy and Human-Capital Formation" (1998).

a legal finding, based on various elements including causation and incidence of harm, which neither Dr. Peterson nor Ms. Biggs incorporate into their estimation. Instead, Dr. Peterson and Ms. Biggs both claim to estimate Grace's future asbestos liabilities by forecasting potential claims and settlement values under the assumption that these claims would be resolved under the tort system.[2]

7. I have been asked to assess whether Dr. Peterson's and Ms. Biggs' forecasting approaches are reliable and apply valid scientific methods for analyzing past and projecting future claiming behavior.

8. Based on my analyses and review of materials related to this case, I have drawn the following central conclusions:

i. Dr. Peterson and Ms. Biggs do not use a reliable methodology to estimate future claim levels and future claim values that would have been filed and resolved in the tort system but for the Grace bankruptcy.

ii. Reliable forecasts of future asbestos claims and settlement values in a changing environment require modeling of the economic incentives driving individual choices (e.g. decision to bring a claim) and firm behavior (e.g., litigation strategy). There is a well-established econometric framework, based on the scientific method, for performing this type of analysis.

iii. Instead, Dr. Peterson and Ms. Biggs employ simple extrapolation of trends and *ad hoc* adjustments.

- Simple extrapolation does not meet the criteria of the scientific method, although it can provide informative estimates of outcomes in instances where processes follow well-established trends that are likely to persist into the future.

- Dr. Peterson's and Ms. Biggs' estimation techniques do not meet the criteria of the scientific method, and whether their estimates provide any information hinges on the stability of the processes that determine these different outcomes over time.

[2] See Peterson Report, p. 9 and Biggs Report, p. 5.

- There have been well-documented changes in the asbestos-related litigation environment. Therefore, Dr. Peterson's and Ms. Biggs' simple extrapolations provide no reliable basis for principled analysis of future claims.

iv. Further, even if Dr. Peterson's and Ms. Biggs' approaches could reliably estimate future claims and settlement values in a tort system but for the bankruptcy, which I do not think they do, their methods do not translate into reliable estimates of the number and value of claims resolved under a bankruptcy regime, which I understand may apply to these estimates.

- I have been told by counsel to assume that the legal standards that will be applied to resolve asbestos claims in the context of bankruptcy are significantly different than the legal standards in the tort system but for the bankruptcy.

- Observed past settlements that were resolved under the tort system, were a function of participants' strategic behavior under the substantive and procedural rules of the many different courts in which claims were and could be brought.

- Therefore, even if Dr. Peterson's and Ms. Biggs' forecasting methodologies could provide informative estimates of Grace's likely future claims and settlement values but for the bankruptcy, these estimates would not be likely outcomes under the bankruptcy regime.

9. In sum, Dr. Peterson's and Ms. Biggs' approaches do not follow scientific or any reliable methodology for forecasting outcomes in changing environments. Therefore, Dr. Peterson's and Ms. Biggs' estimation approaches do not provide a basis from which to draw informative measures of Grace's future asbestos-related liabilities or future claims and settlement values.

## II. PREDICTION OF OUTCOMES THAT DEPEND ON HUMAN CHOICES UNDER CHANGING INCENTIVES IS A CENTRAL AREA IN APPLIED ECONOMICS

10. Dr. Peterson and Ms. Biggs attempt to predict the level of Grace's future asbestos-related claims and claim values. The ultimate levels of these outcomes depend on a host of factors, including the choices that are made by claimants and defendants under specific legal regimes. Prediction of these future outcomes using scientific methods involves identifying the causal relationships between these different factors (such as particular legal requirements) that affect economic incentives and future choices.

11. Methods for predictions of outcomes that are based on decision-making at individual and organizational levels and interactions among these participants are at the heart of economic science. The empirical scientific method calls for the formulation of hypotheses as to causes and effects and the testing of these hypotheses against empirical evidence. Thus, to develop a valid empirical economic model, the first step would be to consider potential relationships among the main economic variables of interest. The next step is then to empirically specify and test the model with data to validate and quantify the hypothesized relationships.

12. By failing to specify or estimate such an economic model, or even provide any indication of a model of decision making that underlies their empirical approach, neither Dr. Peterson nor Ms. Biggs meet the basic standard of empirical science as applied to economic problems. The fundamental methodological requirements for valid economic forecasting were articulated by Haavelmo more than sixty years ago and have been

refined by many researchers since.[3] Instead of applying this body of knowledge, Dr. Peterson and Ms. Biggs simply extrapolate from a set of historical patterns onto future outcomes in an *ad hoc* fashion with no articulated economic rationale.

13. The econometric approach to forecasting develops explicit models of outcomes where the causes of effects are investigated and the mechanisms governing choices are analyzed. The variables that economists generally seek to predict are known as the "choice" or "endogenous" variables in an economic model. They are sometimes called "internal" variables because they are determined by the social system. In particular, the discipline of applied econometrics focuses on explaining and predicting outcomes that are determined by economic participants' choices. In the model of Grace's future claims and claim values, the main endogenous outcomes (i.e., the ones determined by participant choices) are decisions whether to bring or settle claims, settlement values, and case dismissals.

14. Econometric work over the last several decades has focused on organizing and analyzing large datasets that provide an empirical basis to link these multiple interrelated causal factors to the choice-based outcomes. While the basic statistical theory to implement these types of tests has existed for many decades, the advent of computer technology has led to the collection of large datasets and the use of more sophisticated empirical techniques. These developments have dramatically advanced the ability to model outcomes that are driven by multiple causal factors, such as asbestos-related claiming behavior.

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[3] See Haavelmo "The Probability Approach in Econometrics" (1944). For a discussion of recent literature on this topic, see Heckman and Vytlacil "Structural Equations, Treatment, Effects and Econometric Policy Evaluation" (2005).

15. Reliable predictions of outcomes are generated by using carefully estimated models and accounting for any anticipated changes in the relevant factors. The model and resulting estimates also should be scientifically tested for reliability by determining the sensitivity of the estimates when explicit assumptions of the model are varied. The predicted outcomes of this econometric model, developed and tested using scientific methodology, can then be considered to be reliable, as its predictions would be robust and reliable.

16. Estimates of asbestos-related claims and claim values rest on individual decisions, most importantly the decisions whether to bring a claim against a defendant at all, whether to settle the claim, and at what value -- as well as defendants' corresponding decisions. These choices will be controlled by numerous factors influencing the incentives and costs of each course of action. Accordingly, a reliable econometric model used to predict the number and value of Grace's future asbestos-related claims must consider and account for the numerous factors controlling economic incentives to file and settle claims, such as the value of expected settlement payouts, company solvency, and medical documentation standards.

17. Additionally, each of these individual factors in turn will depend on a number of underlying inputs. For example, expected tort settlement payouts can depend on inputs such as the claimant's disease, evidence of exposure and product identification, venue where the claim was filed, conduct of the defendant, the laws governing the claim as well as the defendant's and plaintiff's expectations regarding the cost and success of litigation. Similarly, an individual's decision whether or not to file a claim can depend on the onset

of disease, the full cost of bringing a claim and the expected outcomes of settlement and litigation (which in turn depend on the tort settlement values described above).

18. A scientific approach to building a reliable forecast on the endogenous variables driving Grace's future claims and settlement values under the tort system would indicate both how these endogenous variables affect one another and how each is affected by "exogenous" / "externally-specified" factors (i.e. variables which determine the endogenous outcomes but are themselves determined outside the model). For example, the incidence of disease would be an exogenous variable because it is a function of biological processes, not choice.

## III. DR. PETERSON DOES NOT EMPLOY A RELIABLE EMPIRICAL OR THEORETICAL METHODOLOGY TO ESTIMATE THE NUMBER AND VALUE OF GRACE'S FUTURE ASBESTOS-RELATED CLAIMS

19. Dr. Peterson's estimates of Grace's future claims and claim values are derived from methods that impose specific assumptions on patterns of the future values that he is attempting to estimate. These assumptions on patterns are based only on simple extrapolation of recent trends in settlement outcomes, calibrations based on unjustified benchmarks, and imposed relationships between epidemiological outcomes and human behavior.

20. Dr. Peterson's simplistic estimation approach ignores the significant possibility that current outcomes and recent trends in these Grace data may not accurately reflect future behavior. Under a changing environment, reliably forecasting outcomes involves understanding the factors that drive (and how they drive) these outcomes, since these factors will differ in the future. For asbestos-related settlements, many environmental

factors that influence claimants' and defendants' strategic behavior, and hence the number and value of Grace's future claims, are known to be changing.

21. Further, Dr. Peterson employs benchmarks to predict Grace's future average settlement values using current value metrics derived from other companies and trusts, without establishing either the current or future validity of these comparisons with respect to Grace. Understanding relationships between factors and outcomes is a fundamental aspect of careful econometric forecasting, as it provides a basis from which to select appropriate benchmarks.

22. In sum, Dr. Peterson's naive extrapolation method is unreliable because he fails to account for how changing environmental factors or characteristics unique to Grace may influence future asbestos-related litigation outcomes. Consequently, Dr. Peterson's empirical approach not only fails to meet scientific criteria for developing forecasts but also ignores well-established methods for predicting outcomes that are driven by human choices. I expand on these observations below.

**A. Overview of Dr. Peterson's Estimation Approach**

23. Dr. Peterson predicts the number of claims in future years and the average value of these claims (by disease type). The time-series of these predicted values are used to predict the number and value of claims for particular years (by simply multiplying these two numbers for that year after adjusting for a theoretical percentage of claims that would be dismissed). The approaches he uses for estimating the number and value of claims are as follows:

**1. Peterson's Method for Estimating Future Number of Claims**

24. Dr. Peterson starts with Nicholson's epidemiological model projecting the incidence of asbestos-related cancers. To determine the subset of those who will bring cancer-related claims against Grace, Dr. Peterson calculates a base "propensity to sue" as the ratio of historical claims filed against Grace from 1999 to the first quarter of 2001 to cancer incidence rates for the same period.[4] Dr. Peterson then assumes that this base propensity to sue will grow at the same rate of increase as that actually experienced by the Manville Trust from 2000 to 2006.[5] He calculates a propensity to sue for each of the diseases separately. For years beyond 2006, Dr. Peterson assumes that the propensity to sue will stay constant at the 2006 level. Finally, he calculates the future number of claims that will be filed against Grace by multiplying these projected propensities by the corresponding disease incidence for each of the future years.

25. For nonmalignant claims levels, Dr. Peterson employs a different method. As there is no epidemiological model detailing nonmalignant incidence rates, Dr. Peterson simply assumes the percentage change in nonmalignant claims is the same rate as the percentage change in cancer incidence.[6] I understand that this is a change in the methodology Dr. Peterson has used in previous cases, where he benchmarked non-

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[4] He also calculates an average propensity to sue during 2000-2001 (Peterson Report, pp. 70-71).

[5] Dr. Peterson does not calculate the difference between Manville propensity to sue in 2000 and 2006, but calculates the difference between the propensity to sue in 2000 and an average propensity to sue between 2003-2006. Specifically, Dr. Peterson calculates the "rate of increase in Manville's propensities to sue for each cancer between 2000 and 2003-2006" and spreads "Manville's actual rates of increase in propensities over the 2002-2006 period for our forecast of Grace propensities to sue during 2002-2006" (Peterson Report, p. 73).

[6] Dr. Peterson states that "we start with the level of nonmalignant claims that it received in 1999 and 2000 and then forecast that future claims will decrease at a rate parallel to the Nicholson forecast of the incidence of future asbestos-related cancers" (Peterson Report, p. 82).

malignant claims to cancer claims, as opposed to cancer incidence. As I discuss later, this approach does not appear to be based on any logical and empirically tested relationship, but rather benchmarks an outcome that depends on human choice (bringing a non-malignant claim) to an epidemiological event for a different disease (cancer).

**2. Peterson's Method for Estimating the Future Claim Values**

26. Dr. Peterson uses five scenarios to project Grace's average future claim values. Two of these scenarios are based on extrapolations of Grace's own historical data: 1) Short-Term Grace Ratio and 2) Long-Term Grace Regression. The other three scenarios are based on settlement values paid by "comparable" asbestos defendants – U.S. Gypsum ("USG"), Quigley and Turner & Newall ("T&N").

a) Short-Term Grace Ratio

27. Dr. Peterson calculates the 2001 base settlement value by averaging the settlement values paid by Grace during 2000 and 2001. He then assumes that this base settlement value will increase between 2001 and 2006 at an annualized rate equivalent to the historical rate of increase in average settlement values paid by Grace during the 1997-1999 period to the average paid during the 2000-2001 period.[7] For years after 2006, his simplistic extrapolation method assumes that average settlement values will increase only at the rate of inflation.

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[7] Dr. Peterson states "For each disease we calculated the rates in increase in Grace's settlements from the 1997 to 2001 using the following formula:

*2000-2001 average settlement / 1997-1999 average settlement*

We then projected this increase forward, forecasting that by 2006 Grace would be paying in settlements the amounts that it had paid in 2000-2001 multiplied by the rate of increase that we calculated using the formula above." (Peterson Report, p. 33).

b) Long-Term Grace Regression

28. Dr. Peterson's regression is another method of simple extrapolation from Grace's own historical data. The regression equation does not attempt to model the processes that are driving the outcomes at issue. Technically speaking, he estimates a regression of log settlement values as a function of a linear time trend and state dummy variables using 1991-2001 data for each of the diseases separately, and uses the estimated trend coefficients from this regression to simply extrapolate future settlement values for 2001 through 2006.[8] Furthermore, when extrapolating the future settlement values for 2001 through 2006, Dr. Peterson implicitly assumes that the distribution of claims across states that was observed during 1999 to 2001 will continue to hold for every future predicted year.

c) Increases Based on Other Comparable Firms

29. In this approach, Dr. Peterson calculates the average settlement value for each of the four disease categories paid by Grace during 2000 and 2001 as the 2001 base settlement value. He then uses the settlement values paid by firms he claims are "comparable" asbestos defendants – USG, Quigley and T&N – as of 2001 as a purportedly reliable basis for extrapolating Grace's settlement values from 2001 through 2006.[9] He simply assumes that Grace's base settlement values will increase at an annualized rate such that Grace will pay, in 2006, settlement values that these "comparable" companies paid in 2001.

[8] Peterson Report, Appendix B, page B-1.
[9] Peterson Report, p.31.

**B. Dr. Peterson's Failure to Model the Relationship Among Exogenous Factors and Endogenous Outcomes Leads to Unreliable Predictions**

30. By failing to estimate, or even consider, any of the large number of relationships between the endogenous and exogenous variables that determine future claims and settlement values, Dr. Peterson's approach does not meet basic standards for making reliable predictions. In particular, Dr. Peterson acknowledges the significance of tort reform, changes in disease incidence, and changes in firms' financial conditions, yet his methods do not model or estimate the impact of these changes on future values of the outcomes he is trying to estimate.[10]

31. Dr. Peterson also fails to account for the interrelationships between his three main endogenous variables, each of which is likely affected by changes in the other two, another basic standard of economic science. For example, I have been advised that tort reforms may lead to caps on damages; increase injury thresholds for stating a claim; apply more rigorous standards for admission of proof of injury, causation, or product identification; or eliminate tactical devices, such as forum shopping or case consolidation. Each of these developments could affect total settlement payments in a number of ways, both directly and indirectly through feedback effects. By lowering the value of settlements that plaintiffs receive and increasing dismissal rates, tort reforms could discourage future filings and hence reduce the number of filed complaints, and limit the resources that plaintiffs' legal counsel dedicate towards litigation-related efforts, such as claims recruitment and case prosecution. Tort reforms could increase defendants'

10. He does attempt to adjust for the impact of tort reform on case dismissal rates, but provides no empirical evidence to support the adjustment he makes, and he makes no attempt to adjust for the effect of tort reform on propensity to sue or settlement values.

likelihood of prevailing through litigation (both actual and perceived) and decrease expected damage awards, thus increasing the likelihood that defendants would eschew quick settlement strategies to pursue litigated outcomes (as the downside risks would be mitigated). This in turn could increase potential claimants' perceived costs of pursuing claims, which could further reduce the likelihood of filing a claim.

32. These interrelationships imply that a change in an exogenous factor, such as tort reform, will not only have a direct effect on each of the endogenous variables, but will also have indirect effects through their feedback on one another. For example, if tort reform directly increases dismissal rates, this may reduce the likelihood to file a claim, which may in turn affect settlement values and further change dismissal rates.

33. A reliable estimation method requires an economic model to predict the "equilibrium" outcome of all these interrelated effects. Dr. Peterson's extrapolation methods, however, are based on the conglomeration of *ad hoc* sets of trends from different time periods, benchmarks from different firms, and current state variation in settlement values that may not represent future variations. Thus, Dr. Peterson provides no evidence supporting the conclusion that these methods are valid historically and no basis from which to conclude that they have any predictive power for the future.

34. Such extrapolation methods are well known to provide misleading predictions in dynamic environments. The well-known "Lucas Critique" speaks directly to the difficulty in projecting future outcomes using historical relationships among endogenous variables, or between endogenous and exogenous variables. The Royal Swedish Academy cited this critique as a basis for Dr. Robert Lucas' Nobel Prize in their October

1995 announcement, "The Scientific Contributions of Robert E. Lucas, Jr."[11] In particular, Dr. Lucas contends that relationships measured under one "policy regime" can not be used to make predictions following important policy changes, unless the full impact of those policy changes is accounted for. This critique illustrates exactly why Dr. Peterson's methodology renders his predictions unreliable. While Dr. Peterson acknowledges that there have been and continue to be major tort reforms in state courts, he fails to consider, aside from some *ad hoc* adjustments to claim dismissal rates, how these policy changes could affect any of the other trends or patterns he is measuring.

35. Dr. Peterson's failure to account for how changes in factors underlying asbestos- related outcomes under the tort system ignores economic methods developed over 50 years ago. Since at least the early 1940's, econometricians have understood that accurate prediction of future variables requires identification and estimation of stable economic relationships.[12] Reliable predictions cannot be based on patterns and trends that hold only at one point in time under one set of policies and exogenous factors. Rather, as mentioned above, sound predictions are based on identifying the underlying stable economic relationships, such as how individuals' decisions to sue are determined by expected settlement values, dismissal rates, and exogenous factors and how courts' decisions to dismiss are determined by the number of lawsuits and other factors. Using

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[11] As the Royal Swedish Academy notes, "The 'Lucas critique'...has received enormous attention and been completely incorporated in current thought." The central idea of the Lucas critique traces back to Haavelmo "The Probability Approach in Econometrics" (1944) and Marschak "Economic Measurements for Policy and Prediction" (1953).

[12] See Trygve Haavelmo "The Probability Approach in Econometric," (1944), Jacob Marschak "Economic Measurements for Policy and Prediction," (1953). For a discussion of this issue, see Arthur Goldberger, *A Course in Econometrics*, 1991, p.343-346, James Heckman "Econometric Causality" ( 2007) and James Heckman "Haavelmo's Legacy," ( 2007).

these accepted econometric methods, a model would be estimated on available data. Predictions for these endogenous variables then would be based on these estimated parameters along with projected values of the key exogenous variables. Dr. Peterson takes no steps toward implementing this accepted approach.

36. These complexities and underlying interrelationships among the outcomes that determine Grace's future asbestos claims and claim values make the development of reliable forecasts a challenging but not insuperable task. Armed with modern econometric tools and powerful computing capabilities, economists have formulated and estimated models of comparable complexity. These models are regularly applied to policy decision-making that affects tax policy, education policy and the like. For some representative examples of these types of models, see Appendix B.

37. Simple extrapolation from short-run trends ignores the impact that even small changes in underlying factors can have on outcomes. Therefore, Dr. Peterson's extrapolation methods are insufficient and fail to meet basic economic criteria for sound estimation. As a result, Dr. Peterson's forecasts of Grace's future asbestos claims and claim values are unreliable and uninformative.

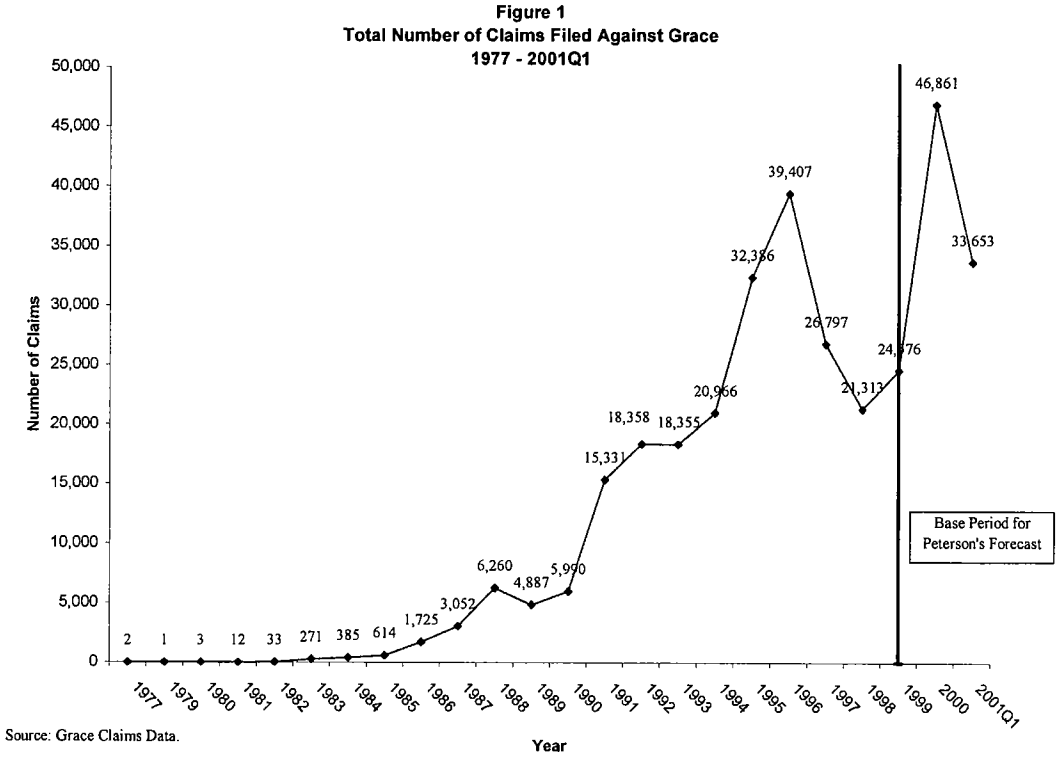
## IV. DR. PETERSON'S ARBITRARY ASSUMPTIONS HIGHLIGHT THE SHORTCOMINGS OF HIS FLAWED METHODOLOGY

38. In his report, Dr. Peterson acknowledges that a simple extrapolation is insufficient for forecasting values in a world that is changing. Instead of identifying and modeling the factors that drive these changes, however, Dr. Peterson employs arbitrary assumptions and adjustments that have neither a theoretical nor an empirical basis. In

this section, I review a number of these assumptions. These assumptions are integral to Dr. Peterson's estimates – different assumptions generate different forecasts. As a result, Dr. Peterson's empirical results are sensitive - in some cases, highly sensitive- to each of the arbitrary assumptions that he makes.

### A. Dr. Peterson Uses an Unusual and Arbitrary Time Period for His Extrapolation

39. The period Dr. Peterson has arbitrarily chosen as the basis for his extrapolation method appears atypical. The observed values of claims filed and average settlements paid during the time period preceding Grace's bankruptcy do not appear to follow any overall trend. This indicates that the underlying determinants driving these outcomes could be changing during this time. Dr. Peterson ignores the implications of these changes on his estimates and instead arbitrarily chooses specific time periods from which to extrapolate. His results are highly sensitive to these arbitrary choices. Additionally, Dr. Peterson's chosen period immediately preceded Grace's bankruptcy, and bankruptcies are, by definition, unusual events. (See Figure 1).




Source: Grace Claims Data.

### 1. Dr. Peterson Chooses Arbitrary Time Spans For Forecasting His Estimates

40. Dr. Peterson uses an extrapolation method to forecast claims and settlement values and yet completely ignores substantial variations in the level of these outcomes over the 10 years in his sample. Further, he provides no evidence as to why the periods he chooses to use in his calculations are the most appropriate. Indeed, as I show below, Dr. Peterson's estimates are highly sensitive to his choice of these time periods.

41. The level of claims filed against Grace varied during the 1990's. For example, the number of cancer-related claims filed against Grace increased by 89 percent between 1998 and 2000 and the number of nonmalignant claims filed against Grace increased by 119 percent in the same period (see Table 1). In contrast, the number of cancer-related

claims filed against Grace fell by 37 percent between 1996 and 1998 and the number of nonmalignant claims declined by 47 percent in the same period.

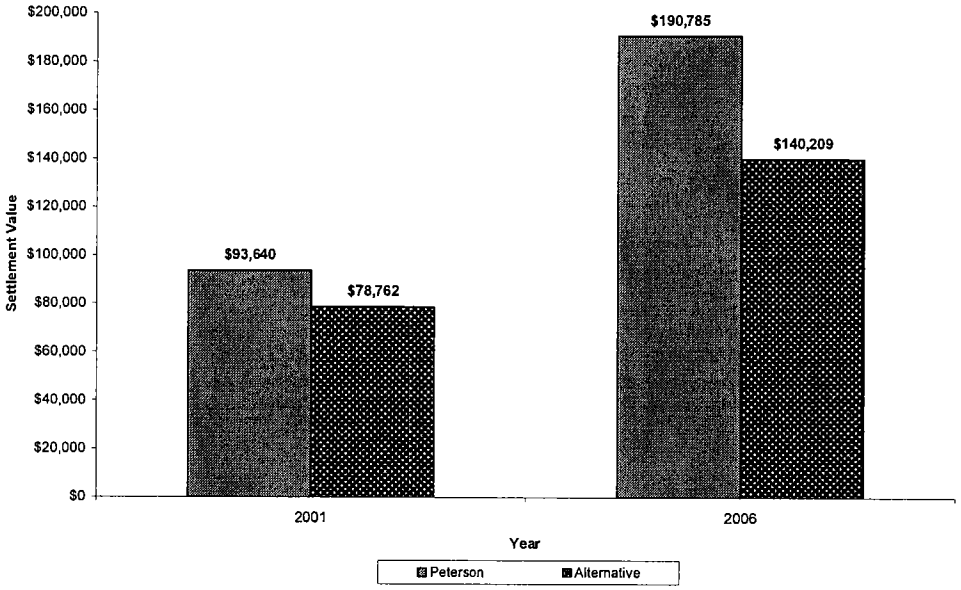
42. Similarly, there have been wide variations in past settlement values paid by Grace. For example, the settlement values for lung cancer increased by 115 percent between 1995 and 2000 (see Table 2), but declined by 67 percent between 1990 and 1995. Nonmalignant settlement values rose by 52 percent between 1995 and 2000, and fell by 52 percent during 1990-1995.

43. These observed swings in settlement values and the number of claims filed against Grace suggest profound changes in the underlying processes generating these outcomes within this short time period. For example, changes in the levels of claim filing could be related to endogenous changes in claimants' and Grace's incentive to litigate a claim. Dr. Peterson fails to explain or model these changes and, as a result, cannot support why his chosen time period is appropriate for his extrapolation method.

44. Given these sizeable variations in settlement values across years, Dr. Peterson's calculation of the rate of increase in settlement values for his "Short-Term Grace Ratios" scenario is highly sensitive to his choice of time periods. For example, using the rate of increase in average settlement values between 1997-1999 and 2000-2001 Dr. Peterson projects that mesothelioma settlement values will increase from $93,640 to $190,785 between 2001 and 2006 (Peterson report, Table 14). If, instead, Dr. Peterson used the rate of increase in settlement values between 1997-1998 and 1999-2001, his projected settlement values for mesothelioma would range from $78,762 in 2001 (a decrease of roughly16% in his estimate) to $140,209 in 2006 (a decrease of roughly 27% in his

estimate). (See Figure 2). Therefore, not only does Dr. Peterson fail to explain why his chosen period is the appropriate benchmark, but his estimates appear highly sensitive to his arbitrary assumptions.

**Figure 2**
**Comparison of Predicted Settlement Values Based on Peterson's and Alternative Base Periods for Trend Calculation**




Note: Peterson uses the rate of increase in settlement values between 1997-1999 and 2000-2001 to forecast settlement values in 2001 and 2006. An Alternative method uses rate of increase between 1997-1998 and 1999-2001 to forecast settlement values.
Source: Peterson's report, Table 9.

### 2. Dr. Peterson's Analysis Does Not Take into Account Structural Breaks

45. Forecasts based on simple extrapolation methods will be misleading during times of structural change in the underlying relationships. Of particular significance here, recent changes in the litigation environment likely alter the structural relationships that determine settlement values.

46. As Dr. Peterson himself acknowledges, many courts and defendants now scrutinize the medical evidence more closely than they did in the past and many important state jurisdictions have changed their tort laws to discourage mass filings,

impose limits on non-economic damages, and make their courts less hospitable to non-resident plaintiffs. This momentous change in asbestos litigation environment will likely change the incentive to litigate a claim going forward. Yet Dr. Peterson chooses to estimate the number of future claims and claim values based on forecasting methods that do not allow for such structural changes.

47. Dr. Peterson's "Long-Term Grace Regression" scenario estimates settlement values as a function of a linear time trend and dummy variables for states (i.e. individual state-specific effects), and uses the estimated trend coefficients from his regression to simply extrapolate future settlement values. This linear-trend model may accurately predict future values in the short run under special circumstances, but without understanding the underlying relationships driving outcomes these would not be sound predictions for long-run claim values. Extrapolation would only accurately predict Grace's short-run claim values if: (1) Grace's settlement values displayed well-established trends in the past; and (2) the structure of those well-established trends is not expected to change going forward. Neither of these appears to be appropriate assumptions in this context. First, as illustrated above, there are wide fluctuations in past settlement values indicating the absence of a well-established trend. Second, the recent changes in the asbestos litigation environment suggest a fundamental structural change in the relationship between settlement values and time-trend – as even Dr. Peterson appears to recognize. (Peterson Report, p. 12)

48. Furthermore, when extrapolating the future settlement values for 2001 through 2006, Dr. Peterson implicitly assumes that the distribution of claims across states that

was observed during 1999 to 2001 will continue to hold for every future predicted year. Given that a number of states have adopted state tort reform in the early 2000's, it is likely that the distribution of claims across states will look very different from those observed during 1999-2001.[13]

49. For example, a simple test of structural change based on Dr. Peterson's own regression confirms the existence of at least one structural break in settlement values.[14] Furthermore, because several states have adopted tort reforms in the early 2000's, one would expect additional structural changes going forward. The fact that Dr. Peterson's regression does not take into account structural changes in settlement values renders his estimates based on "Long-Term Grace Regression" scenario unreliable.

### 3. Dr. Peterson Forecasts from a Period Immediately Preceding Grace's Bankruptcy with Unusual Settlement and Claim Values

50. Dr. Peterson's stated goal is to forecast particular outcomes (Grace's future claims and settlements values) had Grace *not* filed for bankruptcy.[15] Dr. Peterson asserts that he seeks to "avoid and attempt to adjust for artificial events . . . which affect litigation in ways that do not occur and would not recur in the ordinary tort litigation of the defendant's asbestos law suits" (Peterson Report, p. 9). Yet Dr. Peterson provides no evidence that forecasting from a period *immediately preceding Grace's bankruptcy* generates reasonable predictions of what would have happened in the absence of Grace's

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[13] See, e.g., American Tort Reform Association, www.atra.org and CBO (2004).

[14] Specifically, a Chow test for structural breaks finds a statistically significant finding in 1999 at the one percent level. See Gregory C. Chow (1960) and Johnston and Dinardo (1996).

[15] Dr. Peterson states that his "estimation looks at how a debtor would continue to receive and resolve claims within the U.S. court system instead of within the protections of Chapter 11." (Peterson Report, p. 9)

bankruptcy, or that Grace's bankruptcy did not "affect litigation in ways that do not occur and would not recur" in ordinary circumstances.

51. Evidence suggests that claimants anticipated Grace's 2001 bankruptcy and resulted in an acceleration in claims filed immediately preceding the bankruptcy.[16] Indeed, Dr. Peterson himself notes that "During the three months in 2001 to the time of its April 2, 2001 bankruptcy petition, Grace received 33,653 claims, 37 % more claims in three months than in all twelve months of 1999. Its annualized rate of 2001 filings was up almost 50 percent over 2000 [under conservative assumptions]" (Peterson Report, p.5). Dr. Peterson never investigates why filings were so high, or what this might indicate about the influence of Grace's impending bankruptcy, or – most importantly – whether extrapolating from such a period is likely to produce reliable forecasts. Again, Dr. Peterson fails to address this issue or provide evidence of whether he has chosen the appropriate period from which to base his forecasts.

### B. Dr. Peterson Uses Unsound Benchmarks From Which He Projects Future Claim Levels And Their Settlement Values

52. Dr. Peterson uses unsound and arbitrary benchmarks to project Grace's claims and settlement values. First, when projecting future claiming behavior against Grace, Dr. Peterson assumes that the propensity to sue Grace between 2000 and 2006 will increase at exactly the same rate as experienced by the Manville Trust during the same period. Second, when projecting Grace's future settlement values, Dr. Peterson uses settlement values paid by other asbestos defendants. As I discuss below, both these assumptions,

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[16] See, e.g., Biggs Report, p. 41 and "WR Grace CEO: Mulling Chapter 11 as Asbestos Suits Mount" *The Wall Street Journal*, Jan. 29, 2001.

using data from the Manville Trust and other asbestos defendants, constitute poor benchmarks from which to project Grace's future claims and values of these claims.

### 1. Dr. Peterson Arbitrarily Uses Claiming Behavior against the Manville Trust As a Benchmark for Future Claims Against Grace

53. Dr. Peterson assumes that the propensity to sue Grace would have increased between 2000 and 2006 at the same rate actually experienced by the Manville Trust over that period.[17] The Manville Trust administers funds to litigants *post-bankruptcy*, while Dr. Peterson's forecasts are intended to predict the number and value of asbestos-related claims against Grace brought about by litigation in the *absence of bankruptcy*. Dr. Peterson provides no evidence to support his implicit assumption that claiming behavior is unaffected by the prospect of bankruptcy; indeed, he does not even address the issue.

54. Similarly, Dr. Peterson does not address any potential increase in claims against the Manville Trust over the 2000-2006 period due to the bankruptcy filings of large asbestos manufacturers in 2000, an increase he claims Grace would have experienced.[18] If Manville is an appropriate benchmark and he is estimating a but-for world without a Grace bankruptcy, he must estimate the effect from Grace's bankruptcy on Manville claims and adjust the rate of increase in Manville claims from 2000 to 2006 accordingly. Instead, if Dr. Peterson believes that Manville did not experience this spill-over effect from other bankruptcies, as he claims Grace would have, then claiming behavior against the Manville Trust would not be representative of Grace's future experience (according to

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[17] Dr. Peterson states that "we use asbestos claims data from the Manville Trust to understand trends in asbestos claims filings since Grace's April 2, 2001 petition date and to forecast claims that would have been filed against Grace since that date." (Peterson Report, p. 42)

[18] Dr. Peterson argues that because of eight so called top-tier asbestos defendants' declaration of bankruptcies in 2000 and 2001, "both claims against Grace and the amount that it would have had to pay to resolve asbestos claims would have increased greatly." (Peterson Report, pp. 25-26)

his own logic). Either way, the rate of increase in claims against the Manville Trust does not provide a reliable basis from which to infer the rate of increase in claims against Grace.

### 2. Dr. Peterson Uses Three Asbestos Manufacturers as Benchmarks for Forecasting Future Settlement Values with No Empirical or Theoretical Basis.

55. Dr. Peterson assumes that the settlement values paid in 2001 by firms he claims are "comparable" asbestos companies – USG, Quigley, and T&N – provide a reliable basis for forecasting the settlement values Grace would have paid in 2006, but provides no reliable evidence to support these comparisons.[19] Dr. Peterson fails to show that the size, mix of products sold, mix of customers, mix of plaintiff types and illnesses, or even the simple trends in litigation experienced by any of these companies, are sufficiently similar to Grace's to justify using the settlement values of these companies to forecast for Grace.[20] Instead, Dr. Peterson arbitrarily argues that "until its bankruptcy, Grace's increasing settlement costs closely tracked the trends for other defendants" (Peterson report, p. 27).

56. Contrary to Dr. Peterson's assertion, there is much variation in the levels and trends in settlement values paid by Grace and these "comparable" companies (see Table 3). For example, Grace paid an average of $63,774 for a mesothelioma claim in 1998, whereas USG, Quigley, and T&N paid on average $36,072, $20,927, and $50,812,

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[19] Dr. Peterson states "To estimate the amounts by which Grace's settlement payments would have increased since its petition date, we use settlement data for three comparable co-defendants: USG, Quigley, and Turner & Newall." (Peterson Report, p.42)

[20] The extent of Dr. Peterson's analysis of the comparability of these firms to Grace in his report is the following statement: "While there are differences between Grace and each of these defendants, T&N and USG in particular are good comparisons for Grace. All three companies manufactured and sold asbestos-containing construction products. Both T&N and Grace were dominant manufacturers of widely-used spray insulation and each sold a wide range of other asbestos-containing products." (Peterson Report, p. 30)

respectively. In 2001, Grace paid an average of $97,839 for a mesothelioma claim, whereas USG, Quigley, and T&N paid averages of $221,745, $188,031, and $194,051, respectively. Thus, depending upon the year, these companies' mesothelioma settlement values are either much higher or much smaller than those paid by Grace. Specifically, in 1998, Quigley's mesothelioma settlement value is roughly 67 percent smaller than Grace's mesothelioma settlement value, whereas, in 2001, USG's average mesothelioma settlement value is roughly 127 percent higher than that of Grace.

57. Furthermore, the trends have also varied across companies. For instance, between 1996 and 2001, Grace's settlement value for mesothelioma increased by roughly 256 percent. However, during the same time period, settlement values increased by roughly 917 percent for USG, 838 percent for Quigley and 478 percent for T&N.

58. Dr. Peterson provides no support as to why these three companies are appropriate benchmarks. First, the variations in levels and trends in settlement values paid by Grace as compared to these other firms indicates that historically these firms were not comparable to Grace. Second, Dr. Peterson provides no evidence as to why, going forward, these companies are reliable benchmarks. Therefore, his projected settlement values from these analyses are unreliable. Additionally, even if other firms' claim values were comparable to those of Grace, there is no scientific basis for Dr. Peterson's assumption that in 2006 Grace would pay claim values paid by other defendants as of 2001.

### C. Dr. Peterson Employs Additional Unsound Assumptions and Adjustments with No Empirical Basis

59. Dr. Peterson's applies additional unsound assumptions and adjustments in his estimation of Grace's future claims and claim values. First, Dr. Peterson assumes the rate of change in nonmalignant claims will exactly mirror the rate of change in cancer

incidence. Second, he makes arbitrary adjustments when taking into account the effect of tort reforms.

### 1. Dr. Peterson Assumes the Rate of Change in Nonmalignant Claims Filed Against Grace Will Mirror the Rate of Change in Cancer Incidence

60. Dr. Peterson assumes that the rate of change in nonmalignant claims filed against Grace will exactly mirror the rate of change in cancer incidence even though he admits that the "disease processes for asbestos-related cancers and asbestos-related nonmalignant diseases differ" (Peterson Report, p. 79). Dr. Peterson argues that claims against Grace and other defendants across past years reveal a stable relationship between the number of cancer claim filings and nonmalignant claim filings. However, he admits that the "recent changes in the litigation environment have disturbed this historical stability between cancer and nonmalignant filings." (Peterson report, p. 81).

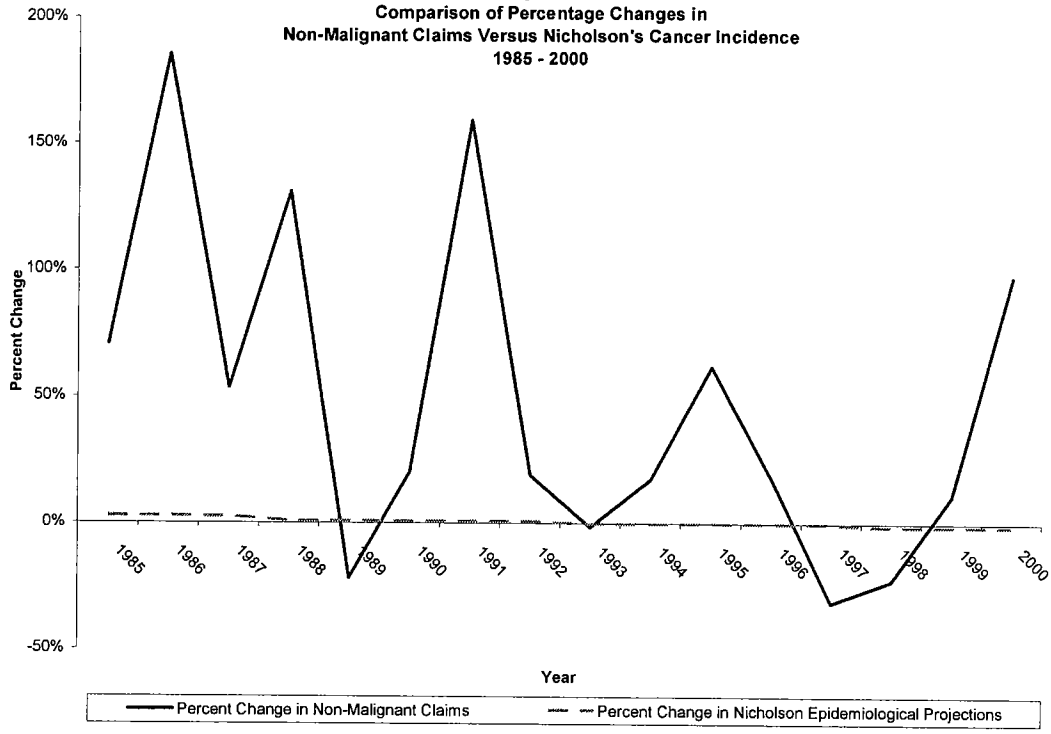
61. As a response to this break in the historical trend, Dr. Peterson assumes that the rate of change in Nicholson's incidence of cancers is an appropriate predictor of the change in the number of nonmalignant claims. Again, Dr. Peterson provides no support as to why the underlying processes generating nonmalignant claims and the epidemiology of cancer incidence are related.

62. In using the change in cancer incidence to predict nonmalignant filings, Dr. Peterson is implicitly employing a purely epidemiological process as a benchmark for that driven by both epidemiology and human behavior. To the extent some of the nonmalignant claims are fraudulent (or have lacked a sound medical basis), Dr. Peterson's method essentially forecasts this behavior using cancer rates without providing any support as to why an epidemiological process provides a reliable basis from which to draw conclusions regarding the decision to commit fraud.[21]

[21] For a discussion on baseless claims, see expert report of Dr. Dunbar, pp. 13-46, June 2007.

63. The act of bringing a claim when there is no actual medical condition arising from the alleged harmful agent is entirely a function of human behavior, controlled by the sorts of incentives and costs as discussed previously. Epidemiology, which models biological processes such as disease, does not capture human strategic behavior, and it makes no sense to use an epidemiological model (and here, of a different disease than that being examined) to project fraudulent and medically-baseless claims. Yet this is exactly what Dr. Peterson does without logical explanation or justification. In fact, the historical rate of change in cancer incidence was a poor predictor of the rate of change in non-malignant claims. (See Figure 3).

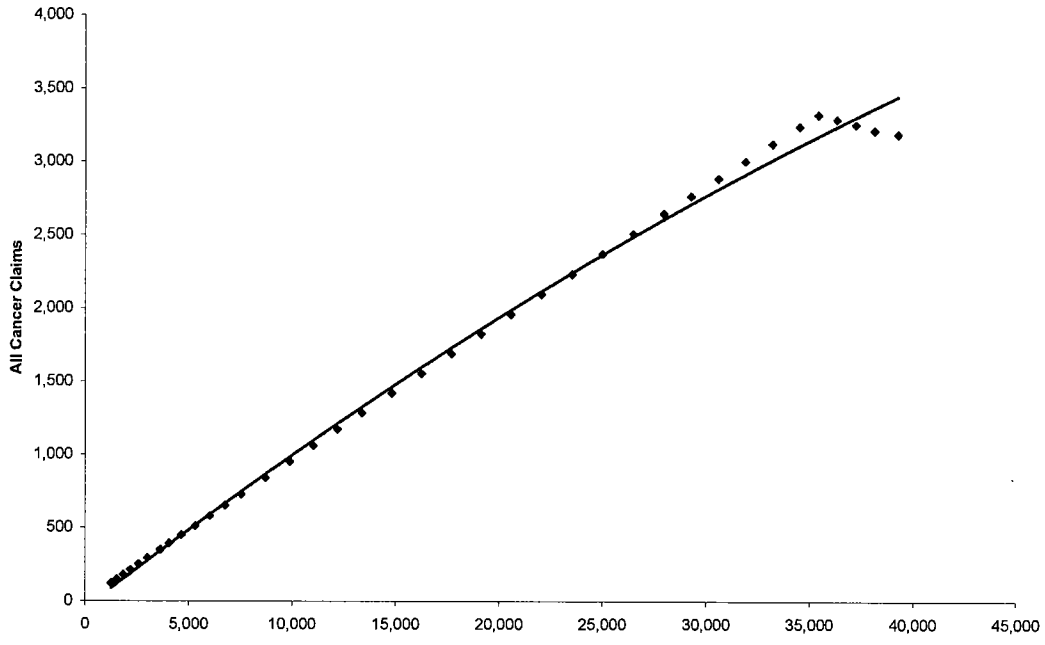
**Figure 3**
**Comparison of Percentage Changes in**
**Non-Malignant Claims Versus Nicholson's Cancer Incidence**
**1985 - 2000**




Source: Peterson Report, Table 29 and Table C1.

64. Moreover, while Dr. Peterson's revised method for projecting future non-malignant claims based on cancer incidence (as opposed to cancer claim filings) was supposed to account for his assertion that the historical ratio of nonmalignant claim filings to cancer claim filings has recently been disturbed, it does not. A simple ratio of Dr. Peterson's projected non-malignant claims and projected cancer claims in this matter exhibits exactly the stable relationship that he claims has been disrupted. (See Table 4). Graphically, this can be seen by plotting Dr. Peterson's predicted number of cancer claims and non-malignant claims. (See Figure 4).

**Figure 4**
**Peterson's Predicted Number of Cancer and Non-Malignant Claims**
**2002-2039**




Source: Peterson Report, Table C3.

**2. Dr. Peterson Employs Arbitrary Adjustments To Account For The Effect of Tort Reform.**

65. Although Dr. Peterson recognizes the importance of tort reform to his forecasts (see, e.g., Peterson, p. 12), he incorporates tort reform into his analysis in arbitrary, and potentially unreasonable, ways. Dr. Peterson acknowledges that tort reform will likely reduce the overall amount of asbestos litigation, and thus the number of asbestos claims that Grace would face.[22] Rather than modeling this process to determine the magnitude of this reduction, Dr. Peterson simply makes *ad hoc* assumptions such as "Grace's nonmalignant claim filings would have been 30 percent below its pre-petition (2000-2001) levels" (Peterson, p. ES-2). However, Dr. Peterson provides no evidence to support the validity of these assumptions.

66. Second, Dr. Peterson makes no adjustment to Grace's claim values despite existing empirical evidence demonstrating that tort reform reduces claim values. For example, as discussed in Browne and Puelz (1999), Appendix B, the authors find that caps on non-economic damages reduce litigated values by 13 to 19 percent. Dr. Peterson ignores such findings, and instead assumes that claim values will be completely unaffected by tort reform. To defend this assumption, Dr. Peterson argues that tort reforms, by culling out the weakest claims, could actually be expected to increase the average value of remaining claims that survive dismissal. This argument conflates two ideas that have not been proven to be directly related: the value of the claim and the standard of medical proof. Most importantly, this issue illustrates what Dr. Peterson

[22] Dr. Peterson states "we must adjust our analyses to reflect changes that have occurred in the litigation environment during the six years since Grace's petition date" (Peterson Report, p. 12).

should have, but did not, do. Having formulated an hypothesis, Dr. Peterson failed to create a model and test it on the data.[23]

67. Therefore, Dr. Peterson applies *ad hoc* and arbitrary adjustments to his estimates of Grace's future claims as a means of accounting for the effect of tort reform without providing any evidence of their validity. As a result, his forecasts are unreliable, and likely (given his assumption that tort reform will not affect claim values) overstate Grace's asbestos future asbestos-related claim payments.

**D. Dr. Peterson Fails to Perform True (Or Useful) Sensitivity Analyses.**

68. Dr. Peterson titles Section 7 of his report, "Sensitivity Analyses." The purpose of a sensitivity analysis is to determine whether forecast results hold when crucial assumptions are altered; for example, assumptions about which factors are important, how basic relationships between factors should be estimated, and so forth. If one finds that changes in crucial assumptions produce only small changes in the forecasts – i.e., the forecasts are not "sensitive" to any particular assumption – one can be more confident in the reliability of the forecasts.

69. Dr. Peterson's "sensitivity analyses" are not sensitivity tests at all, as his tests involve altering only a small set of assumptions (the "adjustments" he had made in an *ad hoc* fashion). Therefore, Dr. Peterson fails to employ any methodology to justify his estimation approach or empirically verify his assumptions. As a result, he does not rigorously test his methodology. As stated previously, Dr. Peterson is extrapolating over a potentially unrepresentative period and ignoring endogenous relationships. Dr.

[23] In fact, when Browne and Puelz investigated the impact of various types of tort reforms on average claim values, they found that the final settlement values either increased or decreased depending on the nature of the reform.

Peterson fails to address the question of how his forecast changes if he uses an earlier or longer time period, or how his results would change if endogeneity were properly accounted for.

70. Once again, Dr. Peterson's basic problem is that he fails to develop an underlying model. Without an underlying model of the process by which asbestos claims and claim values are generated, he cannot conduct a true sensitivity analysis – he has no basis from which to proceed. Because he has not specified which factors matter and how they matter, he cannot analyze the effect of treating them differently; for example, allowing them to change at different rates, or altering the nature of the assumed relationships among (or between) factors and his outcomes of interest (litigation rates, propensity to sue, settlement values).

71. Sensitivity analysis requires an understanding of the basic mechanism determining the outcomes – when one has that understanding, one can construct appropriate tests. For example, one can establish a true confidence interval, which reflects the statistical uncertainty of a given forecast. Dr. Peterson can not calculate any confidence intervals, but instead provides a simple range of possible forecasts resulting from the arbitrary alteration of arbitrary assumptions. However, he is unable to choose among them, as none are derived from an underlying causal structure that would provide the basis for a rigorously justified, or "scientific" model.

### E. Dr. Peterson Arbitrarily Claims His Forecasts Are Both Conservative And Robust

72. Throughout his report, Dr. Peterson claims his estimates are conservative. For example, in his executive summary, Dr. Peterson writes, "Our forecasts are based on

conservative assumptions and analyses that are more likely to underestimate, rather than overestimate, Grace's liabilities" (Peterson Report, p. ES-2). Similarly, Dr. Peterson writes, "we forecast such steep drops [from 2001 levels in claims paid by Grace] out of conservatism, to assure we do not overestimate the number of claims that Grace will now pay" (Peterson Report, p. 85). However, Dr. Peterson appears to use the word "conservative" merely to signify "less than 2001 levels." There is nothing inherently conservative about forecasting "steep drops" from 2001 levels, given that 2001 saw the highest number of claims and settlement values in Grace's history.

73. Dr. Peterson asserts that he is being conservative merely because he assumes that certain historic trends will not continue into the future (e.g., Peterson report, p. 21 and p.70). But since Dr. Peterson fails to account for the processes that generated the historic trends, it is impossible to judge whether his ostensibly conservative assumptions are truly conservative.

74. Dr. Peterson further asserts that his estimates are robust. In his report, Dr. Peterson presents his forecasted settlement amounts and writes of "the close correspondence among these forecasts that are based on three different methods – multiple regression, extrapolation from Grace's recent history, and comparisons to payments made by three different co-defendants—and data from four different defendants. This close correspondence provides assurance about the robustness of each of the forecasts" (Peterson Report, p. 37). In fact, the "close correspondence" among the forecasts tells us nothing about how robust the forecasts are to changes in important assumptions, which is what robustness tests typically are intended to demonstrate. The

mere fact that alternative scenarios based on arbitrary assumptions yield close results does not mean the results are robust or reliable.

**F. Dr. Peterson's Faulty Methods Render His Forecasts Unreliable and Uninformative.**

75. Dr. Peterson does not provide a well-specified model explaining the underlying factors and processes that generate the outcomes (claim levels and settlement values) that he is trying to predict. Had Dr. Peterson identified the determinants driving these outcomes, he could appropriately model any observed changes in the environment in which he is forecasting and accurately adjust for their effects (e.g. the effect of tort reform). Instead, Dr. Peterson employs a simple extrapolation method and, as a result, applies arbitrary assumptions and adjustments to his estimates to account for these observed changing factors. Finally, despite his claims, Dr. Peterson does not provide sufficient evidence that his estimates are either conservative or robust. These unsupported adjustments and assumptions highlight the inherent flaws in his methodology and provide additional reasons why his forecasts for Grace's future asbestos claims and claim values are unreliable and uninformative.

76. Lastly, the nature of Dr. Peterson's calculations – which build on each other in a cumulative fashion – means any bias imparted by one assumption is magnified by biases in others when the biases work in the same direction. As a result, an even larger bias is transmitted in the final forecasts than the biases that these individual assumptions would imply.

## V. MS. BIGGS' ANALYSES ALSO FAILS TO PROVIDE RELIABLE ESTIMATES OF GRACE'S FUTURE CLAIMS OR CLAIM VALUES

77. In her report, Ms. Biggs attempts to estimate the number and value of Grace's future asbestos-related claims under the assumption they would be filed and settled in state tort courts. Ms. Biggs' report is not well documented and thus unclear on certain fundamental points underlying her estimation procedure. This itself runs counter to the application of scientific method, which requires explicit documentation such that analysts can understand and replicate the analysis. As a result, it is difficult to provide a comprehensive opinion of such a poorly documented analysis.

78. The analysis that is explicitly set out appears to suffer from many of the same flaws as found in Dr. Peterson's report. Of crucial significance, the starting point of Ms. Biggs' estimation is a projection of the total number of asbestos claims in the United States (against all defendants), that was based in part on projections by other parties and which Ms. Biggs extrapolated forward in an unprincipled fashion. Like Dr. Peterson, Ms. Biggs appears not to model this system and instead uses a forecasting methodology based on unjustified "judgments" and simple extrapolation of past outcomes.

79. Since the environment for which she is projecting is changing, something a basic extrapolation method cannot accommodate, Ms. Biggs must take account for the effect of these changes. As a result, like Dr. Peterson, Ms. Biggs employs arbitrary assumptions and ad hoc adjustments in her estimation. Therefore, although her calculations differ at points from Dr. Peterson, Ms. Biggs' estimation methods suffer from the same fundamental flaws.

### A. Ms. Biggs Employs a Simple Extrapolation Using Arbitrary Base Values

80. As discussed in this report, claim levels and settlement values are outcomes determined by human behavior as well as certain external variables. Ms. Biggs does not model the underlying processes and factors driving these outcomes, but instead employs a simple extrapolation method using recent Grace data. For example, to project Grace's future asbestos claims filings, Ms. Biggs uses the average "propensity to sue" Grace ("Grace's share") from 1997 to 2001, calculated as the number of Grace's historical claim levels during this period as a fraction of her estimated total claims filed in asbestos litigation, by state (Biggs Report, p. 49). Ms. Biggs provides no evidence, or underlying theoretical support, that this specific average is an accurate measure of the propensity to sue Grace in the future. Furthermore, she provides no justification as to why this metric will remain constant in the changing future environment.

81. Similarly, to project future average settlement values, Ms. Biggs considers several alternative average settlement values based on various historical group of years. She arbitrarily chooses a base value calculated as the 1998-2001 trended average settlement value paid by Grace even though she recognizes "that the averages [based on 1998-2001] are highest for this group of years" (Biggs Report, p. 60). She argues that the "1998 – 2001 trended averages are a reasonable base for future average payments, given that I have made no explicit adjustments for several factors that can reasonably be expected to have placed additional upward pressure on Grace's future settlement amounts" (Biggs Report, pp. 60-61). However, she provides no empirical evidence to

support her contention that using this highest average will be offset by not adjusting for factors that would have otherwise increased the settlement rate.

**B. Ms. Biggs Employs Arbitrary Assumptions and Adjustments**

82. Ms. Biggs attempts to incorporate the effect of changes in the environment into which she is projecting in order to estimate future claim levels and settlement values. However, because Ms. Biggs does not model these changes she cannot reliably account for their effect, but rather she employs arbitrary adjustments with no evidence to support their validity.

**1. Ms. Biggs Makes Arbitrary and Unsound Adjustments for Tort Reform**

83. Ms. Biggs acknowledges in her report that "…the asbestos litigation environment has undergone significant changes over the last several years."[24] To incorporate these changes into her forecasts, Ms. Biggs projects an increase in the dismissal rates for nonmalignant claims from Grace's historical level for claims. However, Ms. Biggs provides no evidence regarding the reliability of the magnitude of these decreases. Further, Ms. Biggs assumes these tort reforms will have no effect on the dismissal rate of malignant claims, an assertion for which she provides no justification.

84. Unlike Dr. Peterson, Ms. Biggs acknowledges that tort reform will likely affect future settlement values. Despite this acknowledgement, however, Ms. Biggs still applies an arbitrary assumption as to the effect. She assumes a 10% reduction in average settlement values from 2003 to 2005 due to tort reform.[25] Ms. Biggs provides no

[24] Biggs Report, p15.

[25] Ms. Biggs states that she imposes "a decline in the average claim values from 2003 to 2005 of 10% per year to reflect changes in the tort system" (Biggs Report, p. 61).

theoretical or empirical basis for either this 10% reduction or the limitation of this effect to the three years.

85. Finally, like Dr. Peterson, Ms. Biggs makes the assumption that tort reform will have no effect on individuals' claiming behavior. Ms. Biggs admits that certain jurisdictions have adopted "laws relating to case consolidation and forum, tightening restrictions regarding the connection between a plaintiff and the venue of the case" (Ms. Biggs, p. 15). Given that several states have recently adopted venue reform, it is likely that the incentives to file claims in these states will decrease going forward.

86. In sum, when accounting for these changes in the asbestos litigation environment, Ms. Biggs applies *ad hoc* adjustments to her estimates of Grace's future claim levels and settlement values without modeling the effect of changes in litigation environment on incentives to litigate.

### 2. Ms. Biggs Employs Arbitrary Assumptions Regarding the Growth of Future Settlement Values

87. Ms. Biggs assumes a growth pattern for average settlement values, from an adjusted 2001 base value, but provides no evidence to justify the validity of her assumptions. As she states in her report "I applied the historical trends for each disease type selected above (e.g. 40% for mesothelioma) through the 2002 Settled Year. I then impose a decline in the average claim values from 2003 to 2005 of 10% to reflect changes in the tort system, relating to venue restrictions and joint and several liability. I then assume a 1% increase per year for five years beginning in 2006, relating to expected increases in plaintiff demands. I assume a 3% annual increase each year to reflect inflation and I also assume there will be a 1% annual reduction in claim values beginning

in 2006 for 15 years to reflect lower expected awards as claimants age."[26] Like her other adjustments, Ms Biggs never provides evidence to support why these different growth rates are valid. For example, she provides no evidence as to why plaintiffs did not already seek maximum awards in the historical data from which she is projecting or why these changes warrant a 1% increase for five years. Finally, Ms. Biggs provides no justification either for why the decline from aging claimants should equal 1% and why this aging population does not affect settlement values until 2006.

### C. Ms. Biggs' Faulty Methods Render Her Forecasts Unreliable and Uninformative.

88. Ms. Biggs uses a simple extrapolation method with arbitrary adjustments to project Grace's future asbestos-related claim levels and settlement values. For precisely the same reasons outlined above regarding Dr. Peterson's estimation methodology, Ms. Biggs' extrapolation methods are insufficient and fail to meet basic econometric criteria for sound estimation. Ms. Biggs' approach does not follow scientific or any reliable methodology for forecasting these outcomes, given both the changing legal environment and changing economic incentives affecting the choices of the participating agents. As a result, Ms. Biggs' forecasts of Grace's future asbestos claims and claim values are unreliable and uninformative.

[26] Biggs Report, p. 61.

## VI. GRACE'S FUTURE CLAIMS AND CLAIM VALUES UNDER TORT LAW WOULD NOT BE RELIABLE ESTIMATES OF GRACE'S FUTURE CLAIMS AND CLAIM VALUES UNDER BANKRUPTCY LAW

89. Both Dr. Peterson and Ms. Biggs state that they are forecasting methods under the assumption that the future claims and claim values they estimate would be settled in a state tort system.[27] Therefore, despite the fact that neither Dr. Peterson nor Ms. Biggs reliably model the processes and factors that determine these outcomes, their estimates implicitly depend on measuring the processes and factors that generate claim levels and settlement values in a tort system. Further, the data from which both experts extrapolate were also generated in a world governed by tort law. However, I am advised that the procedures and legal standards that will be applied in the bankruptcy context are materially different from those of the tort system but for the bankruptcy.

90. For example, I have been told to assume that under the bankruptcy process, both pending and future asbestos claims will be evaluated applying stricter standards than have generally been applied in state courts. Many claims that Grace settled in the past may not satisfy these stricter standards and, therefore, would have had substantially different expected values under a bankruptcy court. The resulting reduction in expected claim values likely would result in a substantial reduction in claims. Thus, claims and claim values in a bankruptcy context could not be extrapolated from predictions under the tort world, even if those predictions were accurate and reliable.

91. In general, the underlying processes and factors that would generate future claim values and claim level outcomes in a bankruptcy court are different from those that generated the observed outcomes in the past. To reliably account for these changes, an

[27] See Peterson Report, p. 9 and Biggs Report, p. 5.

accurate estimation method should model all these changes reflecting the new environment.

92. I have shown that Dr. Peterson and Ms. Biggs have not produced reliable projections for even what they purport to estimate – Grace's total asbestos liability but for the bankruptcy. To the extent the appropriate inquiry is instead to estimate Grace's liability under a bankruptcy regime, their estimates are even more unreliable because they fail to account for the changes in these underlying determinants when forecasting outcomes realized in a bankruptcy environment.

My work is ongoing and I reserve the right to modify this report as new information becomes available between now and the time of trial. I also anticipate that I may be asked to offer opinions about other expert reports that I have not yet received.

James J. Heckman

September 25, 2007

APPENDIX A: TABLES

**Table 1**
**Number of Filings against Grace, by Filing Year and Disease Claim Type**

| Filing Year | Mesothelioma | Lung Cancer | Other Cancer | All Cancers | Non-Malignant |
|---|---|---|---|---|---|
| 1996 | 652 | 1,574 | 550 | 2,776 | 34,454 |
| 1997 | 634 | 1,238 | 361 | 2,233 | 23,651 |
| 1998 | 574 | 887 | 292 | 1,753 | 18,302 |
| 1999 | 675 | 1,114 | 313 | 2,102 | 20,295 |
| 2000 | 1,159 | 1,690 | 463 | 3,312 | 40,079 |
| % Change 1996-1998 | | | | -37% | -47% |
| % Change 1998-2000 | | | | 89% | 119% |

Source: Peterson Report, Table 29.
Note: "All Cancers" is the sum of Mesothelioma, Lung Cancer and Other Cancer.

**Table 2**
**Settlement Values Paid by Grace, by Year and Disease Claim Type**

| Year | Mesothelioma | Lung Cancer | Other Cancer | Non-Malignant |
|---|---|---|---|---|
| 1990 | 28,498 | 24,916 | 5,736 | 4,598 |
| 1995 | 43,987 | 8,215 | 5,301 | 2,186 |
| 2000 | 90,952 | 17,682 | 9,767 | 3,328 |
| % Change 1990-1995 | 54% | -67% | -8% | -52% |
| % Change 1995-2000 | 107% | 115% | 84% | 52% |

Source: Peterson Report, Table 9.

**Table 3**
**Trends in Settlement Averages for Grace and Peterson's "Comparable" Asbestos Defendants**

| Year | Grace | USG | Quigley | T&N |
|---|---|---|---|---|
| I. Mesothelioma | | | | |
| 1996 | 27,484 | 21,794 | | 33,563 |
| 1997 | 26,537 | 25,532 | 20,036 | 50,700 |
| 1998 | 63,774 | 36,072 | 20,927 | 50,812 |
| 1999 | 49,586 | 34,314 | 29,238 | 61,235 |
| 2000 | 90,952 | 59,856 | 46,857 | 86,022 |
| 2001 | 97,839 | 221,745 | 188,031 | 194,051 |
| 2002 | | | 163,311 | |
| 2003 | | | 206,643 | |
| 2004 | | | 263,118 | |
| % Change 1996-2001 | 256% | 917% | 838% | 478% |
| II. Lung Cancer | | | | |
| 1996 | 9,780 | 5,389 | | 12,767 |
| 1997 | 8,255 | 7,269 | 7,874 | 13,609 |
| 1998 | 11,892 | 7,303 | 5,684 | 12,646 |
| 1999 | 11,515 | 6,749 | 5,926 | 12,009 |
| 2000 | 17,682 | 10,286 | 8,288 | 14,274 |
| 2001 | 18,290 | 35,624 | 31,404 | 29,836 |
| 2002 | | | 22,804 | |
| 2003 | | | 31,237 | |
| 2004 | | | 25,006 | |
| % Change 1996-2001 | 87% | 561% | 299% | 134% |

Source: Peterson Report, Table 10.
Note: Quigley's percentage change is calculated for 1997-2001.

**Table 4**
**Forecasts of the Number of Grace Filings, by Year and Disease Claim Type**

| Filing Year | Mesothelioma | Lung Cancer | Other Cancer | All Cancers | Non-Malignant | Non-Malignant to All Cancers Ratio | Total |
|---|---|---|---|---|---|---|---|
| 2001 (3/4) | 809 | 1,239 | 341 | 2,389 | 29,453 | 12 | 31,842 |
| 2002 | 1,079 | 1,652 | 454 | 3,185 | 39,271 | 12 | 42,456 |
| 2003 | 1,160 | 1,584 | 466 | 3,210 | 38,133 | 12 | 41,342 |
| 2004 | 1,237 | 1,532 | 480 | 3,249 | 37,226 | 11 | 40,474 |
| 2005 | 1,313 | 1,480 | 492 | 3,285 | 36,319 | 11 | 39,604 |
| 2006 | 1,389 | 1,428 | 501 | 3,318 | 35,412 | 11 | 38,730 |
| 2007 | 1,384 | 1,374 | 481 | 3,239 | 34,505 | 11 | 37,743 |
| 2008 | 1,352 | 1,309 | 459 | 3,120 | 33,196 | 11 | 36,316 |
| 2009 | 1,321 | 1,243 | 437 | 3,001 | 31,888 | 11 | 34,889 |
| 2010 | 1,290 | 1,178 | 414 | 2,882 | 30,579 | 11 | 33,461 |
| 2011 | 1,259 | 1,112 | 392 | 2,763 | 29,271 | 11 | 32,034 |
| 2012 | 1,228 | 1,047 | 370 | 2,645 | 27,962 | 11 | 30,607 |
| 2013 | 1,174 | 985 | 348 | 2,507 | 26,487 | 11 | 28,993 |
| 2014 | 1,121 | 924 | 325 | 2,370 | 25,011 | 11 | 27,380 |
| 2015 | 1,067 | 862 | 302 | 2,231 | 23,535 | 11 | 25,767 |
| 2016 | 1,014 | 800 | 280 | 2,094 | 22,059 | 11 | 24,153 |
| 2017 | 961 | 739 | 257 | 1,957 | 20,584 | 11 | 22,540 |
| 2018 | 906 | 679 | 237 | 1,822 | 19,143 | 11 | 20,965 |
| 2019 | 852 | 619 | 216 | 1,687 | 17,703 | 10 | 19,390 |
| 2020 | 798 | 559 | 196 | 1,553 | 16,263 | 10 | 17,816 |
| 2021 | 744 | 499 | 175 | 1,418 | 14,822 | 10 | 16,241 |
| 2022 | 690 | 440 | 155 | 1,285 | 13,382 | 10 | 14,666 |
| 2023 | 636 | 397 | 140 | 1,173 | 12,213 | 10 | 13,386 |
| 2024 | 583 | 354 | 125 | 1,062 | 11,044 | 10 | 12,107 |
| 2025 | 530 | 312 | 110 | 952 | 9,875 | 10 | 10,827 |
| 2026 | 476 | 269 | 95 | 840 | 8,707 | 10 | 9,547 |
| 2027 | 423 | 226 | 80 | 729 | 7,538 | 10 | 8,267 |
| 2028 | 382 | 201 | 71 | 654 | 6,756 | 10 | 7,410 |
| 2029 | 341 | 178 | 63 | 582 | 6,006 | 10 | 6,588 |
| 2030 | 303 | 156 | 56 | 515 | 5,311 | 10 | 5,826 |
| 2031 | 267 | 136 | 48 | 451 | 4,647 | 10 | 5,098 |
| 2032 | 234 | 118 | 42 | 394 | 4,054 | 10 | 4,447 |
| 2033 | 204 | 111 | 36 | 351 | 3,629 | 10 | 3,980 |
| 2034 | 177 | 86 | 31 | 294 | 3,019 | 10 | 3,313 |
| 2035 | 153 | 73 | 26 | 252 | 2,586 | 10 | 2,837 |
| 2036 | 130 | 61 | 21 | 212 | 2,180 | 10 | 2,393 |
| 2037 | 111 | 51 | 18 | 180 | 1,835 | 10 | 2,014 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2038 | 93 | 41 | 15 | 149 | 1,522 | 10 | 1,671 |
| 2039 | 78 | 33 | 12 | 123 | 1,257 | 10 | 1,380 |

Source: Peterson Report, Table C3.

Note: "All Cancers" is the sum of Mesothelioma, Lung Cancer and Other Cancer.

APPENDIX B: LITERATURE SUMMARY

1. Dr. Peterson and Ms. Biggs both ignore the academic literature that models individual and firm choices in response to changes in laws or the legal environment. There are standard models in the law and economics literature, directly related to the outcomes Dr. Peterson and Ms. Biggs are attempting to estimate, that model an individual's decision to file a claim and published articles in which this standard model is empirically estimated. There are also many other areas in the economic literature that explore individuals' incentives and responses to changes in the legal environment. In this section, I briefly summarize some of these articles.

## A. The Economic Model of Claim Filing, Settlements and Litigation

2. In Cooter and Rubinfeld (1989), the authors develop a model of litigation, drawing from earlier articles, that includes an exposition of an individual's initial decision to file a claim based on the expected costs and benefits that would result from such a claim. [1] The expected value of the legal claim is a function of the probability that the claim goes to trial and the expected award from a trial, the probability that the claim is settled and the expected settlement, the individual's costs of going to trial or settling, and the defendant's costs of going to trial. Their model implies that the benefit or value of a legal claim is increasing in the expected awards (through trial and settlement) and the probability that the case is settled (because the individual will only settle if it is

1. The authors cite Landes (1971), Posner (1973), Schavell (1982a) and others.

better for them than going to trial) and decreasing in the individual's costs of going to trial or bargaining in a settlement.[2] When deciding whether or not to file a claim, an individual weighs this value against the cost of asserting the claim.

3. Other published papers have attempted to measure empirically the effects of these parameters on an individual's decision to sue. Browne and Puelz (1999) use the cost/benefit model of litigation to test the effect of explicit tort reforms on claim values and individuals' propensity to sue after an automobile accident. The authors find statistically significant effects of tort reform on various outcomes. For example, they find that caps on non-economic damages are associated with a 19% decline in average non-economic claims and 13% reduction in total claim value. By reducing the expected value of a claim, this reform would also affect an individual's propensity to file a claim in the first place. Consistent with this theory, the authors find that caps on non-economic damages reduce the average probability that an individual will file a claim by 65%. Similarly, Schmit, Browne and Lee (1997) empirically test the effect of tort reform on tort filing rates in 19 states from 1984-1990. The authors find that reform variables involving frivolous lawsuits and caps on non-economic damages are negatively related to per capita claim filings.

## B. The Economic Effects to Changes in the Legal Environment

4. In addition to existing economic literature modeling the incentives to file claims and those examining the effect of tort reforms, many other papers identify

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2. The defendant's costs enter into the model through its effect on the expected award. Therefore, the value of the legal claim is decreasing in the defendant's costs as these costs reduce the expected trial outcome.

and/or measure the effect of other kinds of changes in the legal environment. These include the effect of changing labor laws and the effect of tax regime changes.

### 1. The Effect of Labor Laws on Firm Behavior

5. Ashenfelter and Heckman (1976) and Heckman and Wolpin (1976) examine the effect of affirmative action on employment of minorities. These two papers, with the latter building on the former, examine the effect of the minority requirements, for firms awarded government contracts, set out by the Office of Federal Contract Compliance (OFCC) on the employment status of Black males and other minorities and whether any of these measured changes translated into an increase in welfare for these groups. The question these papers answer highlights the importance of understanding and building a theoretical model with which to interpret their empirical results. For example, assume a large enough number of firms exist to satisfy government needs, that these firms already (costlessly) meet the racial requirements, and that government contracts are awarded competitively. Even if one observed a higher percentage of minorities in contract-awarded firms, the OFCC may have had no effect on the hiring of minorities, as these firms met the requirements without additional hiring. On the other hand, if all firms increased their hirings of minorities in anticipation of a contract, then the measured difference could underestimate the true effect. After establishing a proper model, the authors measure a statistically significant effect on minority hiring. However, this increase in employment appears to be concentrated in the blue-collar or operations jobs in these firms.

6. Oyer and Schaeffer (2000) examine the effect of the 1991 Civil Rights Act ("CRA") on firm firing behavior. The CRA contains a number of provisions that increase the expected award from filing a wrongful termination lawsuit, including allowing an individual to now sue for punitive damages in addition to lost wages. The authors present evidence that discrimination litigation has increased since the enactment of the law. They further claim that firms face greater exposure to employment discrimination litigation when dismissing a worker for cause then when dismissing a worker as part of a mass layoff. After specifying a theoretical model, the authors present empirical evidence that firms have increased their use of mass layoffs as a substitute for individual firings.

7. Autor, Donohue and Schwab (2006) estimate the effect of common-law exceptions, adopted by U.S. State courts, to the employment-at-will doctrine that limited employers' ability to fire. These exceptions are the tort of wrongful discharge in violation of public policy, the implied covenant to terminate only in good faith and fair dealing, and the implied-in-fact contract not to terminate without good cause. All three provisions make it more difficult for a firm to fire an individual. Increasing the cost to firing an employee increases the expected costs of hiring an employee. Using data on individuals from the Current Population Survey, the authors find a significant effect of the implied contract law on state employment. They estimate that this provision reduced state employment rates by 0.8-1.7%.

8. Neumark and Wascher (2004) examine the often estimated effect of minimum wage laws across 17 OECD countries, focusing specifically on the

effect of these laws on the employment of youth. Raising the minimum wage increases an employer's costs and would create an incentive to reduce their employment. Low-skilled workers (e.g. young individuals) would be most affected. The authors find a statistically significant effect of these laws on youth employment, although the effect appears to be mitigated in countries with sub-minimum wage provisions for youth.

9. DeLeire (2000) examines firms' responses to the American with Disabilities Act ("ADA") of 1990. The employment provision of the ADA requires employers of disabled persons to provide reasonable accommodations. Additionally, employers are prohibited from discriminating against disabled persons in terms of wages and employment. These provisions raise employers' costs to hiring an individual with disabilities. Deliere presents evidence that the employment of disabled persons declined as early as 1990 and continued to decline through the beginning of 1995. He estimates that, subsequent to its enactment, the ADA indeed reduced the employment of disabled persons by 7.2% on average.

### 2. The Effect of Tax Laws and Tax Regimes

10. Economic theory predicts that individuals and firms respond to changes in tax laws and tax regimes. For example, much attention has been paid to estimating the effects of taxation on labor supply in the economics literature. It is well established that income taxes reduce an individual's incentive to work and

result in deadweight loss. That magnitude of this loss, however, is still being estimated today.[3]

11. Zilliak and Kniesner (1999) build an econometric model that estimates the intertemporal wage effects on individuals' labor supply. Using their estimates, the authors simulate that two recent tax reforms (Economic Recovery Tax Act and the Tax Reform Act of 1986 ("TRA")) stimulated male labor supply by 3 percent.

12. Auerbach and Slemrod (1997) discuss the basic tenets of the TRA and summarize the empirical economic studies that examined the effect of this tax reform on labor supply. Like Zilliak and Kniesner (1999), most studies found that the reduction in the marginal tax rate stimulated labor supply for both men and women, although this effect is mitigated by other provisions of the TRA that effectively diminished the reduction in the marginal tax rate. The authors also discuss the effect of TRA on capital gains realization behavior. For example, TRA eliminated a previous 60% exclusion of long-term capital gains subjecting 100% of these gains to full inclusion in income going forward (which, of course, was partially offset by the reduction in the marginal tax rate). However, although signed into law in October of 1986, the increase did not take effect until January 1, 1987. The authors then cite a study that determined that the long-term capital gains on corporate stock in December of 1986 were seven times their level in 1985.

13. Goolsbee (2000) investigates the impact of Internet taxation policies on commerce, since most Internet transactions do not charge a sales tax for

[3] See Ziliak and Kniesner (2005) for a discussion on the history of this literature.

purchases. His results indicate that Internet sales are highly sensitive to local taxation policies as individuals who live in high sales tax locations are significantly more likely to buy over the Internet.

14. Heckman, Lochner and Taber (1998) develop a general equilibrium model to test the effects on skill formation from changes from progressive taxes to flat income and consumption taxes. Their complex model allows for, among other factors, schooling choices, investments in on-the-job training, and heterogeneity among individuals in ability, endowments, skills, and age. The authors find that progressive wage taxes reduce individuals' incentives to accumulate human capital, since the resulting earnings growth moves these individuals into higher tax brackets. Moving to a flat tax regime changes these predictions. The authors emphasize that the effects from flat taxes depend heavily on whether the model is a partial equilibrium model, one in which skill prices and interest rates are fixed, or a general equilibrium model, one in which these factors are allowed to adjust. Specifically, the incentive to invest in human capital under a flat tax regime is greatly muted when prices are allowed to change. Therefore, simply measuring the effect of a tax regime change using a partial equilibrium model can be a misleading guide when analyzing and trying to predict these effects.

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**Email: jjh@uchicago.edu**

## Personal

**Date of Birth:** April 19, 1944

**Place of Birth:** Chicago, Illinois

## Education

B.A. 1965 (Math) Colorado College (summa cum laude)
M.A. 1968 (Econ) Princeton University
Ph.D. 1971 (Econ) Princeton University

### Dissertation

"Three Essays on Household Labor Supply and the Demand for Market Goods."
**Sponsors:** S. Black, H. Kelejian, A. Rees

### Graduate and Undergraduate Academic Honors

Phi Beta Kappa
Woodrow Wilson Fellow
NDEA Fellow
NIH Fellow
Harold Willis Dodds Fellow

## Post-Graduate Honors

### Honorary Degrees and Professorships

Doctor Honoris Causis, University of Montréal, May 2004.

Doctor Honoris Causis, Bard College, May 2004.

Honorary Professor, Wuhan University, Wuhan, China, 2003.

Doctor Honoris Causis, UAEM, Mexico, January 2003.

Doctor Honoris Causis, University of Chile, Fall 2002.

Honorary Doctor of Laws, Colorado College, 2001.

Honorary Professor, Huazhong University, Wuhan, China, 2001.

Honorary Member, Latin and Caribbean Economic Association, 1999.

Honorary Professor, University of Tucuman, October, 1998.

## Awards

Bank of Sweden Prize in Economic Sciences in Honor of the Memory of Alfred Nobel, 2000.

Theodore W. Schultz Award, American Agricultural Economics Association Foundation, January 2007.

Ulysses Medal, University College Dublin, 2006.

Dennis J. Aigner Award for Applied Econometrics, *Journal of Econometrics*, 2005.

Jacob Mincer Award for Lifetime Achievement, Society of Labor Economics, 2005.

Medal, Center for Early Child Development for "Exceptional Contributions to Childhood Development", May 2004.

Elevated to Distinguished Service Professorship, University of Chicago, 1995–.

A. Whitney Griswold Professor of Economics, Yale University, 1988–1990.

Henry Schultz Professor of Economics, University of Chicago, 1985–.

Statistician of the Year, Chicago Chapter of the American Statistical Association, 2002.

First Annual Louis T. Benezet Distinguished Alumnus Award, Colorado College, 1985.

Irving Fisher Professor, Yale University, Fall 1984.

John Bates Clark Medal (American Economics Association), 1983.

## Fellowships

Fellow, Society of Labor Economics, 2005–.

Fellow, *Journal of Econometrics*, 2005–.

Elected Member, National Academy of Sciences, 1992–.

Elected Fellow, American Academy of Arts and Sciences, 1985–.

Fellow, American Statistical Association, 2001.

Senior Research Fellow, American Bar Foundation, 1991–.

Fellow, Econometric Society, 1980.

John Simon Guggenheim Memorial Fellowship, 1978–1979.

Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford University, 1978–1979.

Social Science Research Council Training Fellow, 1977–78.

Harry Scherman Fellow, National Bureau of Economic Research, 1972–1973.

## Major Invited Lectures

1. "The Technology of Building Human Capacities: Lessons for Public Policy," Building Blocks Conference, Alberta, Canada, May 2007.

2. Keynote Address, "Investing in Disadvantaged Young Children Is Good Economics and Good Public Policy,"National Summit on America's Children, Washington D.C., May 2007.

3. "The Economics, Technology and Neuroscience of Human Capability Formation," Allostasis/Allostatic Load Conference, Princeton University, May 2007.

4. "Left Behind: the GED and America's Dropout Problem," Brookings Institution, Hamilton Project Forum: The Role of Education in Promoting Opportunity and Economic Growth, Washington D.C., March 2007.

5. Plenary Address, "The Evolution of Labor Earnings Risk in the U.S. Economy," 4$^{th}$ International Finance Conference in Collaboration with Université Cergy-Pontoise, REMEREG and ISC Paris, Diar el Medina, Tunisia, March 2007.

6. Theodore W. Schultz Lecture, "The New Economics of Child Quality," American Economic Association, January 2007.

7. Keynote Address, "What Lessons Should China Learn from European Welfare States?" WEAI Pacific Rim Conference, Beijing, China, January 2007.

8. Max Weber Lecture, "The Economics of Human Development," European University, Florence, Italy, October 2006.

9. Koopmans Lectures, "Cowles Commission Structural Models, Causal Effects and Treatment Effects: A Synthesis," "Instrumental Variables: Then and Now," and "The Evolution of Labor Earnings Risk in the US Economy," Cowles Foundation, Yale University, September 2006.

10. Michelson Memorial Lecture, "Skills, Schools and Synapses," US Naval Academy, September 2006.

11. Conway Institute Lecture, "The Technology and Neuroscience of Skill Formation," University College Dublin, June 2006.

12. Ulysses Medal Lecture, "The Economics of Child Development," University College Dublin, June 2006.

13. Invited Lecture, "Understanding Instrumental Variables in Models with Essential Heterogeneity," "Econometric Evaluation of Public Policies : Methods and Applications" Conference, Center for Research in Economics and Statistics, Paris, December 2005.

14. Inaugural Lecture, "Credit Constraints, Family Constraints and Optimal Policies to Reduce Inequality and Promote Productivity," Geary Institute, University College Dublin, April 2005.

15. Richard Ely Distinguished Lecturer, Johns Hopkins University, April 2005. Talks: "Inequality in America: What Role for Human Capital Policies?" "Understanding Inequality: Separating Uncertainty from Heterogeneity in Life Cycle Earnings," "Match Bias and Economic Returns to the GED," "Understanding Instrumental Variables in Models with Essential Heterogeneity," "The Importance of Cognitive and Noncognitive Skills in Explaining a Variety of Socioeconomic Outcome Measures"
16. Hicks Lecture, Oxford University, April 2004.
17. Keynote Lecture, Great Hall of the People, Beijing, December 2003 (Major Lecture on China's Investment in Human Capital at Renmin University's Anniversary Celebration).
18. Nobel Symposium Lecturer, St. Petersburg, Russia, June 2003.
19. Munich Economic Summit, Munich, May 2003.
20. European Society for Population Economics, 2003.
21. Keynote Lecture, Tinbergen Centenary, Rotterdam, April 2003.
22. W.P. Carey Lecture, Colorado College, February 2002.
23. Miguel Sidrauski Lecture, Latin American Econometric Society Meetings, Sao Paulo, 2002.
24. Tinbergen Lecture, Royal Dutch Economics Association, October 2002.
25. Walras-Pareto Lectures, University of Lausanne, October 2002.
26. Gorman Lectures, University College, London, Fall 2001.
27. Klein Lecture, University of Pennsylvania, October 2001.
28. Review of Economics and Statistics Lecture, April 2001.
29. Economic Journal Lecture, Royal Economic Society, April 2001.
30. Jovanovich Lecture, Colorado College, February 2001.
31. Distinguished Lecture, Southern Economics Association, Washington, D.C., November 2000.
32. Fisher-Schultz Lecture, World Meeting of the Econometric Society, August 2000.
33. Yoram Ben Porath Memorial Lecture, Hebrew University, (First in series), June 2000.
34. Wildavsky Forum Lecture, University of California, Berkeley, April 1999.
35. Woytinsky Lecture, University of Michigan, October 1999.
36. Invited Lecture, Latin American Meetings of the Econometric Society, Cancun, Mexico, August 1999.
37. Invited lecturer, Econometric Society Meetings, Lima, Peru, August 1998.
38. Distinguished Lecture, Institute for Survey Research, University of Michigan, January 1998.

39. McKinley Lecturer, University of Illinois, March 1998.
40. Fishelson Memorial Lecture, Tel Aviv University, December 1998.
41. Malim Harding Lecturer, University of Toronto, October 1997.
42. Jacob Marschak Lecturer, Far Eastern Econometric Society Meetings, Hong Kong, July 25, 1997.
43. Economics Study Group, Gronigen, Holland, June 1997.
44. Invited Lecture, Latin American Econometric Society Meetings, Santiago, Chile, August 1997.
45. *Journal of Applied Econometrics* Lectures (First Lecturer in a new series established by the *Journal of Applied Econometrics*, Yale University, April 17–18, 1997).
46. Keynote Lecture, Latin American Econometric Society, Santiago Chile, August 1997.
47. Keynote Lecture, Society For Economic Dynamics and Control, Mexico City, June 27, 1996.
48. Keynote Lecture, Latin American Econometric Society, Rio de Janeiro, August 1996.
49. Keynote Speaker, American Sociological Association Meetings, New York, August 16, 1996.
50. Gilbert Lecture, University of Rochester, April 1996.
51. Seymour Harris Lectures, Kennedy School of Government, 1995. (First lecturer in a newly endowed series) Lectures to be published by Harvard University Press.
52. Distinguished Quantitative Social Science Lecture, University of Indiana, April 1996.
53. Invited Lecture, Centenary of Ragnar Frisch, First Nobel Economist, Oslo, March 1995.
54. Invited Lecture, Public Policy School, SUNY Albany, October 1994.
55. Invited Lecture, Latin American Econometric Society, Caracas, August 1994.
56. Aloysius Dunaway Memorial Lecture, Michigan State University, April 1993.
57. Carl Synder Memorial Lecture, University of California at Santa Barbara, Spring 1992.
58. H. Chase-Stone Lecture in Economics, Colorado College, 1992 (participant in three day symposium).
59. Martin Luther King Lecturer, University of Michigan, 1991.
60. Invited Lecture, Econometric Study Group, Royal Economic Society, Bristol, England, 1991.
61. Barcelona Lecture, Sixth World Econometric Society, 1990.
62. Erik Malmstens Distinguished Guest Professor of Economics, Gothenburg University, Gothenburg, Sweden, 1990.
63. Invited Major Lecture, University of Western Ontario, 1989.

64. Invited Major Guest Lecture, Joint Franco-Belgian Conference in Statistics, Toulouse, France, 1988.
65. Chung-Hua Distinguished Visitor and Academica Sinica Lectures, Taiwan, 1988.
66. Fish Lecture, Brigham Young University, 1987.
67. Harry Lyman Hooker Distinguished Visiting Professor, McMaster University, 1987.
68. Leif Johansen Lecture, University of Oslo, 1986.
69. Abbott Lecturer, Colorado College, 1985.
70. Major Lecture, Australasian Econometric Society, Sydney, Australia, 1984.

## Professional Experience

### University College Dublin

Professor of Science and Society, 2005–

### Peking University

Changjiang River Scholar Professor, 2004–

### University College London

Distinguished Chair of Microeconometrics, 2004–

### University of Chicago

Henry Schultz Distinguished Service Professor, 1995–
Henry Schultz Professor, 1985–1995
Professor of Economics, 1977–
Associate Professor, 1973–1977 (tenured, 1974)
Irving Harris School of Public Policy, 1990–
Director, Center for Social Program Evaluation, 1991–

### American Bar Foundation

Senior Fellow, 1993–

### Yale University

A. Whitney Griswold Professor of Economics, 1988–1990
Professor of Statistics, 1990
Yale Law School Lecturer, 1989–1990

**National Bureau of Economic Research**

Associate, 1971–1985, 1987–
Research Fellow, 1972–1973

**National Opinion Research Center**

Research Associate, 1979

**RAND Corporation**

Consultant 1975–1976

**Columbia University**

Associate Professor 1973–1974
Assistant Professor, 1970–1973

**New York University**

Adjunct Assistant Professor, 1972
Council of Economic Advisors
Junior Economist Advisors, 1967

**Previous Positions**

Martin-Marietta Aerospace Systems Engineer, 1965

**Other Professional Activities**

1. Director, Economic Research Center, University of Chicago
2. Director, Center for Social Program Evaluation, University of Chicago
3. President, Western Economics Association 2003 (Cycle: VP (2003–2004), President Elect (2004–2005), President (2005–2006))
4. Council, Econometric Society, 2000–2006
5. President, Midwest Economics Association, 1998.
6. *Econometrics Reviews*, Co-Editor; Associate Editor, 1987–
7. *Handbook of Econometrics* Vol. 5, Co-Editor with Ed Leamer
8. *Handbook of Econometrics* Vol. 6A, Co-Editor with Ed Leamer
9. *Handbook of Econometrics* Vol. 6B, Co-Editor with Ed Leamer
10. Econometric Society Council, 2001–2004
11. American Economics Association, Executive Committee Member, 2000–2003

12. Science, Technology and Economic Policy Board, National Research Council, Member 2000–
13. *Evaluation Review*, Associate Editor, 1991–1996
14. *Journal of Economic Perspectives*, Associate Editor, 1989–1996
15. *Review of Economics and Statistics*, Associate Editor, 1994–2002
16. Member, Advisory Board and Dean's Search Committee, School of Public Policy, University of Chicago, 1985–1988
17. Member, National Academy of Sciences Panel on the Status of Black Americans, 1985–1988
18. *Journal of Labor Economics*, Associate Editor, 1982–
19. Member, National Academy of Sciences Panel On Statistical Assessments as Evidence in the Courts, 1982–1985
20. *Review of Economic Studies*, Associate Editor, 1982–1985
21. *Journal of Political Economy*, Co-Editor, 1981–1987
22. Member, Board of Overseers, Michigan Panel Survey of Income Dynamics, 1981–1984
23. *Journal of Econometrics*, Editor of the Special Issue on Panel Data, 1981
24. Member, Advisory Board Chicago Urban League, 1980–1987
25. Academic Press Editor of Labor Economics Series, 1980–1984
26. *Journal of Econometrics*, Associate Editor, 1977–1983
27. National Science Foundation Evaluation Panel in Economics - Member, 1977–1979
28. London School of Economics, Visitor, Spring 1977, Center for Research on the Economics of Education
29. University of Wisconsin Institute for Research on Poverty, Visiting Professor, Fall 1977
30. *Annals of Economics*, Editor of special issue on the Social Measurement Analysis of Discrete Data, 1976
31. Social Science Council Research Committee on Research Methods for Longitudinal Data, 1976–1979, 1981–1982

## Students (Chair or co-chair of committee)

University of Chicago unless otherwise noted.

1. John Abowd
2. Ricardo Avelino
3. Alessandro Barbarino
4. Ricardo Barros

5. Herbert Baum
6. Andrea Beller (Columbia)
7. Christine Bellido
8. George Borjas (Columbia)
9. Stephen Cameron
10. Thomas Coleman
11. Robert Cotterman
12. Flavio Cunha
13. Eric Gould
14. Carolyn Heinrich (Harris School, University of Chicago)
15. Bo Honoré
16. Martin Ljunge
17. Lance Lochner
18. Thomas MaCurdy
19. Grecia Maruffo
20. Mauricio Mazocco
21. Salvador Navarro
22. Randall Olsen
23. Larry Olson
24. Brook Payner
25. Heleno Pioner
26. Richard Robb
27. Russell Roberts
28. Daniel Santos
29. Robert Schmitz
30. Sam Schulhofer-Wohl
31. Jeff Smith
32. Rachel Soloveichik
33. Jora Stixrud
34. Chris Taber
35. Andrea Tiseno
36. Petra Todd

37. Sergio Urzua
38. Edward Vytlacil
39. Jim Walker

## Publications

### Books

*Longitudinal Analysis of Labor Market Data*, Burton Singer (ed), Cambridge: Cambridge University Press, 1985.

*Handbook of Econometrics*, Vol 5 (with E. L. Leamer), New York: North-Holland, 2001.

*Inequality in America: What Role for Human Capital Policy?*, J. Heckman and A. Krueger, eds., Cambridge, MA: MIT Press, 2003.

*Evaluating Human Capital Policies* (Gorman Lectures), forthcoming Princeton University Press, 2004.

*Law and Employment: Lessons From Latin America and the Caribbean* (with C. Pages), University of Chicago Press, For NBER, 2004.

*Handbook of Econometrics*, Vol 6A (with E. L. Leamer), Under preparation. New York: North-Holland, forthcoming 2007.

*Handbook of Econometrics*, Vol 6B (with E. L. Leamer), Under preparation. New York: North-Holland, forthcoming 2007.

*The GED*, Under preparation, Brookings, 2007.

### Book Reviews and Op-Ed Pieces

1. "Review of *Problems and Issues in Current Econometric Practices*," *Journal of Economic Literature*, (December, 1974).
2. " 'The Cracked Bell,' Review of Herrnstein and Murray, *The Bell Curve*," *Reason*, March, 1995.
3. "Catch 'em Young: Investing in Disadvantaged Young Children is Both Fair and Efficient," *Wall Street Journal*, January 10, 2006, p. A14.

### Journal Articles

1. "A Note on Second Best Conditions for Public Goods," (with R. Nelson), *Public Finance*, 1, (1972).
2. "Empirical Evidence on the Functional Form of the Earnings-Schooling Relationship," (with S. Polachek), *Journal of the American Statistical Association*, (June 1974), 69(346), 350-354. Also, NBER, mimeo (October 1972).

3. "The Estimation of Income and Substitution Effects in a Model of Family Labor Supply," (with O. Ashenfelter), *Econometrica*, (January 1974), 42(1), 73-86. Presented at the Econometric Society Winter Meetings, (1971).

4. "Shadow Prices, Market Wages and Labor Supply," *Econometrica*, (July 1974) 42(4): 679–94.

5. "The Effect of Day Care Programs on Women's Work Effort," *Journal of Political Economy*, (March/April 1974). Reprinted in T.W. Schultz (ed.), *Economics of the Family: Marriage, Children, and Human Capital*, (University of Chicago Press, 1974), 491-518.

6. "Life Cycle Consumption and Labor Supply: An Explanation of the Relationship Between Income and Consumption over the Life Cycle," *American Economic Review*, (March 1974).

7. "A Stochastic Model of Reproduction: An Econometric Approach," (with R. Willis), *Papers and Proceedings of the American Statistical Association*, Social Statistics Section, 1974.

8. "Estimating Labor Supply Functions," (with O. Ashenfelter), in G. Cain and H. Watts (eds.), *Labor Supply and Income Maintenance*, (Chicago: Markham Publishing Company, 1974).

9. "Measuring the Effect of an Antidiscrimination Program," (with O. Ashenfelter), July 1974 mimeo, in *Evaluating The Labor Market Effects of Social Programs*, (Princeton, N.J.: Princeton University Press, 1975). Presented at the American Economic Association Winter Meetings, 1972.

10. "Estimation of a Stochastic Model of Reproduction: An Econometric Approach," (with R. Willis), in N. Terleckyj (ed.), *Household Production and Consumption*, 40, 99-145, (New York: Columbia University Press, 1976). Presented at the Conference on Research in Income and Wealth, Washington, D.C., November 1973.

11. "Simultaneous Equation Models with both Continuous and Discrete Endogenous Variables With and Without Structural Shift in the Equations," in Goldfeld and Quandt (eds.), *Studies in Nonlinear Estimation*, Ballinger, (1976).

12. "A Life Cycle Model of Earnings, Learning and Consumption," *Journal of Political Economy*, (August 1976), 84(2), pt. 2, S11-S44.

13. "Does The Contract Compliance Program Work?: An Analysis of Chicago Data," (with K. Wolpin), *Industrial and Labor Relations Review*,(Summer 1976). Presented at a Symposium on the Effect of the Office of Federal Contract Compliance on Minority Status, Cornell University, May 1975.

14. "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables," *Annals of Economic and Social Measurement*, (December 1976).

15. "Introduction," *Annals of Economic and Social Measurement*, Special issue on Discrete, Qualitative and Limited Dependent Variables, (December, 1976).

16. "New Evidence on the Dynamics of Female Labor Supply," in E. Andrews and C. Lloyd (eds.), *Women in the Labor Market.* Columbia University Press, 1978. Presented at a Labor Department Conference, "Women in the Labor Market," Columbia University, September 1977.

17. "A Partial Survey of Recent Research on the Labor Supply of Women," *AEA Papers and Proceedings*, (May 1978). Invited paper, presented to the American Economic Association, New York, 1977.

18. "An Economic Analysis of the Contract Compliance Program," *Essay in Labor Market Analysis and Economic Demography in Memory of Peter Comay*, (Halstead, 1977).

19. "The Impact of the Government on the Labor Market Status of Black Americans: A Critical Review," (with R. Butler), in L. Hausman, (ed), *Equal Rights and Industrial Relations*, Madison, Wisconsin: Industrial Relations Research Association, Ch. 9.

20. "A Beta-Logistic Model For the Analysis of Sequential Labor Force Participation by Married Women," (with R. Willis), *Journal of Political Economy*, (February 1977), 85(1), 27-58, read at the Third World Econometric Society Meetings, Toronto, 1975.

21. "Comments on 'The Labor Supply Responses of Wage Earnings in the Rural Negative Income Experiment," in J. Palmer and J. Pechman (eds), *The Labor Supply Responses of Wage Earners in Welfare in Rural Areas: The North Carolina-Iowa Maintenance Experiment*, Brookings, 1977, Presented at the Brookings Conference on Evaluating the Results of the Rural Negative Income Tax Experiment, Washington, D.C., (January, 1977).

22. "Dummy Endogenous Variables in a Simultaneous Equation System," *Econometrica*, (July 1978). Original draft, April 1973. Final draft, April 1977, 46(4), 931-959.

23. "Labor Supply Estimates for Public Policy Evaluation," (with G. Borjas), *Proceedings of The Industrial and Labor Relations Research Association*, Chicago meetings, 1978.

24. "Simple Statistical Models for Discrete Panel Data Developed and Applied to Test the Hypothesis of True State Dependence Against The Hypothesis of Spurious State Dependence," *Annals de INSEE*, Paris, (1978), 227-269, (September, Special Issue).

25. "Sample Selection Bias as a Specification Error," *Econometrica*, (February 1979), 47(1), 153-161.

26. "Reply to Mincer and Ofek," (with R. Willis), *Journal of Political Economy*, (February 1979).

27. "Sample Selection Bias as a Specification Error with an Application to the Estimation of Labor Supply Functions," March, 1977 in J. Smith (ed.), *Female Labor Supply: Theory and Estimation*, (Princeton University Press, 1980).

28. "Addendum To Sample Selection Bias As A Specification Error," in E. Stromsdorfer and G. Farkas, *Evaluation Studies Review Annual*, Vol. 5, (Sage Publications, 1980), 69-74.

29. "Does Unemployment Cause Future Unemployment? Definitions, Questions and Answers from a Continuous Time Model of Heterogeneity and State Dependence," (with G. Borjas). Special Symposium issue on Unemployment, *Economica*, (May 1980).

30. "A Life Cycle Model of Female Labour Supply," (with T. MaCurdy), *Review of Economic Studies*, 1980, XLVII, 47-74.

31. "A Life Cycle Model of Family Labor Supply," in B. Weisbrod and H.Hughes (eds), *Human Resource, Employment and Development, Proceedings of Sixth World Congress*, (IEA, McMillan, 1983).

32. "Statistical Models for Discrete Panel Data," in C. Manski and D. McFadden (eds.), *Structural Analysis of Discrete Data With Econometric Applications*, (M.I.T. Press).

33. "The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process and Some Monte Carlo Evidence," read at the National Bureau of Economic Research Conference on Panel Data, Harvard University, (August 1978). In C.Manski and D. McFadden (eds.), *Structural Analysis of Discrete Data With Econometric Applications*, (M.I.T. Press), (originally scheduled for 1979; due to delays, published in 1981).

34. "Heterogeneity and State Dependence," in S. Rosen (ed.), *Studies in Labor Markets*, (University of Chicago Press, 1981), 91-139.

35. "Current Theoretical and Empirical Studies of Labor Supply: Second Generation Studies," (with T. MaCurdy), *Research in Labor Economics*, (JAI Press Inc., 1981).

36. "Recent Theoretical and Empirical Studies of Labor Supply: A Partial Survey," with M. Killingsworth and T. MaCurdy, presented at Oxford, 1979, in Z. Hornstein (ed), *Studies of The Labor Market*, HMS Treasury, (1981).

37. "The Impact of the Minimum Wage on the Employment and Earnings of Workers in South Carolina," (with Sedlacek), in Vol. 5, *Report of the Minimum Wage Study Commission*, U.S. Government Printing Office, 225-272, (June 1981).

38. "Models for the Analysis of Labor Force Dynamics," (with C. Flinn), *Advances in Econometrics*, 1, 35-95, (New York: JAI Press, 1982).

39. "The Identification Problem in Econometric Models for Duration Data," in W. Hildenbrand (ed), *Advances in Econometrics, Proceedings of Fourth World Congress of Econometric Society*, (Cambridge University Press, 1982).

40. "Earnings and The Distribution of Income," (with R. Michael), in *Part II, Behavioral and Social Science Research, A National Resource*, (National Academy of Science Press, 1982).

41. "New Methods For Analyzing Individual Event Histories," (with C. Flinn), *Sociological Methodology*, 99-140, (Josey-Bass, 1982).

42. "New Methods for Analyzing Structural Models of Labor Force Dynamics," (with C. Flinn), *Journal of Econometrics*, 18 (1982): 115-68.

43. "Are Unemployment and out of the Labor Force Behaviorally Distinct Labor Force States?," (with C. Flinn), *Journal of Labor Economics*, 28-42, (January, 1983).

44. "The Likelihood Function For The Multistate-Multiepisode Model in 'Models For The Analysis of Labor Force Dynamics'," (with C. Flinn), in R. Bassman and G. Rhodes, (eds), *Advances in Econometrics*, 2, 225-231, (1983).

45. "Natural Monopoly," (with D. Evans), in D. Evans (ed.), *Breaking Up Bell: Essays on Industrial Organization and Regulation*, 127-156, (North Holland, 1983).

46. "Multiproduct Cost Function Estimates and Natural Monopoly Tests for the Bell System," (with D. Evans), in D. Evans, (ed.), *Breaking Up Bell: Essays on Industrial Organization and Regulation*, Chapter 10, 253-282, (North Holland, 1983).

47. "A Method for Minimizing the Impact of Distributional Assumption in Econometric Models for Duration Data," (with B. Singer), *Econometrica*, (1984), 271-320.

48. "The Identifiability of the Proportional Hazard Model," (with B. Singer), *Review of Economic Studies*, 231-241, (April, 1984).

49. "Population Heterogeneity in Demographic Models," (with B. Singer), in A. Rodgers and K. Land (eds.), *Multidimensional Mathematical Demography*, (1984), 271-320.

50. "Comments on the Ashenfelter and Kydland Papers," *Carnegie Rochester Conference Series on Public Policy*, (1984), 209-224.

51. "Econometric Duration Analysis," (with B. Singer), *Journal of Econometrics*, (January, 1984), 63-132.

52. "The $\chi^2$ Goodness of Fit Statistic For Models with Parameters Estimated From Microdata," *Econometrica*, (November, 1984), 52(6), 1543-1547.

53. "A Test for Subadditivity of the Cost Function With An Application to the U.S. Bell System," (with D. Evans), *American Economic Review*, (September, 1984), 615-623.

54. "Introduction," (with B. Singer), *Longitudinal Analysis of Labor Market Data*, (Cambridge: Cambridge University Press, 1985).

55. "Social Science Duration Analysis," (with B. Singer), *Longitudinal Analysis of Labor Market Data*, (University Press, 1985).

56. "A Simultaneous Equations Linear Probability Model," (with T. MaCurdy), *Canadian Journal of Economics*, (January, 1985), XVIII(1), 28-37.

57. "Alternative Methods for Estimating The Impact of Interventions," (with R. Robb), presented at Social Science Research Council Conference, Mt. Kisco, N.Y., October, 1978. In J. Heckman and B. Singer (eds.), *Longitudinal Analysis of Labor Market Data*, (Cambridge University Press, 1985).

58. "New Evidence on the Timing and Spacing of Births," (with J. Hotz and J. Walker), *American Economic Review*, (May, 1985), 179-184.

59. "Using Longitudinal Data to Estimate Age, Period and Cohort Effects in Earnings Equations," (with R. Robb), in William M. Mason and Stephen E. Fienberg, (ed),

*Cohort Analysis in Social Research Beyond the Identification Problem*, (Springer-Verlag New York Inc., 1985).

60. "Heterogeneity, Aggregation and Market Wage Functions: An Empirical Model of Self-Selection in the Labor Market," (with G. Sedlacek), *Journal of Political Economy*, (December, 1985), 93(6), 1077-1125.

61. "The Influence of Early Fertility and Subsequent Births And The Importance of Controlling For Unobserved Heterogeneity," (with J. Hotz and Jim Walker), *Bulletin of The International Statistical Institute*, (1985), 51(2).

62. "A Dynamic Model of Aggregate Output Supply, Factor Demand and Entry and Exit For A Competitive Industry with Heterogeneous Plants," (with V. K. Chetty), *Journal of Econometrics*, (1986), 33, No.1/2, 237-262.

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20. "Identifying and Estimating the Distributions of *Ex Post* and *Ex Ante* Returns to Schooling: A Survey of Recent Developments," (with F. Cunha), *Labour Economics*, under review, 2006.

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EXHIBIT B: LIST OF MATERIALS CONSIDERED

June 2007 Expert Report of Dr. Mark Peterson and backup.

June 2007 Expert Report of Ms. Jennifer Biggs and backup.

June 2007 Expert Report of Frederick C. Dunbar

June 2007 Expert Report of Thomas Florence

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# Exhibit 2

Nobelprize.org

# The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2000

KUNGL. VETENSKAPSAKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES



## Press Release

October 11, 2000

The Royal Swedish Academy of Sciences has decided that the **Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel, 2000,** will be shared between

**James J. Heckman**
University of Chicago, USA, and

**Daniel L. McFadden**
University of California, Berkeley, USA.

In the field of microeconometrics, each of the laureates has developed theory and methods that are widely used in the statistical analysis of individual and household behavior, within economics as well as other social sciences.

**Citation of the Academy:**
*"to James Heckman for his development of theory and methods for analyzing selective samples and to Daniel McFadden for his development of theory and methods for analyzing discrete choice. "*

**Microeconometrics** - on the boundary between economics and statistics - is a methodology for studying micro data, i.e., economic information about large groups of individuals, households, or firms. Greater availability of micro data and increasingly powerful computers have enabled empirical studies of many new issues. For example, what determines whether an individual decides to work and, if so, how many hours? How do economic incentives affect choices of education, occupation, and place of residence? What are the effects of different educational programs on income and employment? James Heckman and Daniel McFadden have resolved fundamental problems that arise in the statistical analysis of micro data. The methods they have developed have solid foundations in economic theory, but have evolved in close interplay with applied research on important social problems. They are now standard tools, not only among economists but also among other social scientists.

Available micro data often entail **selective samples**. Data on wages, for instance, cannot be sampled randomly if only individuals with certain characteristics - unobservable to the researcher - choose to work or engage in education. If such selection is not taken into

account, statistical estimation of economic relationships yields biased results. Heckman has developed statistical methods of handling selective samples in an appropriate way. He has also proposed tools for solving closely related problems with individual differences unobserved by the researcher; such problems are common, e.g. when evaluating social programs or estimating how the duration of unemployment affects chances of getting a job. Heckman is also a leader of applied research in these areas.

Micro data often reflect **discrete choice**. For instance, data regarding individuals' occupation or place of residence reflect choices they have made among a limited number of alternatives. Prior to McFadden's contributions, empirical studies of such choices lacked a foundation in economic theory. Evolving from a new theory of discrete choice, the statistical methods developed by McFadden have transformed empirical research. His methods are readily applicable. For example, they prevail in models of transports and are used to evaluate changes in communication systems. Examples of McFadden's extensive applications of his own methods include the design of the San Francisco BART system, as well as investments in phone service and housing for the elderly.

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**James J. Heckman** (US citizen), 56, was born in Chicago, IL in 1944. Since 1995 he is the Henry Schultz Distinguished Service Professor of Economics at the University of Chicago.

**Daniel L. McFadden** (US citizen), 63, was born in Raleigh, NC in 1937. Since 1990 he holds the E. Morris Cox Chair in Economics at the University of California, Berkeley.

**The Prize amount**, SEK 9 million, will be shared equally between the Laureates.

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