CONTEMPORARY STUDIES IN ECONOMIC AND FINANCIAL ANALYSIS

Series Editors: Robert J. Thornton and
J. Richard Aronson

Recent Volumes:

Volume 83: Foreign Direct Investment in the United States
Edited by W. L. Casey

Volume 84: Colombia: An Opening Economy?
Edited by C. M. Callahan and F. R. Gunter

Volume 85: The Irish Economy in Transition: Success, Problems and Prospects, Edited by J. R. Aronson, V. Munley and R. J. Thornton

Volume 86: Asia Pacific Financial Markets in Comparative Perspective: Issues and Implications for the 21st Century, Edited by J. A. Batten and T. A. Fetherston

Volume 87: Developments in Litigation Economics
Edited by P. A. Gaughan and R. J. Thornton

Volume 88: European Responses To Globalization: Resistance, Adaptation And Alternatives
Edited by Janet Laible and Henri J. Barkey

Volume 89: Globalization: Perspectives from Central and Eastern Europe, Edited by Katalin E. Fabian

Volume 90: Privatization in Transition Economies: The Ongoing Story, Edited by Ira W. Lieberman and Daniel J. Kopf

Reprinted with Permission

CONTEMPORARY STUDIES IN ECONOMIC AND
FINANCIAL ANALYSIS VOLUME 91

PERSONAL INJURY AND WRONGFUL DEATH DAMAGES CALCULATIONS: TRANSATLANTIC DIALOGUE

EDITED BY

JOHN O. WARD
University of Missouri-Kansas City, MO, USA

ROBERT J. THORNTON
Lehigh University, Bethlehem, PA, USA



United Kingdom – North America – Japan
India – Malaysia – China

PERIODICAL PAYMENTS AWARDS AND THE TRANSFER OF RISK
Richard Cropper and Victoria Wass 159

THE U.S. APPROACH TO COMPUTING ECONOMIC DAMAGES DUE TO PERSONAL INJURY AND WRONGFUL DEATH
Kurt V. Krueger and Gary R. Albrecht 193

PRINCIPLES OF COMPENSATION FOR INJURY AND WRONGFUL DEATH IN IRELAND
Shane Whelan 233

DOING AWAY WITH INEQUALITY IN LOSS OF ENJOYMENT OF LIFE
Giovanni Comandé 255

SCHEDULED DAMAGES AND THE AMERICAN TORT ENVIRONMENT
Steven J. Shapiro and A. E. Rodriguez 277

EXAMPLES OF "SCHEDULES OF DAMAGES" USED IN EUROPE AND THE UNITED STATES
Robert Minnehan 291

INTERNATIONAL DATA AND THE FORENSIC ECONOMIST: A GUIDE TO SOURCES AND USES
Michael J. Piette and David R. Williams 309

ABOUT THE AUTHORS 321

THE TRANSATLANTIC DIALOGUE: AN INTRODUCTION

John O. Ward and Robert J. Thornton

1. BACKGROUND TO THE DIALOGUE

This collection of original papers had its origin in a series of annual meetings of the National Association of Forensic Economics (NAFE) held in Great Britain, Ireland, Italy, and the United States from 2004 to 2008.[1] NAFE sponsored these meetings to explore common research areas in the calculation of damages in personal injury and death litigation in Western Europe and the United States. NAFE was founded in 1986 and is the largest association of economists and other damages experts specializing in the calculation of economic damages in litigation in the United States and Canada. The *Journal of Forensic Economics* (JFE) is the journal of NAFE and has been the primary outlet of peer-reviewed research in forensic economics over the past 22 years. The field of forensic economics has generated a substantial literature on methodologies and empirical research in the calculation of damages in personal injury, death, employment, and commercial litigation; and the use of that literature in the United States and Canadian courts by economists, Certified Public Accounts (CPAs), and actuaries has become commonplace in the past two decades (Thornton & Ward, 1999).[2]

The intent of the first international meeting of NAFE in Edinburgh in 2004 was to compare U.S. methodologies for calculating economic damages in personal injury and death litigation with those procedures used in the

Personal Injury and Wrongful Death Damages Calculations: Transatlantic Dialogue
Contemporary Studies in Economic and Financial Analysis, Volume 91, 1–10
Copyright © 2009 by Emerald Group Publishing Limited
All rights of reproduction in any form reserved
ISSN: 1569-3759/doi:10.1108/S1569-3759(2009)0000091003

United Kingdom and other European Union (EU) members. In the United Kingdom prior to 1999, economic damages in such litigation were typically assessed by individual judges using "rule of thumb" multipliers with little actuarial or economic input or content. In 1999 in a case titled *Wells v. Wells*[3] before the House of Lords, the courts took judicial notice of actuarially derived multipliers used in the calculation of lost wages in personal injury and death litigation. These actuarially derived multipliers were the "Ogden" tables, named after Sir Michael Ogden. Ogden was the force behind the development of the tables in the 1980s through the work of the Law Commission and the Ogden Working Group, as described by Matthias Kelly, QC, in the following chapter of this volume. After the *Wells v. Wells* decision in 1999 by the House of Lords, there began a process of examination of methodologies appropriate to the calculation of economic damages in personal injury and death litigation in the United Kingdom involving lawyers, actuaries, and economists. The Ogden Working Groups that followed that decision have included the participation of several authors of chapters in this volume and have utilized the best available statistical, actuarial, and economic methodologies in creating future Ogden tables. These have included the examination of forensic economic methodologies used in the United States.

Two of the contributors to this volume, Robert McNabb and Victoria Wass, coauthored a paper in 2003 with Lewis and Robinson titled "Loss of Earnings Following Personal Injury: Do the Courts Adequately Compensate Injured Parties?" (Lewis, McNabb, Robinson, & Wass, 2002[4]). The paper reviewed the development of forensic economic methodologies and concepts in the United States and concluded that, while the current Ogden tables were a substantial improvement over "rule of thumb" verdicts by judges prior to the *Wells v. Wells* decision, the "U.S. model" offered even greater accuracy in the forecasting of lost earnings. The authors also outlined an agenda for future research in the United Kingdom to incorporate improvements into future Ogden tables. It was this agenda that was the focus of the 2004 NAFE meetings in Edinburgh with both Robert McNabb and Matthias Kelly participating.

At the NAFE 2005 meetings in Dublin, Steve Haberman, Richard Verrall, and Zoltan Butt presented their research on enhanced Markov work life tables for the United Kingdom as an addition to the 2006 Ogden tables. Their research parallels that done in the United States by Gary Skoog, James Ciecka, and Kurt Krueger. Haberman, Verrall, and Butts also prepared a paper on their Markov work life calculations for the NAFE meetings in Boston in 2006 (Verrall, Haberman, & Butt, 2006).

In 2007, the NAFE meetings in Florence, Italy, explored the topic of awards for noneconomic damages, focusing on research by Giovanni Comandé on a European model for non-pecuniary damages awards. Comandé later proposed a similar non-pecuniary damages model for the United States in a paper that he presented at the NAFE meetings in Chicago in 2007. Papers were also presented in Florence and Chicago by John Ward and Robert Minnehan on the development of Ogden-type multipliers for the United States, particularly in class-action cases.

The exchange of ideas on forensic economic methodologies between economists and actuaries who attended the NAFE meetings described above has been most fruitful. It has opened new paths for cooperative research and stimulated new ways of thinking about both economic and noneconomic damages in personal injury and death torts in the United States and Europe. And the original papers in this volume serve to capture the essence of the dialogue described above.

2. OVERVIEW OF CHAPTERS

In this section, we provide summary overviews of each of the chapters (largely in the words of the authors themselves). The volume begins with Matthias Kelly's contribution, "The Development of an Actuarial Approach to the Calculation of Future Loss in the UK." The chapter is a history of the adoption of actuarial methods for calculating and awarding pecuniary damages by the courts of the United Kingdom during the past two decades. The author examines the case law leading to the *Wells v. Wells* decision that officially recognized the Ogden tables as the mechanism for determining compensation in personal injury litigation, and also the work of the Law Commission in recognizing the need for actuarial precision in making such awards. The chapter discusses the evolution of the Ogden tables and the role of Sir Michael Ogden, QC, in gaining acceptance for the tables. The work of the Ogden Working Party in addressing issues of discounting, adjusting losses for inflation, and addressing rising health care costs through periodic payments is also reviewed. Finally, the author outlines the areas of damages calculation that remain to be addressed as well as the need for continued input by the Ogden Working Party and the Law Commission to address those issues.

The next chapter is by John Ward and is entitled "Economic Damages and Tort Reform: A Comparative Analysis of the Calculation of Economic Damages in Personal Injury and Death Litigation in the United States and

the United Kingdom." The chapter compares the traditional actuarial method of calculating pecuniary damages for personal injury litigation in the United States with the system of scheduled pecuniary damages (the Ogden tables) in the United Kingdom in the contexts of both exactness of measurement and the goals of tort reform. In the United States, the presentation of a pecuniary-damages claim is commonly made by an economic expert to a jury, while in the United Kingdom the judge directly decides upon damages and may rely upon published actuarial multipliers in arriving at the level of pecuniary damages to award. The chapter lays out the design of the actuarial model used by experts in the United States and how that design has been incorporated into the Ogden tables in the United Kingdom. It also discusses the possibility of developing a system of scheduled damage multipliers for pecuniary-damages awards in the United States and offers a model for the design of such multipliers. Finally, the Ogden tables, the multipliers derived from the damages model of the September 10, 2001, Victim's Compensation Fund, and U.S. scheduled damages model multipliers are each applied to hypothetical personal injury cases. The results are then compared, along with their implications for the accuracy of damages calculations and for tort reform.

In "Accounting for the Effects of Disablement on Future Employment in Britain," Victoria Wass and Robert McNabb first note that UK law generally provides that any person injured through the fault of another may claim monetary compensation in the form of damages. The quantum of damages is determined by means of a formula, the multiplier–multiplicand formula, in which an annual sum for posttax earnings (the multiplicand) is multiplied by the number of years to retirement (the multiplier), with the latter discounted by a real rate of return and the risks of both mortality and nonemployment prior to retirement age. In contrast to U.S. courts, courts in the United Kingdom have been reluctant to engage labor market data or economic expertise in the determination of employment risks. Instead, normal practice has been the arbitrary adjustment of multipliers in the form of judicial discretion. Such adjustments set precedents and become established. One such precedent is the *Smith v. Manchester* award of between 6 and 24 months post-injury earnings in response to the increased risk of nonemployment over a lifetime for a claimant who is disabled but who retains the capacity to work.

There is surprisingly little UK research on the labor market effects of disability, and none that looks at the effects of disability over a working lifetime. However, the research that does exist indicates a much greater employment disadvantage than that assumed by the courts. Nonparticipation

rates for the disabled are generally about twice that of the nondisabled, and the trend is upwards. While acknowledging the difficulties in measuring disability-induced employment effects, the authors proceed to develop a simple two-state increment–decrement model to estimate worklife expectancies (WLE) by age, sex, and employment and disability status. The authors use this model to estimate individual WLEs before and after injury. The use of empirically based disability-adjusted multipliers in the calculation of post-injury earnings precludes the need to make arbitrary adjustments to the lump sum for the purpose of accounting for the employment effects of disability. A comparison of WLE by disability status indicates that the impact of disablement on employment exceeds 24 months by a substantial margin. Finally, using a sample of 100 awards adjudicated in the UK courts during the 1990s, the authors use their model to recalculate the award for future loss of earnings in each case and compare this hypothetical figure with that actually awarded by the court to reveal a situation of substantial undercompensation.

The next chapter, "Estimating and Using Work Life Expectancy in the UK," is by Zoltan Butt, Steve Haberman, Richard Verrall, and Victoria Wass. The starting point for this chapter is the deficiencies in the estimated employment risks contained in the Ogden tables for use in the traditional multiplier–multiplicand calculation, namely the use of average (unconditional) employment rates and the absence of account of the impact of disability. (These points were also raised in the previous chapter.) The focus of this chapter is to provide a suitable modification to the multiplier–multiplicand calculation, since this is the approach that lawyers are committed to using, and to reestimate the parameters of the formula to more accurately account for employment risks.

The parameters of the multiplier–multiplicand formula are contained within the Ogden tables. The baseline multiplier is the discounted life expectancy, and the reduction for employment risks is a discounted WLE expressed as a proportion of the discounted number of years alive to retirement. The authors provide improved estimates of the reduction factors (RFs) for employment risks. WLE and RFs are modeled within the framework of a multiple-state Markov process and, as in the previous chapter, are conditioned upon age, sex, starting employment status, and disability. In this chapter, the authors make use of the longitudinal element of the labor force survey (LFS) and a more sophisticated from of modeling. One of the benefits of this approach is the addition of a further covariate – educational achievement. The combination of disability and skill level proved to be powerful in the determination of employment.

The new RFs estimated in this study, and the adaptation to the calculation to formally incorporate the effects of disability on the multiplier, were adopted in the latest version of the Ogden tables (Sixth Edition, May 2006). However, the law is slow to change. Incorporation of the disability-induced employment disadvantage into the quantum of damages has proved to be controversial with both insurance companies and with the judiciary. The focus of their concern is the magnitude of the impact (compared to the *Smith v. Manchester* award) and the consequent implication for the level of damages. A case example (*Conner v. Bradman*) shows how the courts, while adopting the new approach, use judicial discretion to reduce its effect on the award of damages.

Judicial discretion is the perfectly reasonable response to imprecision in the RFs, which are estimated for broad categories of the working population and not for individual claimants. However, the decision in *Conner v. Bradman* suggests a need for further guidance on the magnitude of discretionary adjustments away from the average RF. In this regard, the authors look to important developments in the U.S. forensic economics literature in which the average RF is treated as a random variable whose distribution can be estimated through simulation techniques.

In the next chapter, "Markov Work Life Table Research in the United States," Gary Skoog and James Ciecka summarize worklife-related research in the United States over the last 25 years. They point out that striking theoretical and empirical developments have occurred over this period. The switch, first of all, from life-table-based constructs to Markov process models was seminal. The probabilistic implications of Markov models have been captured theoretically and estimated with large, current, and nationally representative data sets. Parametric and nonparametric worklife models have been estimated, along with models of full-time and part-time worklife as well as occupation-specific worklife models. Skoog and Ciecka also note that worklife research has progressed along quite different paths in the United States and the United Kingdom over the last 25 years. The chapter concludes with a glimpse at the likely direction of future worklife-related research.

The focus switches again to the United Kingdom in the next chapter, "Periodical Payments Awards and the Transfer of Risk." Richard Cropper and Victoria Wass point out that personal injury claims for future loss in the United Kingdom have been settled traditionally by lump sum payments. Although structured settlements have long been available as a remedy, they have rarely been used. But as of April 2005, an amendment to the Damages Act of 1996 introduced a new approach to claims in the United Kingdom in which the court is required to consider (and potentially impose) an award of

damages in the form of a structured settlement. In contrast to the existing structured settlement, the new form of award is to be called a "periodical payment" and is to be determined on a "bottom up" basis where the claimant's needs are paramount. This approach has been described as "the most fundamental change in 150 years in the quantification of bodily injury claims" (London International Insurance and Reinsurance Market Association, 2003).

As the authors explain, under a lump sum award it is the *claimant* who bears the risk of uncertain mortality and investment returns. However, periodical payments were designed to transfer these risks to the *tortfeasor* where, for reasons of justice, equity, and efficiency, they ought properly to lie. Yet the statutory provision for periodical payments left the issue of indexation unresolved. The UK retail price index (RPI) was the default measure, and the first order for a periodical payment was linked to this index. However, historically earnings have risen faster than have prices in the United Kingdom; and, since the largest component of any care plan is the wages of the "carers" (caregivers), uprating the annual cost of care by the RPI would very likely leave the claimant unable to afford the cost of future care from his/her damages. The risk of a shortfall was high – in fact, it was almost a certainty – and with annual sums often in the region of £250 thousand, the magnitude of the shortfall was also high. The indexation issue was to prove critical to the success of periodical payments. The benefits to the claimant of the transfer of risk were acknowledged by both the parties and the courts. However, indexation to an inappropriate measure, in which the failure of the annual sum to meet the rising cost of the expenditure is all but guaranteed, threatened to jeopardize the reform in its entirety. In this chapter, the authors outline the arguments in favor of replacing the RPI with an earning-based measure for the indexation of annual care costs. As things turned out, these arguments were to prevail in both the High Court and the Court of Appeal so that the very considerable potential benefits to the claimant of the transfer of mortality and investment risks to the defendant were able to be realized. The authors were the lead expert witnesses in a series of test cases centered on the issue of indexation of periodical payments during 2006–2007.

The next chapter, "The United States Approach to Computing Economic Damages due to Personal Injury and Wrongful Death," was written by Kurt Krueger and Gary Albrecht. As the authors point out, tort damage law in the United States allows the claimant to recover economic damages incurred because of injury when the injury causes reduced individual productivity. The level of economic damages recoverable is a function of the difference

between the pre-injury and the post-injury values of the claimant's economic output. Although state jurisdictions in the United States show marked variations in their compensable economic damages, there are nonetheless certain "core" economic methods that are used in all jurisdictions to determine economic damages in tort cases. This chapter presents the generally accepted economic theories and methodologies which comprise what has been called the "U.S. approach" to computing economic damages.

The following chapter crosses the Atlantic once more, this time directing attention to the Republic of Ireland. In "Principles of Compensation for Injury and Wrongful Death in Ireland," Shane Whelan lays out the fundamental processes underlying the assessment of damages in Ireland by reference to landmark statutes and precedents. The principal focus of the chapter, however, is on how damages in Ireland are computed in practice. The discussion highlights those assumptions to which the quantum of damages is most sensitive while also noting the more debatable ones. In particular, Whelan discusses and analyzes the sensitivity of the lump sum to the discount rate(s), to future mortality improvements, and to future taxation. The expert witnesses relied on by the Irish courts to capitalize future pecuniary losses have for many decades been actuaries, and their original market-consistent approach influenced practice in the United Kingdom following the adoption of the Ogden tables. In more recent years, Irish actuaries and Irish courts have had to adopt a less theoretically sound approach to setting the discount rate, consequent on the failure of an index-linked bond market to develop in Ireland from the mid-1980s.

The focus next turns to Italy, with Giovanni Comandé's "Doing Away with Inequality in Loss of Enjoyment of Life." The aim of this chapter is to show the viability and the benefits for the United States of experimenting with awarding methods for non-pecuniary losses in light of European experiences. A comparison of innovative methods shows that the use of "European style" guidelines would help the review process while safeguarding the jury's independence and enabling courts to consider the legitimate evidential factors that evoked the specific jury verdict. A better understanding of non-U.S. solutions would at least bring about more consistency in striving for individual justice while retaining judicial "discretion."

In their chapter, "Scheduled Damages and the American Tort Environment," Steven Shapiro and A.E. Rodriguez return to the United States to compare caps on noneconomic damages with proposals to adopt "scheduling" of such damages. In comparing scheduling with caps on noneconomic damages, the authors conclude that caps do not eliminate horizontal and vertical inequities. In addition, caps can create greater incentives for victims

to underinsure, they can lessen incentives to avoid injury, and they may lead to larger awards for economic damages. By contrast, scheduling is a second-best solution to a status quo of unconstrained awards for noneconomic damages by jurors. Scheduling does provide greater horizontal and vertical equity for litigants. However, scheduling requires using information based on past awards or on subjective judgments by legislators in order to construct schedules. Hence, problems of suboptimal deterrence and insurance are not necessarily reduced.

In "Examples of Scheduled Damages Used in Europe and the United States," Robert Minnehan describes nine selected examples of "Schedules of Damages" from Europe and the United States that illustrate the range of complexity found in such schedules. The author distinguishes between "general" and "special" damages, which are specific concepts in American and British laws, and provides examples of how both types of concepts are formulated and specified. The general damages compensation schemes vary from relatively simple – with only a few levels of awards – to much more complex schemes – with as many as 29 levels of awards in one example or with awards based on the percent of disability in another. The special damages compensation schemes, which focus on quantifiable economic or pecuniary losses, are formula-based calculations with either a few factors or with many factors considered in the calculations. These examples also vary from simple to relatively complex. Although not a specific focus of this chapter, differences in potential award levels across countries can be observed in these descriptions.

The concluding chapter in the volume is entitled "International Data and the Forensic Economist: A Guide to Sources and Uses." As the authors, Michael Piette and David Williams, note, forensic economists are often asked to calculate economic damages in cases that are tried in the United States but involve the death or injury of a citizen or resident of a foreign country. Commonly called "international cases," they can range from a single tourist who is killed or injured when visiting the United States to mass torts such as plane crashes or product liability claims. In international cases, macroeconomic data compiled by various governmental or private sources within the United States are of very limited use in preparing economic loss estimates. Rather, the decedent or injured party's economic, demographic, and social environment may differ significantly from that of an individual living in the United States. In this regard, plaintiffs are impacted by the macroeconomic conditions of their country of domicile. The purpose of this chapter is to provide an overview of the data sources that are available as well as the limitations of these sources in preparing economic loss estimates in international cases.

We hope that the exchange of ideas on forensic economic methodologies contained herein will be both useful and enlightening for practitioners. We also hope that the exchange will continue to create opportunities for cooperative research on both sides of the Atlantic as well as stimulate new ways of thinking about damages estimation in torts involving personal injury and death.

NOTES

1. The European meetings were held in Scotland, Dublin, and Florence; and the U.S. meetings were held in Boston and Chicago in conjunction with the meetings of the Allied Social Sciences Association.
2. See Thornton & Ward (1999) for a history of the development of the field of forensic economics in the United States.
3. *Wells v. Wells* (1999) 1 AC 345.
4. The paper was based on an earlier one, "Methods of Calculating Damages for Loss of Future Earnings," in the *Journal of Personal Injury Law*, 2002, No. 2.

REFERENCES

Thornton, R. J., & Ward, J. O. (1999). The economist in tort litigation. *Journal of Economic Perspectives, 13*(2), 101–112.

Lewis, R., McNabb, R., Robinson, H., & Wass, V. (2003). Loss of earnings following personal injury: Do the courts adequately compensate injured parties? *The Economic Journal* (November), 568–584.

Verrall, R., Haberman, S., & Butt, Z. (2006). The impact of dynamic measurement of worklife expectancy on the loss of earnings multipliers in England and Wales. Presented at the meetings of the National Association of Forensic Economics meetings in Boston, January 6, 2006.

THE DEVELOPMENT OF AN ACTUARIAL APPROACH TO THE CALCULATION OF FUTURE LOSS IN THE UK

Matthias Kelly[1]

1. THE HISTORICAL BACKGROUND

In the common law of the United Kingdom the objective of any award of damages in personal injuries litigation is to achieve as nearly as possible full compensation for the claimant in respect of the injury sustained.[2] To achieve that objective the court seeks to award such sum as is notionally required to be laid out in the purchase of an annuity which will provide an annual amount equivalent to the loss for the whole period of the loss.[3] The basis of the calculation is an assumed annuity. The court makes an assumption about how the award will be invested.[4] Lord Fraser of Tullybelton in *Cookson v. Knowles*[5] put it thus:

> The assumed annuity will be made up partly of income on the principal sum awarded, and partly of capital obtained by gradual encroachment of the principal. The income element will be at its largest at the beginning of the period and will tend to decline, while the capital element will tend to increase until the principal is exhausted.

Personal Injury and Wrongful Death Damages Calculations: Transatlantic Dialogue
Contemporary Studies in Economic and Financial Analysis, Volume 91, 11–34
Copyright © 2009 by Emerald Group Publishing Limited
All rights of reproduction in any form reserved
ISSN: 1569-3759/doi:10.1108/S1569-3759(2009)0000091004

30. Reported in (1999) 1 AC 345.
31. Law Commission paper number 56 (1973), paragraph 222.
32. The 5th programme of Law Reform, 1991, Law Commission Report No. 200, item 11.
33. Consultation Paper No. 125, 'Structured Settlements and Interim and Provisional Damages (1992)'.
34. 1973, Law Com. No. 56.
35. Consultation Paper 125, paragraph 2.21.
36. Paragraph 2.26, Law Commission Report No. 224, September 1994.
37. Paragraph 2.28, Structured Settlements and Interim and Provisional Damages, Law Commission Report No. 224, Fifth programme of law reform, September 1994.
38. Mr John M. Taylor MP, a Minister in the Lord Chancellor's Department.
39. SI 2001/2301.
40. *Wells v Wells* (1999) 1 AC 345 at p. 365C.
41. However, differential rates for future care are now used, particularly where the claimant has a substantial life expectancy and the likelihood of escalating care costs. An index different to RPI may be used: see: *Thompstone v Thameside & Glossop Acute services NHS Trust* [2006] EWHC 2904 (QB), albeit in the context of periodical payments, as opposed to a lump sum award.
42. Recommendation 7.14, Law Commission Report No. 263.
43. By removal of those tables dealing with historic mortality rates.
44. See 'Quantum' (Sweet & Maxwell), 24 January 2005.
45. *Wells v Wells* 1 AC 345 at p. 369.
46. (1999) 1 AC 345 at p. 369.
47. Contained in the Courts Act 2003.
48. Amended by the Courts Act 2003.
49. Annual Survey of Hours and Earnings (ASHE) for the occupational group of care assistants and home carers, produced by the Office of National Statistics (ONS).
50. Paragraph 90, Law Commission Report No. 56, Personal Injury Litigation – Assessment of Damages 1973.
51. With whom Farquharson LJ agreed in a court split 2–1.
52. Paragraph 4.10.
53. Paragraph 4.15.
54. Paragraph 4.17.
55. Paragraph 4.18.
56. See, for example, *White v ESAB Group* (UK) (2002) PIQR Q6.
57. Including future losses.
58. *Gregg v Scott* [2005] UKHL 2 at paragraph 182.

REFERENCES

Haberman, S., & Bloomfield, D. S. F. (1990). Work time lost to sickness, unemployment and stoppages: Measurement and application. *Journal of the Institute of Actuaries, 117*, 533–595.

Lewis, R., McNabb, R., & Wass, V. (2002). Methods of calculating damages for loss of future earnings. *Journal of Personal Injury Law, 2*, 151–165.

ECONOMIC DAMAGES AND TORT REFORM: A COMPARATIVE ANALYSIS OF THE CALCULATION OF ECONOMIC DAMAGES IN PERSONAL INJURY AND DEATH LITIGATION IN THE UNITED STATES AND THE UNITED KINGDOM

John O. Ward

1. INTRODUCTION

Proponents of tort reform in the United States frequently point to specific features of tort systems of Western European Countries to support their positions on such proposals as:

- the elimination of the jury system;
- the enforcement of a loser-pays-all legal fees system;
- the curtailment or elimination of contingency fee arrangements with plaintiff's attorneys;

Personal Injury and Wrongful Death Damages Calculations: Transatlantic Dialogue
Contemporary Studies in Economic and Financial Analysis, Volume 91, 35–71
Copyright © 2009 by Emerald Group Publishing Limited
All rights of reproduction in any form reserved
ISSN: 1569-3759/doi:10.1108/S1569-3759(2009)0000091006

- the imposing of caps on nonpecuniary damages;
- the curtailing of "expert" testimony through judicial screening and scheduled damages;
- the admission of collateral income/payment sources for plaintiffs.

All of the above proposals are realities in Western Europe, and it is suggested that the adoption of such "reforms" would substantially reduce the transaction costs of providing compensation to deserving plaintiffs, improve the efficiency of the tort system, and provide manufacturers and service providers with greater predictability and "fairness" in potential tort damages in the United States.

One example of such a comparison of the United States with other Western tort systems is provided in a paper by David Bernstein entitled "Procedural Tort Reform: Lessons from Other Nations," published in 1996 in the Cato Institute publication, *Regulation* (Bernstein, 1996). Bernstein began his paper with the statement:

> By all reasonable measures, the American tort system is a disaster. It resembles a wealth-redistribution lottery more than an efficient system designed to compensate those injured by the wrongful actions of others. Modern product liability litigation is particularly problematic. As has been well documented elsewhere, product liability lawsuits have made a few plaintiffs' attorneys and their clients rich (p. 1).

Bernstein's distrust of the jury system and expert testimony in general is best summarized by his statement that:

> Perhaps the most radical and important measure that legislatures can take to eliminate the pernicious effects of civil juries is to remove the issue of damages from the jury and put it in the hands of judges. Judges are repeat players with a stake in the coherence of the system, and have some idea of what the going rate for certain injuries is (p. 3).

In a Manhattan Institute study in 2002, Stephen Presser argued that the U.S. system relies too heavily on litigation to compensate injured parties. In the European Union (EU), compensation for injured parties incorporates both social welfare programs and awards from the litigation process, and greater concern is given to a consistent regulation of the safety of products and services. Presser states that:

> Even though the European Community recently altered its tort doctrines from a pure fault-based system to strict products liability, there are features of the European legal system that lessen the effects of even strict liability. Consequently, European courts are much less likely to hand out unpredictable and disproportionate damage judgments – unlike American courts, where ruinous verdicts are a potential in too many lawsuits.

> Europe has escaped an American style litigation explosion by erecting barriers to excessive litigation. Such barriers include:
>
> - Absence of contingent fees
> - Loser pays winner's attorney fees
> - Discouragement of massive discovery filings
> - Lower damage judgments
> - Absence of punitive damages
> - Nonuse of juries in civil cases
> - Lower expectations of damages
>
> Unless similar barriers to excessive litigation are created in the U.S., American companies face an ongoing competitive disadvantage relative to European manufacturers who operate in a more predictable, less costly, and less litigious legal environment (Presser, 2002).

The opinions of Stephen Presser and David Bernstein are shared by a substantial number of policymakers in the United States. The accuracy of their opinions is greatly contested, but the process of tort reform in the United States will likely continue, with or without evidence of need. While the elimination of the jury system in civil cases is unlikely in the near future, alternative dispute resolution methods are effectively replacing jury trial in a growing number of personal injury and death cases. Other adoptions of Western European civil tort procedures and rules will likely occur. Punitive damages caps, the admissibility of collateral source payments to plaintiffs as offsets against economic damages, limits on class action suits, and/or lowered expectations of damages through caps on noneconomic damages, such as pain and suffering, have been adopted in a growing number of states.

In the United States and the EU the objective of damages awards in personal injury and death litigation is to make a plaintiff "whole," to restore the plaintiff to the position they would have enjoyed but for the tort. However, in the United States additional objectives of damage awards may be deterrence and the assignment of all damages to the defendant. An award of economic and noneconomic damages to a plaintiff by a judge or a jury should be based on the "wholeness" objective. Ideally, the methods of calculating economic damages and noneconomic damages should be predictable and consistent given the specific facts of a case. In the determination of economic damages, such as (a) a person's loss of earnings capacity, (b) the ability to perform services, or (c) needed medical care as the result of an injury, there exists a considerable literature on appropriate methodologies for making such calculations of losses in the EU and the United States.

Bernstein's suggestion that judges have some idea of the "going rate" for certain injuries and are in a better position to bring coherence to the system contains several assumptions. The idea of a "going rate" for an injury implies that judges possess knowledge of the methodologies used by economic and actuarial experts in calculating economic losses and that they are consistent in their use of such methodologies in awarding damages. There is no logical basis for such a suggestion, however. Rather, judges in the EU until recent years have relied on rule-of-thumb multipliers in calculating economic damages and that process has provided neither consistency nor predictability. In the past decade considerable effort has been expended to replace that system of rule-of-thumb damages with a system of actuarially derived multipliers, particularly in the United Kingdom.

In the United Kingdom, actuaries, economists, barristers, and legislatures have successfully adopted the use of actuarially based damages multipliers in the courts through legislation and *Wells v. Wells* in 1999. The methodologies underlying those multipliers are similar to the methodologies used by damages experts in the 50 state jurisdictions in the United States, but the process of applying the methodologies in the courts is much different. In the United Kingdom there is effectively one court system rather than the federal and 50 state tort systems of the United States. In the United Kingdom one set of multipliers (and qualifiers) is directly available to judges as a starting point for calculating damages while in the United States a presentation of economic damages by a forensic economist is unique to each personal injury or death case, and is also unique to each jurisdiction.

One aspect of damages determination in European torts that has been the focus of attention in tort reform debates in the United States has been the replacement of expert-driven damages calculations with a system of scheduled damages using multipliers. Rather than having a jury consider evidence of pecuniary losses of earnings, benefits, and services from testimony by economic, financial, and actuarial experts (loosely designated as "forensic economists") on issues of forecasting loss, the judge would direct a loss award on the basis of statutory damages schedules and multipliers that would be consistent for similar cases. Among the suggested benefits of such a system would be simplicity and uniformity of awards, predictability of awards, the diminished potential for unreasonable jury awards, and lower litigation costs by reducing or eliminating the uses of expert witnesses in the damages calculation. The Ogden tables used in the United Kingdom are one example of such a system.[1]

This chapter reviews the experience of the United Kingdom with the Ogden tables in terms of their promotion of consistency, predictability, and "wholeness" of calculated economic damages. One recent U.S. experiment with a uniform damages methodology is the Victim's Compensation Fund (VCF) to compensate victims and survivors of the September 11, 2001, World Trade Center and Pentagon attacks. The chapter also compares the results of using Ogden multipliers to those of using the VCF methodology as well as a generalized U.S. methodology in calculating economic damages in a hypothetical case. Finally, the chapter explores a system of scheduled compensation in the United States using the methodologies used by damages experts in the United States. The results of all three models, applied to the same hypothetical example, are compared and conclusions offered.

2. THE ROLES OF DAMAGES IN THE UNITED STATES TORTS

When someone is injured or dies, the person injured or survivors usually will suffer economic and noneconomic losses. Economic losses consist of losses of earnings and support, employer-paid fringe benefits, the ability to perform household services, and other family services such as advice counsel and care and medical costs. Noneconomic losses might include loss of companionship, consortium, or pain and suffering. As in loss of enjoyment of life, loss might be either economic or noneconomic depending on the law of a particular jurisdiction. Loss may extend beyond self, family, and survivors to a business or society. If the incident that generated the injury or death was not attributable to the negligence of another, the individual or society will bear the economic and noneconomic costs of injury or death. However, if the injury or death occurs in the workplace or is due to the fault or liability of someone else, then economic and noneconomic costs might be recovered as damages from the individual or institution liable for the harm.

Injuries or death in the workplace in most western industrialized nations are usually covered by workers' compensation, and no fault insurance on the part of the employer is necessary to recover losses.[2] In the United States, there is no national system of workers' compensation; rather each State administers its own system, and those systems vary widely. Moreover, railroad, seamen, and harbor workers are not covered by workers' compensation and must recover damages for injury or death through civil

suits, requiring proof of negligence. In nonjob-related actions, liability usually requires some proof of negligence. Because recovery for loss in workers' compensation does not imply negligence and focuses on providing financial assistance to the injured or their survivors, the intent of the recovery is not to make the injured person or survivors whole or to punish those liable for the harm.

Where loss comes from a wrongful action or defective product (a tort), the intent of recovery in the United States is usually to make the injured person or survivors (plaintiff(s)) whole: to restore to them their full measure of economic losses and some measure of their noneconomic losses (such losses are frequently limited or capped). Moreover, tort law usually seeks to recover all economic and noneconomic losses of the plaintiff(s) from liable defendant(s). This full-recovery from the defendant is both a legal and an economic foundation of the US tort law system. Usually, evidence of collateral sources of financial and support assistance to the plaintiff(s) by third parties is not admissible in court. This exclusion also furthers the economic goal of internalizing the externalities of harm to those creating the harm and providing efficient deterrence for those who harm.

The concepts of efficient deterrence expands the concept of internalizing the externality to an appropriate, efficient standard of liability represented by Justice Hand's Rule where "B" (the expenditure on precaution against harm by the defendant) equals "p" (the probability of an accident occurring) times "L" (the cost of the harm to the plaintiff(s) resulting from the accident at an equilibrium level of precaution). As originally used by Hand as a measure for deciding the threshold of negligence for liability, if $B>pL$ the firm would not be liable for accidental harm. While the Hand rule focuses on liability, harm is also an important variable. If L is overestimated, society will exercise an inefficient level of precaution, and awards for plaintiffs will be excessive. If L is underestimated there will be too little precaution, too little compensation for plaintiffs, and too little deterrence for defendants.

L can be overestimated or underestimated on the basis of

- incorrect information about the earnings or services of the person injured or killed and their ability to mitigate any losses of such in injury cases;
- incorrect methodology used by a damages expert in forming an opinion on mitigation, future medical needs, or the present value of actuarial calculations of damages by an economist; and
- inappropriate laws that restrict information on taxes or collateral income that the damages expert cannot consider in calculating L.

Systems of scheduled damages, such as the Ogden tables, should be ultimately evaluated as to whether they would serve to improve the quality and predictability of L measurements as compared to the U.S. model and still be compatible with the make-whole principle.

In the United States, when settlement efforts fail, the recovery of losses in tort laws is in two steps: the proof of liability and the offer of proof of the economic and noneconomic losses suffered by the plaintiff(s). The plaintiff can seek a jury trial, and the evidence of losses often consists of testimony of expert damages witnesses, such as vocational/rehabilitation experts, life-care planners, and/or economists. The laws that define the recovery of losses in the various states and in federal cases are a combination of both case law and statute – but the damage award itself rests with the jury (subject to caps and the ability of judges to reduce or increase losses with or without the approval of the parties). That is not the case in most other western democracies where jury decisions have been replaced by judges' decisions based on systems of scheduled damages. Moreover, the legal and economic intents of making the plaintiff(s) whole and fully internalizing the harm created by the defendant to the defendant are not fully shared by other western democracies. In Western Europe, tort laws typically allow evidence of some collateral payments to plaintiffs and even require reductions in awards for such payments. Such payments usually include national health care payments and services. In the case of the Ogden tables, specific provision is made for incorporating such collateral payments into the damages award of the judge.

There are obvious advantages to the use of Ogden tables and similar legislated damages formulas for calculating and awarding damages in torts. Such multipliers are simple to apply, avoid expert testimony costs and conflicts, are transparent and subject to change by legislation, and offer the promise of predictability and uniformity to all parties. But are they reasonable, accurate, and economically good and sound estimators of pecuniary loss? Moreover, are they consistent with the intent of U.S. tort law?

3. THE ORIGIN OF THE OGDEN TABLES

Prior to 1999, the system by which judges in the United Kingdom calculated damages has been described as arbitrary and capricious (Lewis, McNabb, Robinson, & Wass, 2003). Rules of thumb for estimating damages evolved, which were not based on either case law or economic logic. Various

multipliers were selected by judges based on their "common sense" value rather than their actuarial foundation.

In an attempt to bring some sound actuarial principles to the use of multipliers, the British Actuary's Department first prepared a set of multipliers in 1984 named "Actuarial Tables with Explanatory Notes for Use in Personal Injury and Fatal Accident Cases." Sir Michael Ogden was the chairperson of the joint committee of actuaries and lawyers who were responsible for the publication of the tables of multipliers, and the tables became known as the Ogden tables. Now in their sixth edition, the Ogden tables assist in the calculation of lost earnings or cost of care by providing a factor to multiply a person's base earnings or annual cost of care to derive a present value of economic loss in that category. These multipliers, then, incorporate actuarial data such as annual probabilities of death by age, disability status, education, and gender in combination with an assumed retirement age and a real discount rate. The sixth edition of the tables added disability status and educational levels in the multipliers. These variables are used to prepare unique multipliers for disabled individuals and individuals by level of education rather than adjusting all tables by transitional probabilities of disability or age-earnings transitions by educational level. A judge could then use these multipliers to arrive at a lump-sum award for economic damages. In their base form, the Ogden tables have the characteristics of work life tables with adjustments for growth and discounting rolled into one number. However, there have been no formal work life tables available for the United Kingdom until very recent years.[3] The tables provide multiple discount rates despite the mandated 2.5% rate and there are no bright lines for the judge in selecting a discount rate other than the legislated rate.

Judges were not required to use the Ogden tables in calculating damages until 1999. In a landmark case, *Wells v. Wells*, the House of Lords approved actuarial evidence as the primary method of calculating future pecuniary loss[4] and required the judges use the tables in forming their opinions. This decision applied to England and Wales. Scotland has its own legal system that closely parallels that of England and Wales. Matthias Kelly was a barrister in the *Wells* case and had a key role in advancing the mandatory use of the Ogden tables by the courts. He considers the mandatory use of Ogden multipliers as a substantial improvement over the prior practices of judges in arriving at pecuniary damages, although he admits that numerous deficiencies still exist in the use of Ogden tables.[5] These deficiencies include the omission of provisions for real growth in earnings and age-earnings cycle adjustments for younger workers, as well as after-the-fact postinjury risk

adjustment made by judges without any particular basis in fact. Also, the treatment of unemployment probabilities amounts to adjusting multipliers up or down, and can be rather arbitrary.

4. DAMAGES IN THE UNITED KINGDOM AND DEFICIENCIES IN THE OGDEN TABLES

In their two recent papers (2002 and 2003) comparing pecuniary damages calculations in the United States and the United Kingdom, Lewis, McNabb, Robinson, and Wass have concluded that "the (United Kingdom) tort system fails to satisfy one of its main objectives in that it does not provide recipients of damages with 'full' compensation. Instead claimants are often under-compensated by the present methods used to assess loss of future earnings" (Lewis, McNabb, Robinson, & Wass, 2002). They arrive at their conclusions by first constructing a generalized U.S. model of damages largely from the literature of the *Journal of Forensic Economics* and the *Journal of Legal Economics*. This U.S. model incorporates labor force participation data, annual probabilities of death and unemployment probability adjustments, and age-earnings cycle adjustments by educational level and future productivity growth (no future real growth or age-earnings corrections are incorporated into the Ogden tables). The UK data on age-earnings trends include categories for disabled workers, which were used by the authors in calculating postinjury earnings capacity. Future losses are discounted to present value at real rates varying from 3% to 4.5%, using those rates used by UK courts for the periods where those rates applied. The hypothesis tested by Lewis et al. was whether the reluctance of courts in Britain to make use of economists in assign damages actually would make a difference to those claiming compensation.

Next, the authors examined (Lewis et al., 2002) a sample of 108 personal injury cases tried between 1990 and 1998 where economic damages were awarded. Given the facts of each case, the present values of lost earnings awarded by the courts were compared to damages calculated using the fourth edition of the Ogden tables and a generalized U.S. model. They found that

> by comparison with our alternative (US) method, the courts under-compensated future earnings loss by 88%. Of the cases in our survey, over half of the claimants adversely affected would have received at least 50 per cent more if our alternative calculation had been used, and a third of them would have more than doubled their court award (p. 164).

Some of these court awards may have been made on the basis of Ogden tables prior to 1999, but many were probably based on "rule-of-thumb" multipliers. Using Ogden tables increased average awards in most categories, but not to the levels reached with the U.S. model.

The major reasons for the differences between awards using Ogden tables and U.S. methodologies, according to Lewis et al., lie in the Ogden tables' failure to directly consider age-earnings and productivity growth of wages over a worker's life, impacts of disability on earnings of workers, and excessive reductions by UK judges for postinjury employment risks. Actual awards by UK courts in the above cases may have relied on Ogden tables, in part, prior to 1999, but judges were not required to use such tables and when they did use multipliers (either "rule-of-thumb" or Ogden variants) they frequently made rather arbitrary, significant reductions in calculations for the risks of unemployment.

In their 2003 paper in *The Economic Journal*, Lewis et al. applied four alternative models to the calculation of damages for their sample, based on varying economic assumptions, but their essential findings were that "rules of thumb" yielded very unequal damage awards under similar circumstances, and that a more scientific approach to calculating damages should be a first goal for the judicial system of the United Kingdom. The mandatory use of Ogden tables, according to them, is a first necessary step in that process, but the adoption of methodologies used in the United States would add even greater exactness to the process of determining damages. The use of forensic economic testimony would further enhance that exactness.

While Lewis et al. viewed the use of Ogden tables as a more "scientific" approach to the assessment of damages, they also believe that the tables "merely support the existing multiplier and multiplicand method and thus do not address the absence of compensation for earnings growth" (p. 165). Also, the tables in the fourth edition did not address issues of reduced capacity to work because of possible future disability for the currently able bodied.

Much of the current criticism of the use of Ogden tables in England and Wales also centers on the mandated stable net discount rate. Although reduced from 3% to 2.5% in 2001, many argue that it should be reduced much farther and that judges should have the freedom to use alternative rates when justified. Given that all earnings losses are net of taxes and that medical costs are being projected, it can be argued that a tax-free bond yield should be used in discounting. Stephen Grime, QC, writing for the Deans Court Chambers in 2003 observed that (Grime, 2003)

> The courts and the Lord Chancellor have stressed the advantage for the administration of justice in having a single relatively stable rate as it facilitates settlements and the disposal of disputed cases – see e.g. Lord Steyn in *Wells v. Wells* [1999] AC 345 at 388d and the Lord Chancellor in the reasons published on 27th July 2001 for the setting of the 2.5% rate. Allowance of greater flexibility by, for example, permitting differing rates for different heads of loss or varying the discount rate to take account of changes in investment conditions is likely to be financially favourable to claimants and detrimental to insurers and the N.H.S. – at least in the present economic climate. Therefore any attack on the single, stable rate will probably be fiercely resisted and, if the relevant criteria can be demonstrated, insurers and/or the N.H.S. would try to appeal any unfavourable decisions of the Court of Appeal to the House of Lords.

Nevertheless, Grime calls for at least a reduction of that net discount rate, if not a freeing of the rate on the basis that

> It is possible to be more sophisticated, because data is available covering both pay in the Health Service and pay received by Personal Social Service workers. The table below covers the period from 1994 to 2002 from which it can be seen that Average Earnings and Health Service pay have risen on average by 4.1% per annum against a rise of 2.5% per annum in R.P.I. – a differential of 1.6%. In the case of Personal Social Service pay (derived from date in the New Earnings Survey) the differential is 1.4%. The effect of adoption of a differential discount rate would be significant. At present the argument is being advanced on two fronts. It is said that a lower discount rate could be taken in setting a multiplier. The alternative is to make an adjustment of the multiplicand. Either of these approaches is easy to adopt given access to the Ogden Tables. The first would assume that the reduction of the discount rate should be equivalent to the excess rate of inflation in care costs. If the data from 1994 to 2002 were to be adopted, the result would probably be to reduce a discount rate of 2.5% to 1.0%. Taking the example of a 25 year old male with unimpaired life expectancy and care costs of £50,000, the effect would be to give a multiplier of 42.1 against 29.56 increasing the size of the award by £627,000 or 58%. The alternative (US and Canadian) method involves forecasting future costs for each year, discounting for accelerated payment and awarding a lump sum on the basis of the total of the discounted future costs. This is likely to give a very similar result to a simpler multiplier/multiplicand approach.

While the use of Ogden tables is mandated in England and Wales only, the tables, or a variant of them, are also commonly used in Scotland and the Republic of Ireland. However, like England and Wales, multipliers used by judges are often "rule-of-thumb" standards derived from prior cases. In 2003, Ireland established a Personal Injuries Assessment Board (PAIB) to independently assess personal injury claims. The PAIB was "inspired" by the perceived high and inconsistent levels of compensation for personal injury claims in Ireland. One of the objectives of the PAIB was to substitute a more consistent and scientific basis for making such awards than the multipliers used by judges. Presumably the PAIB will incorporate some of the Ogden methodology reforms in their analysis.

Following the two papers by Lewis et al. (2002, 2003) on the inadequacies of the Ogden tables (based on the fourth edition), significant changes were made in the fifth edition, published late in 2004, and in the sixth edition in 2006. A number of these changes resulted from the Lewis et al. criticisms and from the research of Steven Haberman, a participant in the 2005 meeting of the National Association of Forensic Economics in Dublin and the 2006 meetings in Boston (Verrall, Haberman, & Butt, 2006). The most recent Ogden tables do recognize the deficiencies of not incorporating age-earnings trends in the multipliers. However, the tables have been enhanced by allowing for extended life expectancies due to improved health, by the inclusion of disability transitions and unemployment probabilities, and by allowing ranges of assumed growth of earnings by multiple net discount rates. The tables also are categorized by levels of educational attainment. A copy of the current Ogden table multipliers for a male retiring at age 65 is contained in Appendix A (Table A1).

Previous editions of the Ogden tables gave minimal direction to the use of the tables in calculating losses to survivors in death actions. The new tables provide clearer direction for use in such cases, however. Basically the multiplicand in the calculation of loss is the loss to survivors at the time of death of the individual times the loss multiplier appropriate to the persons age, gender, and education. Traditionally the personal consumption reduction has been 25% for a husband or wife with children and 33% for a husband–wife household. These rates are comparable to those used in the United States. The calculation of loss of services in both death and injury cases is based on replacement costs, using the multipliers over a lifetime or to a specific age. The Ogden tables require calculation of loss from the date of injury or death rather than the date of trial. It has been proposed that past losses be separately calculated and that future loss begins with the date of trial, but the tables do not allow such a calculation.

One of the strengths of the U.S. methodology for calculating damages in personal injury and death litigation is that it has been the product of a competition of ideas and research by forensic economists in the crucible of the courtroom. Virtually every element of that methodology has been subject to intense debate, publication, and criticism by other forensic economists and the courts. Virtually all U.S. forensic economists would agree that projections of economic damages in personal injury and death litigation today are, on average, far superior to those of twenty, ten, or five years ago. Even so, much room for improvement remains. But the system of courts, trial by jury, and acceptance of economic expertise by the courts concerning damages provide the dynamics for such improvements.

In the United Kingdom and Ireland, with centralized systems of tort law, trial by judge or panel, and with an absence of economic expertise in the courtroom, there is no internal impetus for improvements in damages methodologies. Those reforms that have occurred, such as the Ogden tables, have been the product of external commissions and while the Ogden actuarial multipliers are a considerable improvement over prior "rule-of-thumb" multipliers, they still require rather arbitrary adjustments in practice. Moreover, with a mandated net discount rate above the market rate, they tend to undercompensate plaintiffs. In this respect the United Kingdom and Ireland could benefit from the positive features of the U.S. damages methodology and structure, and the research of Lewis et al. (2002, 2003) and Verrall et al. (2006) has been directed to this end.

5. WHAT IS BEING MEASURED? LEGAL PARAMETERS IN THE UNITED KINGDOM AND THE UNITED STATES

Although the general methodological frameworks for calculating lost-earnings capacity or value of services is fairly consistent in the variety of jurisdictions in the United States, the constraining assumptions for using that framework are not uniformly consistent. Each state in the United States has its own common law, legislative constraints, and directives for the use of the model. Federal cases usually follow the law of that state where the case is tried, but not in all cases (such as FELA cases). In general, damages are calculated on the basis of gross earnings with no reduction for taxes except for FELA and Jones Act cases. All states require a discounting of lost earnings, services, and future medical costs, but in some states, that discounting can be offset by presumed future increases in wages or costs. Only a few states legislate a discount rate. Collateral income sources are not generally allowed as deductions from earnings loss, although in some states such deductions have been permitted. Such rules do not restrict collateral payment providers (such as State Workers Compensation Insurance) from seeking recovery from a plaintiff's award. Household services lost to plaintiffs as a result of injury or death is recoverable in all state and federal courts, but common law precedents for measuring such losses can vary considerably by state. Such differences in assumptions and inputs into the damages model required by state law produce often uneven results in projecting damages throughout the United States.

In England, Wales, and Northern Ireland, where the Ogden tables are used, all earnings losses are net of taxes in personal injury and death actions.[6] Since the legal system is centralized, the framework for calculating damages is uniform in all courts. Prejudgment interest is allowed for past damages in personal injury or death cases, unlike most past damages calculations in the United States. Gratuitous collateral payments are not deducted from loss, and private insurance, pension, and disability pension payments are not subtracted from loss. But social benefit payments in the first five years from the initial cause (if greater than £2,500) are deducted from loss and repaid to providers. Sick pay or salary continuation funds, if not paid by the employer, are subtracted from loss. For other Western European countries, reductions for collateral social welfare payments are more prevalent. In death actions in the United Kingdom, losses to survivors are specified under the Fatal Accidents Act of 1976. The loss period is calculated from time of death, as is the multiplier. The multiplier is adjusted for life expectancy and the risks of death and unemployment probabilities. An assessment of loss must consider the uncertainty of whether the decedent would have provided the claimant with support. In valuing services where the decedent primarily provided services, replacement costs will be used. For the care of a child, the cost of a nanny is appropriate.

In the Republic of Ireland (where multipliers may be considered), social security injury or disability benefits received by an injured person are to be deducted from an award, and no further right of subrogation exists for the provider. No other collateral payments are deducted, and earnings losses are based on after-tax earnings. Recovery in death actions can occur under a wrongful death action or a survival action. There is no mandated net discount rate, and judges are to consider the after-tax nature of the award in selecting a net discount rate. Structured settlements are an option for a judge with the consent of parties. The creation of the Person Injuries Assessment Board (PIAB) in 2004 offers the most radical departure from traditional systems of tort recovery. The methods for calculating damages under the PIAB are still unknown in that awards have yet to be announced. A parallel to the PIAB might be the VCF special master system in the United States.

The above-mentioned, limited comparison of rules of recovery of damages in personal injury or death actions in the United States, the United Kingdom, and Ireland show a number of similarities and contrasts. The use of mandated real discount rates in the United Kingdom is in contrast to a trier-of-fact determination in the United States and Ireland, but the intent of recovery is basically the same. Reductions for taxes from

lost-earnings awards exist in Ireland and the United Kingdom, but only are made in death actions in FELA and Jones Act cases in the United States. Reductions for collateral payments from social security agencies are made in the United Kingdom and Ireland, but not in the United States. Despite these differences, similarities in rules of recovery share a common law origin and are greater than differences.

6. THE RELEVANCE OF THE OGDEN TABLES TO THE UNITED STATES

In the United Kingdom and increasingly in Ireland, tort recovery is moving to a system of scheduled payments, determined by multipliers, with no juries, loser pays, substantial limits on punitive damages, substantial caps on noneconomic damages, mandatory structures in some situations, scheduled damages, and no class actions for products such as asbestos. It should also be pointed out that these tort limitations in the United Kingdom and Ireland are accompanied with substantial regulation of industries and services for the public welfare. Such regulation includes stricter oversight on product safety, quality of services offered, product marketing, and environmental impacts of manufacturers.

In the United States we have a greater "free market" mentality with respect to products and services in the marketplace as well as in the system of torts. It is argued that manufacturers are given greater leeway to produce dangerous products or externalities with the understanding that those harmed are allowed to recover damages for the harm through the tort system. A consumer harmed by an unsafe product can also recover damages that would not only compensate for harm, but also send a market signal to stop such production. That does not mean that a system of scheduled payments using multipliers such as the Ogden tables could not be useful in the United States, especially in class action cases such as asbestosis or black lung cases.

In the United Kingdom, Ireland, and Western Europe as a whole, there is a greater willingness for society to absorb the costs of torts through national health and other social programs than there is in the United States, just as there is a greater willingness to substitute public for market solutions in resource allocation. But that may be changing. The creation of the VCF following the September 11, 2001 attack is one example of a public solution

to a potentially massive tort action in the United States. Over 5,000 individual claims were resolved without the assignment of liability to the airlines or to the owner's and architects of the World Trade Center through the use of a Special Master, a specified system of formulas for the calculation of damages, and through the use of public funds. Moreover, a number of collateral payments including workers compensation, disability, and social security payments were allowed as offsets against damages awarded.

7. THE SEPTEMBER 11 VICTIM COMPENSATION FUND (VCF)

The VCF was established by the U.S. Congress as a device to compensate the 2,680 persons injured and the survivors of the 2,973 persons killed in the terrorist attacks on September 11, 2001. A Special Master, Mr. Kenneth Feinberg, was appointed by the U.S. Justice Department to devise a plan to compensate these individuals on a no-fault basis, avoiding litigation and quickly. Over a period of 33 months a plan was established, and more than 97% of those injured or the survivors of those killed received compensation of over $7 billion for economic and noneconomic damages suffered. A total of 5,560 claims were paid with total fund expenses of $86.9 million, of which $76.5 million was paid to PricewaterhouseCoopers LLP for developing the loss model, calculating economic losses under the model, and processing other claims (averaging $13,760 per claim paid). This was done with minimal participation of attorneys using scheduled damages, with implicit multipliers, and with the flexibility to consider special circumstances. Although there were claimed shortcomings in the process, it was successful in most respects (Feinberg, 2004).

In a paper published in 2006 entitled "Did the 9/11 Victim Compensation Fund Accurately Assess Economic Losses," Frank Tinari, Kevin Cahill and Elias Grivoyannis, have offered a critical appraisal of the economic compensation provided to victims by the fund in a number of categories (Tinari, Cahill, & Grivoyannis, 2006). The paper outlines the development of the VCF guidelines and methodologies used to award compensation. Many individuals contributed to those guidelines and methodology over the several months of its development. As a no-fault program of compensation, there were no issues of liability, general rules of make-whole, or deterrence to consider, although by accepting VCF compensation, claimants did forego the right to sue the airlines involved in civil torts.

Collateral offsets, such as life insurance and disability payments, were subtracted from the final determination of loss; and noneconomic losses were capped at $250,000 per family, with an additional $100,000 for the spouse and each dependent of a deceased victim (although these sums could be increased on appeal). A set of tables, based on age, income, and household size, was prepared, which were in effect multipliers for the determination of wage loss compensation. The tables were capped at an income of $250,000 per year, which was much criticized by highly compensated individuals. The Special Master responded by pointing out that this was a system of financial assistance to victims rather than compensation for total loss, but claimants could seek a hearing with the Special Master or his representative to make a special claim. Since household service loss was excluded in the initial tables, these hearings became important.

We show an example of the initial VCF Damages Tables with projected awards in Appendix B. It is simple to develop the multipliers used to calculate projected economic loss (excluding services) from the tables by subtracting noneconomic damages of $250,000 and $100,000 per dependent where appropriate and then by dividing the result by the base gross income shown. In Appendix B, the multipliers for a 25-year-old single individual would be 49.4 for a single person earning $10,000 per year, 37.5 for such a person earning $30,000 per year, 36.2 for such a person earning $60,000 per year, and 35.4 for such a person earning $125,000 per year. The tables were constructed by incorporating (1) a three-year average of earnings and (2) appropriate fringe benefits, tax reductions, a work life expectancy, earnings growth, adjustments for an age-earnings cycle, unemployment probabilities, and a reduction to present value. Except for the after-tax calculation and ultimate reductions for collateral income, the methodology used was basically consistent with the methodologies used by economists in damages torts.

The Tinari's analysis of the VCF process centered on a comparison of awards where individuals used an economist in presenting damages in a hearing with the Special Master or his representative, with awards outlined in the initial multiplier tables, and with awards damages calculated by economists in those cases. Tinari concluded that final awards were larger than the multiplier damages when an economist was used. The economist's calculations of damages were, on average, larger than the multiplier damages but smaller than the final awards. He concluded that the tables were a conditional success but that special circumstances did reduce the usefulness of the tables in calculating accurate damages. Given the fact

that such circumstances could be considered in special hearings did reduce that bias.

Any attempt to use the VCF approach to award compensation in civil torts would have to address the VCF's caps on noneconomic damages, after-tax calculations, reductions for collateral payments, and failure to directly address losses of services. However, such considerations can be addressed. Moreover, more exact multipliers can be developed using the state-of-the-art methodologies available to economists in the United States.

8. DAMAGES MULTIPLIER TABLES FOR THE UNITED STATES

In this section we offer a basic set of multipliers (Economic Loss Tables) for damages using the basic techniques used by forensic economists in the United States to forecast economic damages in personal injury and death torts. A first construction of Economic Loss Tables (EL Tables) for the United States should provide at least

- earnings multipliers based on age, gender, race, and level of education (EL-E);
- service multipliers based on age, gender, race, and family demographic (EL-S); and
- medical-loss multipliers based on age, gender, and race (EL-M).

This preliminary design of EL-E tables enables the calculation of a methodologically sound estimate of the present value of the average expected future earning capacity or earnings based on inputted parameters specific to a person. Although the methodologies employed in the EL tables have been accepted in the literature and are widely used by economists in the United States, no single person will be (or would have been) "absolutely" typical when compared to statistics that describe the average person. In many, if not most situations, an individual has special circumstances that can be quantified to allow an economist to improve upon the EL table presumed economic loss calculation. With that said, the EL tables are limited to providing an estimate of the presumed loss for a typical individual based on the known characteristics of a specific person.

8.1. EL-E Input Parameters

The EL tables consist of multipliers. To obtain the EL-E multiplier, it is necessary to know the age, gender, race, and level of education of the person being evaluated. With this input, multipliers are provided for combinations of discount rates and retirement ages. The chosen multiplier is applied to the individual's preevent earning capacity or earnings to arrive at the present value of his or her future earning capacity or earnings.[7]

To use the EL-E tables, it is necessary to choose a discount rate. The discount rates provided in the tables are real rates of net discount – the use of real rates obviates the need to forecast inflation as recognized by the U.S. Supreme Court in *Jones & Laughlin Steel Corporation v. Howard E. Pfeifer* case where the court suggested using a real net discount rate of between 1% and 3%. The real net discount rate considers future anticipated wage and compensation increases and future anticipated interest rates under the following standard formula:

$$r_{\text{net}} = \frac{(1+w)}{(1+R)} - 1 = \frac{(1+((1+g)(1+i)-1)}{(1+((1+r)(1+i)-1)} - 1 = \frac{(1+g)}{(1+r)} - 1$$

where w is the expected nominal future wage growth, R is the expected nominal future interest rate, g is expected real future wage growth, i is the expected nominal future inflation rate, and r is the expected real future interest rate.

Using the EL tables also requires the choice of a retirement age. This is the age at which an individual would have voluntarily and permanently exited the labor force. In some cases information regarding the age that a particular individual planned to retire is available. In other cases, the age at which the individual would have been eligible to retire with full social security retirement benefits may be a reasonable choice. If the choice of one particular age is not practical, a range of ages can be used in order to obtain a range for the loss.

8.2. Factors Imbedded in EL-E Multipliers

The EL-E tables constructed here consist of two basic tables of multipliers by gender and race combination for each age. The first table adds a life cycle earnings pattern adjustment and the second table assumes that earnings growth is limited to the constant real wage rate growth embedded in the net discount rate. Multipliers can be provided for a range of education levels,

the choice of net discount rate, and the age of retirement. In the example derived here, a high school level of education is assumed. The hazards of death, disability preventing work, and other involuntary reasons for not being employed (unemployment and discouragement) reduce the expected number of full-earnings years from the beginning age through the age of retirement.

8.3. The Concept of Life Cycle Earnings Patterns

When studying the changes in earning capacity over time, economists frame their methodology within their understanding of an individual's marginal product of labor (MPL). The changes in an individual's MP_L over time are a function of changes in innate abilities, human capital, and technological conditions. In the EL-E tables, we assume that changes in technological conditions are captured by the real net discount rate. Innate abilities refer to the individual's natural mental and physical capacities that are subject to changes with age. Loss of innate ability creates negative marginal productivity growth causing earning capacity to decline (the decline can be gradual with advancing age or immediate with the onset of disability). Human capital, in contrast to innate abilities, refers to skills and positions acquired by an individual throughout life. In general, human capital is acquired early in life leading to a concave path of wages over the life cycle, ceteris paribus. The generally accepted Ben-Porath human capital model contains the derivation of the generally accepted concave life cycle earnings pattern. We summarize the Ben-Porath model as follows (Ben-Porath, 1967):

$$E_t = wC_t$$

where E_t is earning capacity, w is the wage rate per unit of human capital stock, and C_t is the number of units of human capital processed in time t.

The behavior of E_t over time will depend on the behavior of C_t over time. Increasing C_t involves an investment cost that requires the use of some portion of the existing human capital stock (i.e., the human capital stock used for investment could otherwise be used for current earnings). The individual benefit to increasing C_t is an increase in remaining lifetime earning capacity. By equating the marginal cost and marginal benefit of increasing the human capital stock, the human capital model shows that the investments will be greater at younger ages and then diminish with time, resulting in the concavity of wage rates (or earning capacity) over a worker's lifetime. To address human capital's impact on earning capacity, economists

on a case-by-case basis empirically construct data for life cycle earnings patterns that coincide with the theoretical models of human capital.

8.4. The Concept of the Hazards of Death, Disability, and Nonaccess to a Job

Generally accepted theoretical models of labor supply are based on consumer demand for consumption. Income from market work depends on hours of work h and, in the simplest case, the fixed wage rate w (or earning capacity) per unit of work. Under the assumption of utility maximization, the real wage is the consumer's implicit value of his or her time at the margin between participating and not participating in the labor market. If at the margin the market's valuation of the consumer's time (w) exceeds the consumer's implicit value of his or her time when $h = 0$ (w^* or the reservation wage), then the consumer will participate in the labor market and supply a positive number of hours h of market work. A constraint to the model of labor supply for an individual includes the involuntary factors that would prevent his or her participation in the labor force. Those involuntary factors include death, disability that prevents work, and lack of access to a job due to unemployment, or discouragement from employment.

During the course of a lifetime, we expect an individual to continually face at least two different living states (able to work and not able to work) from which there is no exit. In the EL-E tables, we model such lifetime hazards using an increment–decrement Markov life table model that allows movement from one living state to the other before death. The movements between states and time are presented as transition probabilities that give the probability of being in state i at time t and in state j at time $t+n$ where n is some interval of time following time t.

We specify two fluid living states with regard to ability to be employed, active and inactive, using the annotations a and i, respectively, and we denote the absorbing state death with the letter d. The active state is ability to be employed and the inactive state is the inability to be employed. We let ${}^m p_x^n$ denote the transition probability that a person in state m at age x will be in state n at age $x+1$ where $m \in \{a, i\}$ and $n \in \{a, i, d\}$. The sums of the Markov transitions probabilities equal 1:

$${}^a p_x^a + {}^a p_x^i + {}^a p_x^d = 1 \tag{1}$$

$${}^i p_x^i + {}^i p_x^a + {}^i p_x^d = 1 \tag{2}$$

Unfortunately, mortality data by activity state are not available, so we assume that

$$ {}^{a}p_x^d = {}^{i}p_x^d = {}^{\bullet}p_x^d \tag{3} $$

which states that the transition probabilities from active to death and inactive to death are identical and marked with a • to represent either active or inactive.

The number of active and inactive survivors at each age x is calculated recursively from

$$ {}^{\bullet}l_x = {}^{\bullet}l_{x-1}(1 - {}^{\bullet}p_{x-1}^d) \tag{4} $$

where the beginning life table radix value of l_x is set to a positive number (usually 100,000). The number of survivors at any age is obtained from

$$ {}^{\bullet}l_x = {}^{a}l_x + {}^{i}l_x \tag{5} $$

Following the standard life table equation, the active and inactive survivors at age x are determined recursively on the transition probabilities and survivors at age x–1 are determined from

$$ {}^{a}l_x = {}^{a}l_{x-1} + {}^{i}p_{x-1}^{a}\,{}^{i}l_{x-1} - {}^{a}p_{x-1}^{i}\,{}^{a}l_{x-1} - {}^{\bullet}p_{x-1}^{d}\,{}^{a}l_{x-1} \tag{6} $$

$$ {}^{i}l_x = {}^{i}l_{x-1} + {}^{a}p_{x-1}^{i}\,{}^{a}l_{x-1} - {}^{i}p_{x-1}^{a}\,{}^{i}l_{x-1} - {}^{\bullet}p_{x-1}^{d}\,{}^{i}l_{x-1} \tag{7} $$

We assume that all transitions occur evenly through the year, so that the number of person years of life, activity, and inactivity at age x are given by

$$ {}^{\bullet}L_x^d = \frac{{}^{\bullet}l_x + {}^{\bullet}l_{x+1}}{2} \tag{8} $$

$$ {}^{\bullet}L_x^a = \frac{{}^{a}l_x + {}^{a}l_{x+1}}{2} \tag{9} $$

$$ {}^{\bullet}L_x^i = \frac{{}^{i}l_x + {}^{i}l_{x+1}}{2} \tag{10} $$

Survival and ability-to-work probabilities to any mid-year-age after age $\bar{x}$ are computed from ${}^{\bullet}\ell_x^{\bullet} = {}^{\bullet}L_x^{\bullet}/{}^{\bullet}l_{\bar{x}}$ where ℓ is a probability and $\bar{x}$ is the age beginning the relevant synthetic lifetime of a subcohort in the life table (e.g., if we want probabilities of state participation beyond the exact age of 35, then $\bar{x}$ equals exact age 35). From Eqs. (8) to (10), we calculate living, active, and inactive participation probabilities for each mid-year-age after age x as follows:

$$ {}^{\bullet}\ell_x^d = \frac{{}^{\bullet}L_x^{\bullet}}{{}^{\bullet}l_{\bar{x}}} \tag{11} $$

$$ {}^{\bullet}\ell_x^a = \frac{{}^{\bullet}L_x^a}{{}^{\bullet}l_{\bar{x}}} \tag{12} $$

$$ {}^{\bullet}\ell_x^i = \frac{{}^{\bullet}L_x^i}{{}^{\bullet}l_{\bar{x}}} \tag{13} $$

A feature of the Markov model in computing ability-to-work attachment probabilities is that we can change the radix or beginning value of state participation at each age x to be comprised entirely of actives or inactives to reestimate the synthetic lifetime ability to work attachment probabilities for actives and inactives after that one age x. For example, suppose the life table for the entire population begins at age x. For conformity with the life table model, the radix value of ${}^{\bullet}l_x$ is equal to the number of survivors at age x from the mortality table. The radix values of the active able-to-work population is ${}^{a}l_x$, which is computed as ${}^{\bullet}l_x$ times the percentage of the population that is able to work at age x and the radix value of ${}^{i}l_x$ is ${}^{\bullet}l_x$ minus ${}^{a}l_x$. All of the remaining values of the life table are dependent on these radix values to compute the expected probabilities of active and inactive ability to work. However, if we change the radix values to ${}^{a}l_x = {}^{\bullet}l_x$ and ${}^{i}l_x = 0$, we could compute the active and inactive able-to-work probabilities by age for only those who were active at age x. Likewise, if we change the radix values to ${}^{i}l_x = {}^{\bullet}l_x$ and ${}^{a}l_x = 0$, we could compute the active and inactive able-to-work probabilities for only those who were inactive at age x. Using Eqs. (12) and (13), which do not depend on beginning ability to work state participation, and changing radix values at the beginning exact age x, we calculate active and inactive ability to work probabilities for each mid-year-age after age x as follows:

$$ {}^{a}\ell_x^a = \frac{{}^{a}L_x^a}{{}^{\bullet}l_{\bar{x}}}, \text{ where at } \bar{x},\ {}^{a}l_x = {}^{\bullet}l_x \tag{14} $$

$$ {}^{a}\ell_x^i = \frac{{}^{a}L_x^i}{{}^{\bullet}l_{\bar{x}}}, \text{ where at } \bar{x},\ {}^{a}l_x = {}^{\bullet}l_x \tag{15} $$

$$ {}^{i}\ell_x^{i} = \frac{{}^{i}L_x^{i}}{{}^{\bullet}l_{\bar{x}}}, \text{ where at } \bar{x},\ {}^{i}l_x = {}^{\bullet}l_x \tag{16} $$

$$ {}^{i}\ell_x^{a} = \frac{{}^{i}L_x^{a}}{{}^{\bullet}l_{\bar{x}}}, \text{ where at } \bar{x},\ {}^{i}l_x = {}^{\bullet}l_x \tag{17} $$

For all of our calculations of the hazard of death or inability to work, the EL-E multiplier begins in the active state of alive and able to work. Therefore, the Markov hazard in the EL-E tables only considers those persons dying or becoming unable to work after a specific age.

8.5. Data Source for Life Cycle Earnings and Hazards Preventing Employment

Using the monthly outgoing rotations of the Current Population Survey (CPS) from January 1998 through December 2005, from 781,056 one-year-apart matching records on individuals in the CPS, we found the average size of the U.S. noninstitutional population by age, gender, and six educational levels by the statuses of "able to work" and "not able to work." The data set used appears in Krueger's analysis with the addition of dividing the population into persons that are able to work (or are employed for age-earnings calculations) and those that are unable to work (Krueger, 2005). The *U.S. Life Tables, 2003* from the U.S. Centers for Disease Control provide data regarding the hazard of death.

Persons in the CPS that are unable to work include disabled persons, unemployed persons, and discouraged persons. Persons that are able to work include employed persons, students and homemakers who are at those activities not because of an inability to work due to disability, retired persons who did not retire due to disability nor want a job but cannot work due to disability, and other nondisabled persons. Persons are categorized in the CPS as disabled and unable to work when all of the following conditions are met:

- a person has a specific physical or mental condition that prevents the individual from working;
- the disability is not a combination of minor disabilities that normally come with advanced age; and

- the disability incapacitates a person and prevents him or her from doing any kind of work, not just the type of work at his or her last job, for at least the next six months.

Students or homemakers who want a job but cannot work due to disability are categorized as disabled and unable to work. Retired persons who retired due to disability or are retired and want a job but cannot work due to disability are categorized as disabled and unable to work. Unemployed persons are categorized in the CPS as persons able to work and who have been looking for work over the last four weeks. Discouraged persons are persons able to work but were not currently looking for work specifically because they believed no jobs were available for them. Under the above definitions, for persons aged 18–75, 10.3% of males are unable to work and 9.8% of females are unable to work.

For the EL-E tables, we have used the life cycle earnings patterns distinguished by gender and level of education. We have used 10 levels of education: less than 9th grade, 9th to 12th grade but no diploma or GED, GED, high school diploma, vocational AA degree, academic AA degree, bachelor's degree, master's degree, professional school, and doctorate degree. The earnings data are recorded from the same matched sample of persons used to compute the hazard of inability to work based on the usual weekly earnings of employed persons. Included in the calculation of earnings by age are all persons employed full-time and persons with a disability that are employed part-time.

8.6. Sample EL-E Tables

In Appendix C, we show two example EL-E tables. Both tables are for all males in the United States with a high school education with retirement at age 65. The first table in Appendix C, Table C1, includes the life cycle age-earnings adjustment and the second table, Table C2, does not. Conforming to the Ogden tables, real discount rates from 0% to 5% are shown. From Table C2, the work life period is easily gleaned from the 0% net discount rate column. For example, at age 18 there are 38.96 remaining full-years of earnings in the EL-E table without considering life cycle earnings adjustments. From Table C1, we see that when adding the life cycle earnings adjustment, the loss multiplier at age 18 increases from 38.96 to 78.17 showing that the incorporation of life cycle earnings doubles the total economic loss-of-earnings estimate. After age 46, the multipliers in Table C2

exceed those in Table C1 because of the concavity of the age-earnings equation.

9. COMPARING OGDEN, VCF, AND EL-E MULTIPLIERS

In Table 1 we provide comparisons of projections of loss of earnings in personal injury cases using the male Ogden, VCF, and EL-E tables at a net discount rate of 0%, omitting the consideration of income taxes. For the Ogden and EL-E tables, retirement is set at age 65. Since the VCF tables rely on work life statistics that include voluntary retirement, the age of retirement is not entirely compatible with those of the Ogden and EL-E tables. To minimize the discrepancy between retirement ages, we only show VCF data for persons aged 45 and under. The top part of Table 1 shows VCF and EL-E data without incorporating life cycle earnings adjustments, and the bottom part of Table 1 includes the VCF and EL-E life cycle earnings adjustment. The Ogden and VCF tables are not delineated by education, so the EL-E data we choose are for high-school-educated persons who fairly represent "average" work life for all males as used in the VCF.

As can be seen from Table 1, the VCF and EL-E tables produce similar multipliers when not considering life cycle earnings adjustments. Since the Ogden tables for able-bodied workers do not include probabilities of

Table 1. Comparing Ogden, VCF, and EL-E Multipliers at 0% Net Discount.

Age	Ogden	VCF	EL-E
Without life cycle earnings			
25	38.71	32.62	33.01
30	33.78	28.48	28.61
35	38.88	24.29	24.40
40	24.00	20.16	19.95
45	19.16	16.15	15.74
With life cycle earnings			
25		56.77	46.99
30		41.46	35.39
35		30.63	27.26
40		22.79	21.02
45		16.93	15.88

disability or unemployment that would reduce earnings, the Ogden multipliers are significantly higher than those of the VCF and EL-E tables when neither include life cycle earnings adjustments. The deficiency of the Ogden tables not including the life cycle earnings adjustment is most noticeable at early ages in the tables. The life cycle earnings adjustment in the VCF reaches a maximum at age 52 without any decline thereafter, while the life cycle earnings adjustment in the EL-E tables results in declining earnings after age 52. Therefore, even though the basic worklives contained within the VCF and EL-E tables with retirement at age 65 are comparable, the VCF table multipliers with life cycle earnings are higher because of the VCF's truncated life cycle earnings pattern. The Ogden tables, compared to the EL-L and VCF multipliers, thus appear to undercompensate young individuals and overcompensate older workers. These conclusions are consistent with those of Lewis et al. in 2002.

10. CONCLUSIONS

David Bernstein, in his 1997 paper "Procedural Tort Reform: Lessons from Other Nations," urged the adoption in the United States of a variety of features of tort law in the United Kingdom and other Commonwealth countries. In this paper we have provided a basic outline of the differences between the methodologies for calculating damages in personal injury and death litigation, rules for calculating damages, and the court structures of the United Kingdom as compared to those of the United States. Several conclusions can be drawn from these comparisons. First, the U.S. model of damages calculations, which uses an actuarial, economic methodology, testimony by economic experts, and a jury system, has produced a fairly dynamic process of continuing improvement in damages methodologies and exactness in estimates of loss. In the United Kingdom a centralized system of law, with trial by judge without the use of economic experts in the litigation process, according to Lewis et al. has led to a systematic undercompensation of plaintiffs, a situation that has improved with the adoption of the Ogden tables in 1999. With the use of actuarial Ogden tables by judges in determining damages, the compensation to plaintiffs is expected to rise, and come closer to levels found in the United States. That, in itself, will likely produce a "Tort Reform" crisis in the United Kingdom. As a recent (2004) electronic paper, "Potential Effects of Ogden Table Review on Insurance Claims and Premiums," states:

> The Tables and discount rates applied to them are consistently cited as one of the reasons for increasing liability insurance costs and therefore premiums. In addition, there has been a notable increase in the number of high-value claims, on which the Ogden Tables have the highest impact. Claims expenses have risen dramatically, with the average cost of a motor claim increasing by 23% between 1997 and 2002, and the contributing factors include the use of Ogden Tables and the discount rates applied to them. Some insurance industry experts consider that the revised Ogden Tables could lead to as much as a 9% increase in the cost of claims.[8]

In many respects, the lessons from the United Kingdom with respect to the calculation and award of damages in personal injury and death litigation are that past systems of damages calculations, on average, appear to have undercompensated plaintiffs. The Ogden commission members have incorporated sound actuarial methodologies into the multipliers used by the courts, and the database used in constructing the tables has improved over time. The sixth edition tables have incorporated disability and employment status and educational levels into the multipliers Thus the use of actuarially derived Ogden tables have improved the "wholeness" objective of damages as have promoted consistency and predictability of awards, and the use of damages methodologies used in North America would further increase awards in all probability. No doubt, a comparison of Ogden multipliers to U.S. damages projections, as done by Lewis et al. in 2003, would yield more equal results today.

However the accuracy of a damages projection rests on variables that are still not considered at all in the Ogden table multipliers. These variables include the future growth rate of earnings and the discount rate. In the above comparison of damages using Ogden, VCF, and EL multipliers, no future earnings growth and no discounting were assumed. In reality, in the U.S. methodology the forensic economist would project future earnings with some growth rate and then discount those future earnings to present value. But the Ogden multipliers leave the choice of growth rates and discounting to the judge. The discount rate is mandated by the House of Lords (Section 1 of the Damages Act of 1996) and that rate is now 2.5%, but the tables are arranged by discount rates ranging from 0% to 5%. Therefore, the judge might use a 1% rate to implicitly account for future earnings growth rather than the 2.5% rate. The judge might also incorporate age-earnings adjustments in the calculations by adjusting base earnings (the multiplicand) at specific ages (from $25,000 per year for ages 20–29 to $35,000 per year for ages 30–39). Although such devices for correcting projections for growth and discounting rates exist, their use is at the discretion of the judge, and

there is no economic logic underlying their selections. In other words, legislated discount rates are not good substitutes for rates supported by economic reasoning.

As to the application of Ogden tables to litigation in the United States, several observations are in order. First, in situations like the September 11, 2001, terrorist attacks on the World Trade Center and the Pentagon, and in cases involving very large groups of plaintiffs with the same causes of action (tobacco, asbestosis, or radon litigation), multipliers offer the advantages of consistency and predictability in awards with minimal transaction costs. Moreover, multipliers can be constructed that incorporate many of the features of "expert-driven" damages methodologies used in the United States. The EL multipliers developed in this paper represent an example of such multipliers. However, the "expert-driven" system has been the source of enhancements to the projections of economic damages, including the Ogden tables, and it should remain the method by which economic damages are determined in the majority of personal injury or death cases in the United States.

NOTES

1. See Ager (2000) for a discussion of scheduled damages in other western European countries, such as Spain. He points out that schedules may create predictability in pecuniary damages, but cannot address the variability in noneconomic damages where multipliers do not exist. Also, see Bona (2003) for a discussion of the process of harmonizing compensation rules in Europe.
2. Ireland is an exception and such claims are considered torts, which has placed pressure on the court system of Ireland and has promoted movement away from trials in recent years.
3. The most recent Ogden tables, along with the methodology used to creating the tables, can be found in *Actuarial Table, with Explanatory Notes for Use in Personal Injury and Fatal Accident Cases* (6th ed.). Actuary's Department http://www.gad.gov.uk/Other_Services/Compensation_for_injury_and_death.htmGovernment
4. [1999] AC 345.
5. Based on Matthias Kelly's presentation to the First Trans-Atlantic Conference of the National Association of Forensic Economics in Edinburgh in 2004.
6. Scotland has a separate legal system within the United Kingdom, but rules for calculating damages are much the same as those in England, Wales, and Northern Ireland. Although the Ogden tables are not mandated for use in calculating damages, they are commonly used and strongly encouraged.
7. In most situations, the difference between the present value of earning capacity and earnings centers on the choice of final exit from the labor force.
8. www.icclaw.com/devs/uk/frame/isframe.htm, July 2004.

ACKNOWLEDGMENT

The author thanks Kurt V. Krueger and Gary R. Albrecht for their work on an earlier draft of this paper.

REFERENCES

Ager, J. (2000). Scheduling damage awards. *INDRET, 1*, 1–16.

Ben-Porath, Y. (1967). The production of human capital and the life cycle of earnings. *Journal of Political Economy, 75*(1), 352–365.

Bernstein, D. (1996). Procedural tort reform: Lessons from other nations. *Regulation, 19*(1). Available at www.cato.org/pubs/regulation/reg 19nle.html

Bona, M. (2003). Towards the 'Europeanization' of personal injury compensation? In: M. Bona & P. Mead (Eds), *Personal injury compensation in Europe*. Deventer: Kluwer.

Feinberg, K. (2004). *Final report of the special master of the September 11th victim compensation fund of 2001, Vol. 1*. The report and details of the fund can also be seen at http://usdoj.gov/archive/victimcompensation/

Grime, S. (2003). *Multiplier issues*. Deans court chambers. Available at www.deanscourt.co.uk/legal/multipliers.html

Krueger, K. (2005). Tables of inter-year labor force status of the U.S. population (1998–2004) to operate the Markov model of worklife expectancy. *Journal of Forensic Economics, 17*(3), 313–381.

Lewis, R., McNabb, L., Robinson, H., & Wass, V. (2003). Loss of earnings following personal injury: Do the courts adequately compensate injured parties. *The Economic Journal, 113*(491), 568–584.

Lewis, R., McNabb, R., Robinson, H., & Wass, V. (2002). Methods of calculating damages for loss of future earnings. *Journal of Personal Injury Law, 2*, 151–165.

Presser, S. (2002). How should the law of products liability be harmonized? what Americans can learn from Europeans. *Global liability issues*. Manhattan Institute, April.

Tinari, F., Cahill, K., & Grivoyannis, E. (2006). Did the 9/11 victim compensation fund accurately assess economic losses? *Topics in Economic Analysis and Policy, 6*(1), 1–42.

Verrall, R., Haberman, S., & Butt, Z. (2006). The impact of dynamic measurement of worklife expectancy on the loss of earnings multipliers in England and Wales. Paper presented at the meeting of the National Association of Forensic Economics, Boston, January 6.

APPENDIX A. THE SIXTH EDITION OF THE OGDEN TABLES: SELECTED PAGE

Table A1. Multipliers for Loss of Earnings to Pension Age 60 (Females).

Age at Date of Trial	Multipliers Calculated with Allowance for Projected Mortality from the 2004-Based Population Projections and Rate of Return of											Age at Date of Trial
	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	
16	43.49	39.07	35.26	31.97	29.10	26.60	24.42	22.50	20.81	19.32	17.99	16
17	42.49	38.27	34.62	31.44	25.68	26.26	24.14	22.27	20.63	19.16	17.87	17
18	41.50	37.46	33.96	30.91	28.24	25.91	23.85	22.04	20.43	19.01	17.74	18
19	40.50	36.65	33.30	30.37	27.80	25.55	23.56	21.80	20.23	18.84	17.60	19
20	39.51	35.84	32.63	29.82	27.35	25.18	23.25	21.55	20.03	18.67	17.46	20
21	38.51	35.02	31.96	29.27	26.89	24.80	22.94	21.29	19.81	18.49	17.31	21
22	37.51	34.20	31.28	28.70	26.43	24.41	22.62	21.02	19.59	18.31	17.16	22
23	36.52	33.37	30.59	28.13	25.95	24.01	22.28	20.74	19.35	18.11	16.99	23
24	35.52	32.54	29.89	27.55	25.46	23.60	21.94	20.45	19.11	17.91	16.82	24
25	34.53	31.70	29.19	26.96	24.96	23.18	21.59	20.15	18.86	17.69	16.64	25
26	33.53	30.86	28.48	26.36	24.46	22.75	21.22	19.84	18.60	17.47	16.45	26
27	32.54	30.02	27.77	25.75	23.94	22.31	20.85	19.52	18.33	17.24	16.25	27
28	31.54	29.17	27.04	25.13	23.42	21.86	20.46	19.19	18.04	17.00	16.04	28
29	30.55	28.32	26.32	24.51	22.88	21.40	20.07	18.85	17.75	16.74	15.83	29
30	29.56	27.47	25.58	23.87	22.33	20.93	19.66	18.50	17.44	16.48	15.60	30
31	28.56	26.61	24.84	23.23	21.77	20.45	19.24	18.14	17.13	16.20	15.36	31
32	27.57	25.74	24.09	22.58	21.21	19.95	18.81	17.76	16.80	15.92	15.10	32
33	26.58	24.88	23.33	21.92	20.63	19.45	18.36	17.37	16.46	15.61	14.54	33
34	25.59	24.01	22.57	21.25	20.04	18.93	17.91	16.97	16.10	15.30	14.56	34

Table A1. *(Continued).*

Age at Date of Trial	Multipliers Calculated with Allowance for Projected Mortality from the 2004-Based Population Projections and Rate of Return of											Age at Date of Trial
	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	
35	24.60	23.14	21.80	20.57	19.44	18.39	17.44	16.55	15.73	14.97	14.27	35
36	23.61	22.26	21.02	19.88	18.82	17.85	16.95	16.12	15.35	14.63	13.97	36
37	22.62	21.38	20.23	19.18	18.20	17.29	16.45	15.67	14.95	14.28	13.65	37
38	21.63	20.49	19.44	18.47	17.56	16.72	15.94	15.21	14.53	13.90	13.31	38
39	20.64	19.60	18.64	17.75	16.91	16.14	15.41	14.74	14.11	13.51	12.96	39
40	19.65	18.71	17.83	17.02	16.25	15.54	14.87	14.24	13.66	13.11	12.59	40
41	18.67	17.81	17.02	16.27	15.58	14.92	14.31	13.74	13.20	12.69	12.21	41
42	17.68	16.92	16.20	15.52	14.89	14.30	13.74	13.21	12.71	12.25	11.80	42
43	16.70	16.01	15.37	14.77	14.19	13.66	13.15	12.67	12.22	11.79	11.38	43
44	15.71	15.11	14.54	14.00	13.48	13.00	12.54	12.11	11.70	11.31	10.94	44
45	14.73	14.20	13.69	13.22	12.76	12.33	11.92	11.53	11.16	10.81	10.48	45
46	13.76	13.29	12.85	12.43	12.02	11.64	11.28	10.93	10.60	10.29	9.99	46
47	12.18	12.37	11.99	11.62	11.27	10.94	10.62	10.32	10.03	9.75	9.48	47
48	11.80	11.46	11.13	10.81	10.51	10.22	9.94	9.68	9.43	9.18	8.95	48
49	10.82	10.53	10.25	9.99	9.73	9.48	9.25	9.02	8.80	8.59	8.39	49
50	9.85	9.61	9.37	9.15	8.94	8.73	8.53	8.34	8.15	7.97	7.80	50
51	8.87	8.67	8.49	8.30	8.13	7.96	7.79	7.63	7.48	7.33	7.19	51
52	7.89	7.74	7.59	7.44	7.30	7.16	7.03	6.90	6.78	6.66	6.54	52
53	6.91	6.79	6.68	6.56	6.46	6.35	6.25	6.15	6.05	5.95	5.86	53
54	5.93	5.84	5.76	5.67	5.59	5.51	5.44	5.36	5.29	5.22	5.14	54
55	4.95	4.89	4.83	4.77	4.71	4.66	4.60	4.55	4.50	4.44	4.39	55
56	3.96	3.93	3.89	3.85	3.81	3.78	3.74	3.70	3.67	3.64	3.60	56
57	2.98	2.96	2.93	2.91	2.89	2.87	2.85	2.83	2.81	2.79	2.77	57
58	1.99	1.98	1.97	1.96	1.95	1.94	1.93	1.92	1.91	1.90	1.90	58
59	1.00	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.97	59

APPENDIX B. SELECTED VCF SCHEDULE

Table B1. Presumed Economic and Noneconomic Loss for a Single Decedent Before Any Collateral Offset.

Age	Income								
	$10,000	$20,000	$25,000	$30,000	$35,000	$40,000	$45,000	$50,000	$60,000
25	$383,953	$502,525	$565,791	$643,072	$751,528	$877,423	$963,377	$1,051,593	$1,214,526
30	$348,755	$436,170	$482,811	$539,785	$619,743	$712,557	$775,925	$840,961	$961,080
35	$325,946	$393,171	$429,040	$472,854	$534,344	$605,721	$654,453	$704,468	$796,844
40	$310,562	$364,169	$392,772	$427,712	$476,746	$533,664	$572,525	$612,408	$686,071
45	$300,000	$337,221	$359,073	$385,766	$423,226	$466,709	$496,398	$526,867	$583,144
50	$300,000	$315,111	$331,423	$351,349	$379,313	$411,774	$433,936	$456,681	$498,692
55	$300,000	$300,000	$308,408	$322,702	$342,761	$366,047	$381,945	$398,261	$428,396
60	$300,000	$300,000	$300,000	$300,000	$312,200	$327,813	$338,473	$349,414	$369,621
65	$300,000	$300,000	$300,000	$300,000	$300,000	$302,076	$309,211	$316,533	$330,056
	$70,000	$80,000	$90,000	$100,000	$125,000	$150,000	$1750,000	$200,000	$225,000
25	$1,376,302	$1,751,060	$2,107,059	$2,281,192	$2,669,889	X,XXX,XXX	X,XXX,XXX	X,XXX,XXX	X,XXX,XXX
30	$1,080,347	$1,356,630	$1,619,085	$1,747,461	$2,034,021	$2,344,344	$2,643,787	X,XXX,XXX	X,XXX,XXX
35	$888,564	$1,101,035	$1,302,871	$1,401,596	$1,621,971	$1,860,619	$2,090,900	$2,311,844	$2,523,762
40	$759,212	$928,644	$1,089,594	$1,168,322	$1,344,055	$1,534,361	$1,717,995	$1,894,184	$2,063,174
45	$639,020	$768,460	$891,421	$951,566	$1,085,821	$1,231,208	$1,371,498	$1,506,100	$1,635,203
50	$540,404	$637,031	$728,821	$773,719	$873,940	$982,472	$1,087,198	$1,187,679	$1,284,054
55	$458,318	$527,632	$593,477	$625,684	$697,577	$775,431	$850,555	$922,634	$991,768
60	$389,685	$436,162	$480,314	$501,910	$550,116	$602,320	$652,693	$701,025	$747,381
65	$343,484	$374,589	$404,137	$418,590	$450,852	$485,789	$519,501	$551,847	$582,871

APPENDIX C. SAMPLE EL-E TABLES

Table C1. Lifetime Age-Earnings Multipliers for All Males with a High School Education with Retirement at Age 65.

Age at Loss	Selected Net Discount Rate										
	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%
18	78.17	69.09	61.34	54.71	49.02	44.11	39.86	36.17	32.95	30.14	27.67
19	71.60	63.50	56.57	50.62	45.49	41.06	37.20	33.85	30.92	28.34	26.08
20	66.01	58.75	52.51	47.14	42.49	38.46	34.94	31.88	29.18	26.82	24.73
21	61.20	54.66	49.02	44.14	39.91	36.22	33.00	30.18	27.70	25.52	23.58
22	57.03	51.10	45.98	41.53	37.66	34.28	31.32	28.71	26.42	24.39	22.59
23	53.33	47.95	43.28	39.21	35.66	32.55	29.81	27.40	25.27	23.38	21.70
24	49.99	45.09	40.82	37.09	33.82	30.95	28.42	26.18	24.19	22.43	20.86
25	46.99	42.52	38.61	35.18	32.16	29.51	27.16	25.07	23.22	21.57	20.09
26	44.28	40.19	36.60	33.44	30.66	28.20	26.01	24.07	22.34	20.79	19.41
27	41.79	38.04	34.74	31.82	29.25	26.96	24.93	23.12	21.50	20.05	18.74
28	39.49	36.05	33.01	30.32	27.94	25.81	23.92	22.23	20.71	19.35	18.12
29	37.36	34.20	31.40	28.92	26.71	24.74	22.97	21.39	19.97	18.68	17.53
30	35.39	32.49	29.91	27.61	25.56	23.73	22.08	20.60	19.27	18.06	16.97
31	33.55	30.88	28.51	26.39	24.48	22.78	21.24	19.85	18.60	17.47	16.44
32	31.83	29.39	27.20	25.23	23.47	21.88	20.45	19.15	17.98	16.91	15.94
33	30.23	27.98	25.96	24.14	22.51	21.03	19.69	18.48	17.38	16.38	15.46
34	28.71	26.64	24.78	23.10	21.59	20.21	18.97	17.83	16.80	15.86	15.00
35	27.26	25.37	23.65	22.11	20.70	19.42	18.26	17.20	16.24	15.35	14.54
36	25.88	24.15	22.57	21.14	19.84	18.66	17.58	16.59	15.69	14.86	14.09
37	24.58	22.99	21.54	20.22	19.02	17.92	16.92	16.00	15.15	14.37	13.66
38	23.33	21.88	20.55	19.34	18.23	17.21	16.28	15.42	14.63	13.90	13.23
39	22.15	20.82	19.61	18.49	17.47	16.53	15.67	14.87	14.13	13.45	12.82
40	21.02	19.80	18.69	17.67	16.73	15.86	15.06	14.32	13.64	13.00	12.41
41	19.91	18.81	17.80	16.86	16.00	15.20	14.46	13.78	13.14	12.55	12.00
42	18.86	17.86	16.94	16.08	15.29	14.56	13.88	13.25	12.66	12.11	11.60
43	17.84	16.94	16.10	15.32	14.60	13.93	13.30	12.72	12.17	11.67	11.19
44	16.85	16.03	15.27	14.57	13.91	13.30	12.72	12.19	11.69	11.22	10.78
45	15.88	15.15	14.46	13.83	13.23	12.67	12.15	11.66	11.20	10.77	10.36
46	14.95	14.29	13.68	13.10	12.56	12.06	11.58	11.13	10.72	10.32	9.95
47	14.04	13.46	12.91	12.39	11.91	11.45	11.02	10.62	10.23	9.87	9.53
48	13.16	12.64	12.16	11.70	11.26	10.85	10.47	10.10	9.75	9.43	9.12
49	12.31	11.85	11.42	11.01	10.62	10.26	9.91	9.58	9.27	8.97	8.69
50	11.46	11.06	10.68	10.32	9.98	9.66	9.35	9.06	8.78	8.51	8.26
51	10.65	10.30	9.97	9.66	9.36	9.07	8.80	8.54	8.29	8.06	7.83
52	9.85	9.55	9.27	9.00	8.74	8.49	8.25	8.02	7.80	7.59	7.40
53	9.08	8.82	8.58	8.34	8.12	7.90	7.70	7.50	7.31	7.13	6.95
54	8.34	8.12	7.92	7.72	7.53	7.34	7.17	7.00	6.83	6.68	6.53
55	7.60	7.42	7.25	7.09	6.93	6.77	6.62	6.48	6.34	6.21	6.08
56	6.85	6.71	6.57	6.43	6.30	6.17	6.05	5.93	5.82	5.71	5.60
57	6.10	5.98	5.87	5.76	5.66	5.56	5.46	5.36	5.27	5.18	5.09
58	5.34	5.26	5.17	5.09	5.00	4.93	4.85	4.77	4.70	4.63	4.56
59	4.59	4.53	4.46	4.40	4.34	4.28	4.22	4.17	4.11	4.06	4.00
60	3.84	3.80	3.75	3.71	3.66	3.62	3.58	3.54	3.50	3.46	3.42
61	3.09	3.06	3.03	3.00	2.97	2.95	2.92	2.89	2.87	2.84	2.81
62	2.35	2.33	2.31	2.30	2.28	2.26	2.25	2.23	2.22	2.20	2.19
63	1.59	1.59	1.58	1.57	1.56	1.56	1.55	1.54	1.53	1.53	1.52
64	0.81	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.79	0.79
65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table C2. Lifetime Simple Earnings Multipliers for All Males with a High School Education with Retirement at Age 65.

Age at Loss	Selected Net Discount Rate										
	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%
18	38.96	34.87	31.36	28.34	25.74	23.48	21.51	19.79	18.28	16.95	15.77
19	38.09	34.17	30.80	27.89	25.37	23.18	21.27	19.59	18.12	16.82	15.67
20	37.23	33.48	30.24	27.44	25.01	22.89	21.03	19.40	17.96	16.69	15.56
21	36.39	32.81	29.70	27.01	24.66	22.61	20.81	19.22	17.82	16.58	15.48
22	35.57	32.15	29.17	26.59	24.32	22.34	20.60	19.06	17.69	16.48	15.40
23	34.74	31.48	28.63	26.15	23.97	22.06	20.37	18.87	17.55	16.37	15.31
24	33.87	30.76	28.04	25.66	23.57	21.72	20.09	18.64	17.36	16.21	15.18
25	33.01	30.04	27.45	25.17	23.16	21.38	19.81	18.41	17.16	16.04	15.04
26	32.15	29.34	26.86	24.68	22.76	21.05	19.53	18.18	16.97	15.88	14.91
27	31.27	28.60	26.24	24.16	22.32	20.68	19.22	17.91	16.74	15.69	14.74
28	30.38	27.85	25.61	23.63	21.86	20.29	18.89	17.63	16.50	15.48	14.57
29	29.49	27.10	24.97	23.09	21.40	19.90	18.55	17.34	16.25	15.27	14.38
30	28.61	26.35	24.33	22.54	20.93	19.50	18.20	17.04	15.99	15.04	14.18
31	27.73	25.59	23.69	21.99	20.46	19.09	17.85	16.74	15.73	14.81	13.98
32	26.85	24.84	23.05	21.43	19.98	18.68	17.50	16.43	15.46	14.58	13.78
33	25.99	24.10	22.40	20.88	19.50	18.26	17.14	16.11	15.19	14.34	13.57
34	25.12	23.35	21.75	20.31	19.01	17.83	16.76	15.79	14.90	14.09	13.35
35	24.24	22.59	21.09	19.74	18.51	17.39	16.37	15.45	14.60	13.83	13.11
36	23.37	21.82	20.42	19.15	17.99	16.94	15.97	15.09	14.29	13.55	12.87
37	22.50	21.06	19.75	18.56	17.47	16.48	15.57	14.73	13.97	13.26	12.61
38	21.64	20.31	19.08	17.97	16.95	16.01	15.15	14.37	13.64	12.97	12.35
39	20.80	19.56	18.42	17.38	16.43	15.55	14.74	14.00	13.31	12.68	12.09
40	19.95	18.81	17.75	16.79	15.90	15.08	14.32	13.62	12.97	12.37	11.82
41	19.10	18.04	17.07	16.18	15.35	14.58	13.88	13.22	12.61	12.05	11.52
42	18.26	17.29	16.40	15.57	14.80	14.09	13.43	12.82	12.25	11.72	11.23
43	17.42	16.54	15.72	14.95	14.25	13.59	12.98	12.41	11.88	11.38	10.92
44	16.58	15.77	15.02	14.32	13.67	13.07	12.50	11.98	11.48	11.02	10.59
45	15.74	15.01	14.33	13.69	13.10	12.54	12.02	11.53	11.07	10.65	10.24
46	14.91	14.25	13.63	13.05	12.51	12.00	11.53	11.08	10.66	10.26	9.89
47	14.08	13.49	12.94	12.42	11.92	11.46	11.03	10.62	10.23	9.87	9.53
48	13.27	12.74	12.24	11.78	11.33	10.92	10.53	10.15	9.80	9.47	9.15
49	12.46	11.99	11.55	11.13	10.74	10.36	10.01	9.67	9.36	9.05	8.77
50	11.65	11.24	10.85	10.48	10.13	9.79	9.48	9.18	8.89	8.62	8.36
51	10.86	10.50	10.16	9.83	9.52	9.23	8.95	8.68	8.43	8.19	7.95
52	10.07	9.76	9.46	9.18	8.91	8.66	8.41	8.17	7.95	7.73	7.53
53	9.29	9.03	8.77	8.53	8.30	8.07	7.86	7.66	7.46	7.27	7.09
54	8.55	8.32	8.11	7.90	7.70	7.51	7.33	7.16	6.99	6.82	6.67
55	7.80	7.61	7.43	7.26	7.09	6.93	6.78	6.63	6.49	6.35	6.21
56	7.03	6.88	6.73	6.59	6.45	6.32	6.19	6.07	5.95	5.84	5.73
57	6.25	6.13	6.01	5.90	5.79	5.68	5.58	5.48	5.39	5.29	5.20
58	5.47	5.38	5.29	5.20	5.12	5.03	4.95	4.88	4.80	4.73	4.66
59	4.69	4.62	4.56	4.49	4.43	4.37	4.31	4.25	4.19	4.14	4.08
60	3.91	3.86	3.82	3.77	3.73	3.69	3.64	3.60	3.56	3.52	3.48
61	3.13	3.10	3.07	3.05	3.02	2.99	2.96	2.93	2.91	2.88	2.85
62	2.37	2.35	2.34	2.32	2.30	2.29	2.27	2.25	2.24	2.22	2.21
63	1.60	1.60	1.59	1.58	1.57	1.56	1.56	1.55	1.54	1.54	1.53
64	0.81	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.79	0.79
65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00