An investigative study on current practice of estimating the loss of earnings in personal injury claims in England and Wales. The Ogden Tables and contingencies other than mortality

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Abstract

In this paper, we provide an overview of the scientific literature concerning the labour force dynamics from the perspective of the loss of earnings multipliers in England and Wales. Loss of earnings multipliers are used to estimate the financial value of future worktime, when allowing for mortality and labour market risks, and are currently published in the Ogden Tables. The modelling approaches of the labour market contingencies underwent significant advances in the last decade or so, shaped by great improvements in the available data. This study encompasses the labour market literature starting from the original empirical investigation of Haberman and Bloomfield (1990) to the alternative approach suggested by Lewis et al. (2003) and aims to assess the past and current methodology of estimating contingencies other than mortality which affect the value of the awards. The purpose of this paper is to review the rationale and the suitability of the Ogden Tables to current population worklife expectancy and labour force participation projections in the light of the latest methodological advances.

Keywords: *future loss of earnings, multiplier–multiplicand approach, Ogden Tables, Labour Force Survey, multiple state modelling.*

1 Introduction

The assessment of compensation for loss of earnings in personal injury and fatal accident cases in England and Wales has attracted considerable attention following the research of Lewis et al. (2002). Previous debate among personal injury lawyers has concentrated on quantitative aspects of the current multiplier–multiplicand valuation system and how to tailor this framework to more complex cases (e.g. Judicial Studies Board 2002, 2004*a*). However, Lewis et al. go

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beyond the practical considerations and highlight severe shortcomings in terms of the methodology, giving a new dimension to the debate. They claim that a large majority of the plaintiffs in England and Wales might be under-compensated by the multiplier–multiplicand calculation method due to an incorrect valuation of the future loss of earnings. In particular, they stress the importance of dynamic modelling of future labour market hazards (i.e. non-participation due to contingencies other than mortality) and the need for taking account of the earnings growth of the plaintiffs. While the latter argument is being currently considered strictly on individual merits in the courts in England and Wales, there is a general consensus that the recent improvements in quality of published labour force data deserve greater attention (see notes by Grime QC 2003).

Therefore, in this paper we focus on the past and current methodologies for estimating the effect of contingencies other than mortality which affect the value of court awards in the case of future loss of earnings compensation. This paper reviews the methods currently in use, and in particular the rationale and suitability of the Ogden Tables for estimating population worklife expectancy. It is not the purpose of this paper to determine the adequacy of current loss of earnings awards, instead to make use of the improved methodologies and data. Our aim is only to make a critical appraisal of the methodologies discussed in the current literature in the light of recent developments in LFS data. The perspective of the paper considers primarily the UK literature, but we will also examine some advanced topics from the USA related to multiple state modelling.

In the remaining parts of this paper, we will cover the following. In section 2 we consider the background to the financial compensation for future loss of earnings in England and Wales and in section 3 we present the key issues surrounding the estimation and use of the multipliers, emphasizing the shortcomings of the current figures. This is followed in section 4 by an in depth review of the purpose and role of the Ogden Tables in the valuation of compensations. Then in section 5 and 6 we elaborate on the main features of the past and the alternative methodology respectively to value future loss of earnings. Other approaches focusing on the main contingencies (in parts) of the labour market risk is considered in section 7. Further, in section 8 we briefly describe some multivariate modelling frameworks that make use of longitudinal labour market data sets. Finally, in section 9 we consider some further implications of the dynamic modelling on the Ogden Tables multipliers and we conclude this presentation.

2 Background

In general, in the UK, the damages in personal injury and fatal accident cases is a single capital sum awarded to the plaintiff. Note that a *structured settlement* is a viable alternative to the lump sum award and the Damages Act 1996, indeed, allowed for this form of a compensation when it was reached by consent. Recently, the UK government has introduced ammendments to the earlier law, in sections 100 and 101 of the Courts Act 2003, which has received Royal Assent in the same year, thus giving the courts powers to enforce structured settlements without the parties consent (see also the Lord Chancellor's Department Consultation Paper 2000, 2002). However, in its current form, the structured settlement compensation still depends strongly on the lump sum calculation method to determine the price of an approapriate annuities product. Arguably, the legislative process is still in its early development phase and it may take many years until structured settlements form of damages replaces the lump sum awards in the UK.

The lump sum award is made up of a number of components reflecting both pecuniary and non-pecuniary losses. In serious injury cases, the cost of care and the future loss of earnings are far the most important elements of the pecuniary losses suffered by the plaintiff. The cost of care is determined both on medical and social grounds and it is awarded over the expected future lifetime of the plaintiff. Similarly, the loss of earnings is determined over the expected number of years the plaintiff might have stayed active and generated earnings. It is generally accepted that the pecuniary (i.e. fiscal) element of the compensation award is determinable fairly objectively using standard econometric and actuarial techniques, and these are investigated in this paper. By contrast, the non-pecuniary losses are clearly subject to individual circumstances[1] and should be undoubtedly at the judicial discretion of the courts, and as such are not the subject of this study.

Traditionally, the pecuniary losses are determined in the UK Courts as the product of the *multiplicand* (i.e. the annual loss and/or expense) and the *multiplier* (i.e. the estimated number of years for which provisions should be made). The latter is computed as a discounted measure of expected time (usually the future life or worklife expectancy) over which the loss occurred, assuming that the losses/expenses would be incurred on a continuous basis. Thus, in essence, the final capital sum of the award is the equivalent of the estimated actuarial value of the stream of future losses. Given the long time-span over which the damages are awarded, the multiplier is the single most important factor affecting the size of the final award. Its main role is to account for significant future risks, such as early mortality or involuntary non-participation in the labour force.

[1] Non-pecuniary losses are awarded with respect to the 'pain and suffering' endured and for the financially irreplaceable amenities of life lost due to the accident.

3 Multipliers in England and Wales: Broad Issues

Before the 1990s, the courts in England and Wales were reluctant to rely on the actuarial valuation of the multipliers, apart from the discount factors for future mortality risk. Contingencies other than the expectation of life were generally estimated by unsophisticated non-actuarial methods, not least because of their transparency and simplicity. Also, the general perception of the courts was that the difference between scientific and traditional estimates of contingencies other than mortality was in most cases negligible. This view began to be dispelled by the work of a multi-disciplinary working party made up of actuaries, lawyers and insurance industry representatives. Their publication in 1984 of the first set of tables of multipliers has led to a turning point in the attitude of the courts towards the admissibility of scientific evidence in personal injury cases.

The loss of earnings multipliers for England and Wales are currently prepared by the Government Actuary's Department (GAD) in consultation with the multi-disciplinary working party, and are periodically published together with explanatory notes. This set of tabulated multipliers are simply referred to as the Ogden Tables (see section 4). Making use of the Ogden Tables, one can estimate multipliers according to various individual and macro-economic factors, such as age at trial, age at retirement, job type, economic activity, geographic location and expected future rate of interest. It is universally accepted that the tables facilitate a more objective and balanced assessment of personal injury compensation awards than previous methods (see Judicial Studies Board 2004*a*,*b*).

Nevertheless, the Ogden Tables are subject to the important criticism of being out-of-date in terms of the applied reduction factors that account for labour market risks. The reduction factors[2] proposed in the Ogden Tables to allow for contingencies other than mortality, such as unemployment, sickness, industrial disputes, etc., have been estimated from labour force data which is well over 15 years old. The factors are based on the traditional methodology of constructing a working life table, and were put forward by Haberman and Bloomfield (1990). The factors are then used to adjust a traditional measure of worklife expectancy which allows for mortality risks only. This approach relied on sets of cross-sectional labour market data, and Haberman and Bloomfield recognized that a multiple state modelling framework would have been more sound in theoretical terms and could have been implemented if the appropriate data had been available. Although better quality data now exist, the underlying methodology has not changed, reflecting perhaps the reluctance of the courts in England and Wales to recognize

[2]The reduction factor represent the ratio of the worklife expectancy and the number of years remaining alive to pension age t_p (e.g. 65 and 60 for males and females respectively): $k_x = \frac{e^w_{x:\overline{t_p-x}|}}{e_{x:\overline{t_p-x}|}}$. Therefore, $1-k_x$ gives the percentage discounts for the labour market risks applicable to the value of the multipliers.

more sophisticated statistical and actuarial techniques.

The empirical evidence for the above argument draws on the work of Lewis, McNabb and Wass (2002), which suggests that the implications of an improved methodology and new labour market data are far reaching. The authors argue that the alternative methodology could yield an average award (for plaintiffs without post-injury earnings potential) that is as much as 36 % higher[3]. The authors advocate an alternative methodology, based on the US tort system, which makes use of a multiple state model and also allows for economic and individual productivity growth in the estimation process. The growth indices are an important part of the proposed model and would account for around 25 % of the increase in the mean value. Nevertheless, the authors also find that almost a quarter of the cases could be over-compensated by the traditional system. That is because a dynamic labour market model would yield lower participation rates for a broad class of workers (e.g. self-employed or part-time workers, etc.) than those applied in the UK courts. Similarly, there would be significant gender differences in the size of the awards, compared to the traditional methods, given women's greater nurturing roles in society, which significantly reduces their participation rates over the working lifetime.

Lewis et al. (2002) make use of a straightforward 3-state model (employed-unemployed-inactive) in conjunction with the 1997 LFS data, in order to estimate employment probabilities. Their primary purpose is not to estimate discounts for labour market risks, but to weight the estimated annual earnings stream of the plaintiffs in a US style methodology for calculating damages awards. Nonetheless, they have demonstrated that more sophisticated methods are now available for the measurement of labour market dynamics in England and Wales. Thus, they have signaled that the revision of discount factors for the labour market hazards now may be overdue. In the explanatory notes to the 5$^{\text{th}}$ edition of the Ogden Tables, Chris Daykin[4] acknowledges the warning signs raised by the research of Lewis et al., and he highlights the importance of further research into these shortcomings of the Ogden Tables.

4 The Ogden Tables

The purpose of the Ogden Tables is to provide scientific guidance to the courts in England and Wales in their efforts of determining the pecuniary losses suffered by plaintiffs. They are named in honour of Sir Michael Ogden QC, who chaired the multi-disciplinary working party in the early 1980s and encouraged the use of actuarial evidence in personal injury and fatal accident cases. The Tables were instigated by personal injury lawyers and then developed in

[3]Based on a comparative statistical analysis carried out on a sample of over 100 documented court awards (see further discussion in section 6).

[4]Chris Daykin is the Government Actuary and a member of the multi-disciplinary working party.

collaboration with actuaries, accountants and representatives of the insurance industry. The primary function of the tables is to achieve transparency and simplicity, in the interest of those affected, while offering reasonable levels of accuracy. Recently, in a press release to the 5th edition, Chris Daykin noted: "The Ogden Tables have been endorsed by the House of Lords through guidance from the Department for Constitutional Affairs and represent an important practical tool for the Courts to use in order to insure that awards provide fair and adequate compensation."

Historically, the Ogden Tables brought about a long awaited improvement in the area of personal injury compensation. The initial set of multipliers were first published in 1984 with some brief notes. However, they gained true recognition only after the publication of the 2nd edition in 1994, when the Tables were generally accepted in the courts in England and Wales as admissible evidence and became a point of reference in determining the value of multipliers. As a consequence, the Law Commission subsequently called for formal legislation, which materialized in the Civil Evidence Act 1995 and was implemented in the Damages Act 1996 (that received Royal Assent in the same year). The further editions have followed: the 3rd, 4th and 5th in 1998, 2000 and (most recently) in 2004 respectively. They have provided significant improvements in terms of clearer guidelines and practical recommendations, that have ensured far better accuracy and transparency in comparison to traditional, so-called "broad-brush", approaches that had often been adopted by the courts.

The Ogden Tables represent an actuarial tool constructed to aid the courts in England and Wales in their valuation of monetary losses in personal injury and fatal accident cases. The Ogden Tables are a collection of base multipliers, representing the discounted worklife expectancy for mortality risk of the average workers in England and Wales, which control for factors such as gender, age at trial and pension age, and allow for real rates of return. Currently, labour market risks are not incorporated directly into the tabulated multipliers. Instead, the Ogden Tables contain recommendations for reduction factors for the base multipliers with respect to economic activity, type of occupation and geographical area. The resultant (discounted) multipliers constitute a straightforward measure of the future years the plaintiff would most likely, based on national mortality and labour force data, be able to spend working and generating earnings had the injury or fatal accident not taken place.

The adoption of the Ogden Tables introduced a systematic element in the calculation of the future loss of earnings awards. The level of compensation (i.e. multipliers), in general, have increased significantly, compared to the traditional values used by the courts. It is important, nevertheless, to acknowledge the fact that there are inevitably some limitations and disadvantages associated to the use of the Ogden Tables. Lewis et al. (2002) argue strongly that the Ogden Tables, despite all its benefits, only encourage the use of an out-dated methodology. In

their opinion, the multiplier–multiplicand approach is inherently inadequate to allow for wage inflation and productivity growth in the calculation of damages[5]. Further, the authors claim that the Ogden Tables make no allowance for reduced post-injury worklife expectancy of the injured persons (i.e. impaired lives), resulting in significant under-compensation of the plaintiffs with post-injury earnings capacity. Similarly, critics from the legal profession also perceive the Ogden Tables as a generally rigid system, which is difficult to be applied to complex cases; for example, where the cost of care could increase at rates which are much faster than normal price inflation. However, what the system might lack in flexibility it clearly makes up for in transparency: for example, it is a widely accepted practice to use split multipliers with differentiated discount rates to account for future events, like certain career leaps or unusual escalation in cost of care[6].

In the light of the accelerating improvements in human life expectancy over the last decades or so, the Ogden Tables multipliers have been characterized by conservative assumptions for the future mortality risk. For reasons of convenience, the earlier editions of the Ogden Tables made use of historical mortality rates instead of current or projected mortality. Thus, initially, the Ogden Tables were based on the ELT 13 and although they have been updated, the base values of the 4^{th} edition (2000) depend on the ELT 15 (published in 1997), which represents the observed mortality experience of the period 1990–92. However, recognizing the unfavorable effect of this on all but the smallest financial awards, the working party have recommended modified values to reflect future mortality improvements. Thus, the 4^{th} edition also contains a separate set of tables (No. 19–36) based on "prudent" estimates of future mortality improvements, whereas in the most recent (5^{th}) edition, projected mortality rates[7] have replaced entirely the past mortality experiences in the computations.

A considerable shortcoming of the Ogden Tables are the lack of recommendations with respect to the reduction factors for impaired lives (i.e. discounts for mortality and labour market risks). This is particularly relevant when the courts need to assess the post-injury (residual) earnings capacity of an injured (disabled) person. Currently, the courts make a

[5]Note that in the 5^{th} edition of the Ogden Tables, there are made some brief recommendations (see Appendix A) with respect to the additional factors accounting for the overall economy wide earnings growth (currently about $\sim 2\,\%$ above the RPI).

[6]The Judicial Studies Board (2004*a*) considers 3 different methods (see paragraphs 97–100), that are used throughout the courts in England and Wales, to account for time varying multiplicands. For instance, the second method calculates the losses over distinct "brackets of years" of the plaintiff's working lifespan and applying multiplicands equal to the predicted average earnings for each period. Then by treating each of these periods as terms certain, the corresponding multipliers are estimated based on Tables No. 37 and 38. Nevertheless, the authors of the Judicial Studies Board (2004*a*) note that the three variants of the split multipliers result in damages awards that are equal for all practical purposes.

[7]Office of National Statistics PP2 No. 24

straightforward fixed payment, equivalent to 6–24 months post-injury earnings, in order to compensate for the likely disadvantages that the injured person faces in labour market[8]. Lewis et al. (2002) suggest that any such method applied by the courts in England and Wales fails to compensate adequately plaintiffs with post-injury earnings capacity and advocate that an econometric type estimation of post-injury earnings capacity should be made an integral part of the estimation process. However, the type of data required for the estimation of mortality experience of impaired lives is insufficient. Similarly, there is even less information that might be statistically significant regarding the labour market participation of disabled individuals, especially with respect to the effect of the type of disability.

Another important aspect in the determination of the future loss of earnings awards is to make reasonable provisions for contingencies other than mortality. The Judicial Studies Board (2004*a*) believes that the discount factors applied by the courts for the other contingencies in the past was around $10 - 15\,\%$[9], though currently this might be lessened to somewhere below $10\,\%$. Hence, in relation to the average $3 - 4\,\%$ for the mortality risk, the discounts for the labour market risks account for a considerable proportion of the total deductions that have been applied to the value of the loss of earnings multiplier. Thus, it has become an area of great controversy and debate, not least because the deductions recommended by the Ogden Tables are on average less than $3\,\%$ for ages below 40 (and less than $5\,\%$ for ages above 40).

5 Calculating reduction factors for labour market risks: Ogden Tables approach based on Haberman and Bloomfield (1990)

Haberman and Bloomfield (1990) was among the first studies to identify formally and estimate the effect of contingencies other than mortality on the valuation of the loss of earnings in the UK. This is an acclaimed empirical study, which considers data available at the time (primarily from the UK, but also with examples from Denmark and USA) to measure worklife expectancy when allowing for contingencies other than mortality. The detailed recommendations have led to the reduction factors contained in the last four editions of the Ogden Tables (2^{nd}– 5^{th}). However, the authors have expressed their concern that the proposed labour market risks of unemployment have been understated due to the limitations of the methodology and data used, thus inflating potential multipliers (i.e. awards) by as much as $8\,\%$ over a full working life of the plaintiff.

[8] Traditionally, this is referred to as a Smith v. Manchester award.

[9] Lewis et al. (2002) refers to earlier sources claiming that it was in average even as high as $20\,\%$. Nonetheless, it should be noted that the courts would often consider in their rulings other factors, such as state-provided sickness or unemployment benefits, etc. that would reduce the estimated earnings related loss.

There are three different methodologies put forward in the paper, as follows:

- **simple working life table**

  This approach is inhibited by two underlying assumptions such as: a single (lifetime) transition in/out of active state (i.e. stationarity of the labour market) and a unimodal curve of age-specific labour force participation rates (w_x). Currently, neither of these is satisfied in practice. Further, the method ignores the information on the individual's initial labour force status and therefore ignores the conditional nature of the underlying transition probabilities (i.e. it predicts the same worklife expectancy for employed and unemployed).

- **improved working life table (allowing for average time spent out of the labour market)**

  The methodology is designed to provide an improved alternative to the simple working life table. In essence, it replaces the age-specific work-force participation rates w_x, used in the first method, with *average active rates* g_x, that considers for the observed average times spent sick, unemployed or in industrial disputes in England and Wales. The authors stress the limitations imposed by unreliable data-sources to measure the economically inactive times of the labour force. Thus the estimates of g_x have been provided on two different economic bases: "low" and "high" (activity), reflecting the volatility of the labour market over the observation period (during the 1970s to 1980s).

- **multiple state model**

  This is a fundamentally different methodology based on the Markov chain multiple state model approach, as suggested by Alter and Becker (1985), which not only provides better estimates of the worklife expectancy, but also gives the distribution of the times spent in different activity states (i.e. dispersion measures are readily available). However, it requires detailed longitudinal data of high reliability. Haberman and Bloomfield note that such data were not available in the UK at the time of their study but they provide an illustration from Hoem (1977), which makes use of Danish LFS data collected between 1972 and 1974.

The first two approaches use published mortality rates together with (stationary) stock indices (i.e. participation rates) as opposed to the (dynamic) flow indices (i.e. transition probabilities) employed by the multiple state model. The stock indices reflect the age-specific labour force attachment of the current population, but fail to provide information on the labour market behaviour when conditioned on age and the starting economic state. It is noted in the

paper, in comparison with the Hoem (1977) and other results, that the worklife expectancy is overestimated with the conventional method, regardless of the initial labour force status. The authors find that the discrepancies between the two estimates are in average 5 % and can be as high as 8 % (when calculated for ages that are towards the end of the working life time). Therefore, the reduction factors will be also systematically overestimated when based on the conventional methods.

The application of Haberman and Bloomfield considers the following types of risks and relevant covariates in the calculation of reduction factors:

Type of risks considered:

- sickness
- unemployment (redundancy)
- industrial disputes

Groupings of reduction factors by:

- sex and age
- age and occupation
- age and region

We note that the risk of early retirement has not been considered on its own. It is not clear whether the effect of this is accounted for indirectly through the unemployment and/or the sickness rates; or rather omitted altogether similarly to the special case of *discouraged workers* due to data shortcomings. The authors discuss the latter, and similar problems with the data in general, in section 7.7 of their paper. For example, they point out that the 1984 LFS data shows 197, 000 male discouraged workers, making up about 1.2 % of the labour work-force, which could not be included in the calculations.

Haberman and Bloomfield's estimates of sickness absence have been compiled and compared from various data sources, which raised many compatibility issues. The DHSS reported the number of workers claiming sickness benefits for the period 1962 to 1974 over a number of age groups. Since this was discontinued in 1974, indirect estimation was required for later years. Thus, cross sectional LFS data was used between 1972 and 1982, but these did not include those permanently ill. Hence, the LFS data were combined with the Social Security statistics on those receiving invalidity benefits. Finally, for the later years, the General Household Survey (GHS) provided a limited amount of information on days off sick for 1982 and 1986. Namely, the crude gross annual estimates of sickness absence were derived in a direct way from the average number of days off sick in the week before the survey interview (i.e. reference week) over all respondents[10]. The authors note that the above fragmented data sources and the frequently mismatched groups and/or categories made the estimation very difficult and subject

[10] A more refined modelling framework that makes use of the absence rates recorded in the reference week is given by Ercolani (2000) (see section 7.2).

to measurement errors. Nevertheless, the authors attempt to cope with these difficulties and provide systematic estimates, that were interpretable easily within the courts.

The authors note that making estimates of time lost due to unemployment, in a similar fashion, was extremely difficult from the available data, which was marked by frequent changes in definitions and methods of recording. In general, unlinked quarterly LFS data were available, assembled into whole years. However, such a non-cohort based methodology prevented the exact estimation of the work time lost to unemployment for each age group. Only three complete statistical years (1983, 1984 and 1985) were available (permitted by the introduction of computerized records)[11]. Overall, the estimates of work time lost to unemployment are more variable, which could be partly due to the volatile economic conditions in the 1980s. Nevertheless, this investigation finds that the work time lost due to industrial disputes and stoppages are negligible compared to sickness and unemployment (on average 0.5 a day with a maximum of 1.3 days per year per employee from 1965 to 1985). The authors acknowledge that the estimates for the older age groups could also be inaccurate, because of the different recording procedures of older unemployed workers.

In section 9 of the paper, the authors sum up the results of their study in a *Ready Reckoner*. That is intended as a simple guide for practitioners about the expected times spent out of the labour market (i.e. $1 - k_x$) in England and Wales when using a 3 % real rate of interest. It is only reported here the deductions applicable to male workers by broad age groups and three types of economic conditions (low, medium and high). The authors also suggest some further recommended adjustments according to economic regions and type of industry[12]. For example, for a man in his early 30s, in normal (i.e. medium) market conditions, the estimated percentage deduction is about 3 %, which is far lower than the level that had been applied previously by the Courts in England and Wales. Nonetheless, the *Ready Reckoner* constitutes a very important synopsis of the research which simplifies a complex study into a device and terminology directly applicable to the Courts.

[11] Other, limited amount of cohort based data sets were provided by a DHSS study of those who joined the unemployment registry in autumn of 1978 and followed up over 2 years. The resulting unemployment rates had to be combined with the percentage of workers who were already unemployed at the beginning of the autumn quarter of 1978, which was extracted from the corresponding GHS data. Unfortunately, the resulting age groups did not match the LFS data structure and comparison was not possible.

[12] Suggestions for adjustments related to educational attainment are considered briefly in the light of studies carried out in the USA.

6 The Alternative Approach based on Lewis et al. (2002, 2003)

Traditionally, the courts in England and Wales focus overwhelmingly on the valuation of negative contingencies, to the detriment of positive contingencies (such as promotions, productivity growth, exceptional career achievements, etc.). For example, commenting in the Wells v. Wells case, Lord Lloyd states unequivocally that: "In the case of loss of earnings the contingencies can work in only one direction – in favour of the Defendant."[13]. The implication of this judicial aspect has been investigated extensively by Lewis et al. (2002) (summed up in Lewis et al. 2003). The authors find that the courts sometimes deduct as much as 20 % for negative contingencies (representing the labour market risks), while making no allowance at all for economic and earnings growth.

Lewis et al. (2002) provide a detailed review of the calculation of the damages for future loss of earnings in England and Wales, in personal injury cases, from the perspective of the labour economics approach applied in North America. The authors assess in detail the system on which judges in England and Wales base their awards of damages in personal injury cases, in comparison with the method applied in the United States and Canada. They collect details on over 100 adjudicated cases in England and Wales in order to make a statistical analysis of the impact of an alternative method of calculation of the awards, based on the US approach. The proposed alternative method relies on the observed labour force dynamics combined with predicted economic and personal productivity growth. The authors claim that the alternative approach is in direct contrast with the method in use in England and Wales courts, that only considers stationary labour force participation rates and, most importantly, makes no allowances for inflationary factors. Their study indicates that plaintiffs in England and Wales, in particular young male professionals, are significantly under-compensated in comparison to the North American tort system.

The authors make a critical review of the approach of the England and Wales court system to calculate damages awards in personal injury cases. They note that this approach is inherently based on both judicial intuition and precedent, and that although it had produced consistent calculations in the UK, it would inevitably fail to take into account the true labour force dynamics. Lewis et al. (2002) undertake a dissection of the method of *multiplier–multiplicand* currently employed in the England and Wales courts and evaluate each component in detail. Their main criticism of this method lies in the way the multiplier is calculated in the courts based on the Ogden Tables. While the authors find that the Ogden Tables represent a significant improvement on the traditional approach, they note that it contains a number of arbitrary features.

[13] Wells v. Wells [1999] 1 AC 345.

A distinctive feature of Lewis et al. research is that it provides a statistical analysis of the value of the awards through a representative sample of 108 adjudicated cases between 1990 and 1998. Most regions and accident types are represented in the sample, with three quarters of the claimants being male. Work-related accidents are most common among the older claimants in the sample, whereas road traffic accidents and criminal injuries are characteristic of the 25-29 age group. The authors acknowledge the potential drawback of their comparative approach given that the vast majority of personal injury cases are settled outside the courts, hence the full impact of any given award system cannot be evaluated. Nonetheless the authors carry out a preliminary multivariate analysis on the awards of this sample and they find no evidence that the awards (based on the multiplier–multiplicand approach) would be biased with respect to gender, ethnicity or pre-injury occupation or educational attainments. Based on their detailed analysis, they conclude that the existent methodology, overall, is applied consistently throughout the courts in England and Wales.

Lewis et al. (2002) put forward an alternative method of awards calculation based on a stylized US approach. In this framework, the discounted stream of future earnings, until final departure from the labour force, take into account individual and economy wide productivity growth. That is, the net present value of the future earnings is given by:

$$\mathrm{NPV}\,(W) = \sum_{j=0}^{T} \frac{W_j \prod_{i=1}^{j} (1+g_i)}{\prod_{i=1}^{j} (1+r_i)}$$

where g_i is the yearly economy wide growth rate and r_i is the yearly discount rate. The stream of future earnings W_j represents the net wages adjusted by the probability of being alive and active and allows for individual productivity growth.

The net wages (i.e. age-earnings profiles) are estimated from the LFS with respect to six occupation groups by a multivariate regression model (involving a term that is cubic in the number of years of work experience). The authors report on two approaches to weight the resulting stream of future net wages by employment and survival probabilities. The first method simply makes use of the age-specific employment rates (estimated from LFS) multiplied by the survival probabilities (derived from relevant life tables). The second method, preferred by the authors, follows Alter and Becker (1985) and calculates the expected age-specific earnings using conditional employment probabilities based on a multiple state model, which is estimated from the LFS data-sets. The latter approach constitutes an important improvement on the methodology that was adopted in the Ogden Tables. The method is often referred to as the *increment-decrement* model of the labour force movements and involves the estimation of the age-specific transition probabilities of individuals between distinct economic states, conditional on surviving to the given age and on the previous economic activity, which leads to dynamic

estimates of the stream of post-injury earnings/losses.

Lewis et al. (2002) estimate yearly transition probabilities as the ratio of the number of transitions over the initial number of cases in any given state (i.e. initial exposure). However, in order to estimate the number of transitions, between the defined economic states, the authors had to rely on the current employment status and the retrospective employment status of the subjects in the sample. These estimates are likely to be potentially biased for two main reasons. Firstly, this approach clearly overlooks the potential number of transitions in and out that could have occurred during one year of working lifetime and, secondly, it is prone to *recall error* resulted mainly from misreporting, but also from misclassification. As recognized more recently by a number of authors (e.g. Artola and Bell 2001, Paull 2002), the bias introduced by recall error (i.e. due to human recollection or misrepresentation) leads to a significant proportion of spurious transitions, in particular, between the unemployment and inactive economic states. The effects are more intense in the case of short-term contract workers, affecting both the number of transitions and the duration in the involved states.

7 Models of labour market contingencies in the UK

In the valuation of the loss of earnings compensations the courts have to consider the future stream of income the plaintiff might have realized (with reasonable certainty) had the accident not taken place. An important aspect of this process relates to the identification and valuation of contingencies other than mortality that might affect the estimated future earnings of the plaintiff. Shaped by micro-economic and individual characteristics the worklife and earnings of the plaintiff are reduced by unfavorable events like involuntary unemployment, e.g. short or long term ill health (disability), or by voluntary labour market withdrawal, e.g. for the purposes of further qualifications, parenting or early retirement. It is important to emphasize that the courts in England and Wales focus overwhelmingly on the negative contingencies, which decrease the earnings potential of the plaintiff (see section 6). Nonetheless, the courts are impelled to rely on increasingly more sophisticated scientific techniques to value such contingencies, driven by the recent improvements in data volume and accuracy. In this section we will consider some of the modelling approaches and data applied in the UK to account for labour market contingencies that affect most significantly the future loss of earnings.

7.1 Unemployment

In the past, methodologies applied in the UK were often constrained to *static*, as opposed to *dynamic*, frameworks of modelling the labour market participation rates, primarily due

to data restraints. Haberman and Bloomfield (1990) highlight the disadvantages of using 'stock' (i.e. cross-sectional) data to describe a phenomenon that is distinctively characterized by 'flow' in and out of different economic states. However, nationally representative linked (i.e. cohort based) socio-economic data-sets were not available in the UK until the early 1990s. For example, the first linked LFS data was introduced in the first quarter of 1992 and the first set of interviews for the British Household Panel Survey (BHPS) were conducted during 1991. While a few short-lived cohort based studies have surfaced from time to time, before the 1990s, these have often focused on a specific subgroup of the working age population and are thus inadequate for dynamic modelling. One of such studies was the DHSS records of men joining the unemployment register during the autumn of 1978 and observed over the next two years. This data set (extended with the GHS) has been used in a practical way by Haberman and Bloomfield (1990) to estimate the average time lost to unemployment for men for predefined age groups over 1978/79.

Yet a more elaborate investigation of the same 1978 DHSS cohort data, that allowed for the dynamic characteristics of the unemployment exit rates, was carried out by Narendranathan and Stewart (1993*b*) to measure the effect of micro-economic factors over the length of unemployment. The authors model the conditional probability of leaving unemployment, subject to the spell of unemployment being at least 4 weeks in duration, as the DHSS made no computer records in the first 4 weeks of the unemployment (i.e. left censored data). The analysis is carried out in a duration event with proportional hazards (PH) modelling framework.

First, the authors compare proportional hazards models with flexible baseline hazards versus models with Weibull type baseline hazards, and find evidence against the Weibull baseline assumption. In addition, the authors extend the single decrement model to a two decrement competing risk model, in order to disaggregate the probability of leaving unemployment into components corresponding to transitions from unemployment into active (i.e. full-time employment as the risk of interest) or partially active economic states (i.e. part-time, temporary, self-employed). In general, the effects demonstrated by the single decrement model are validated by the competing risk settings, although it is shown that the single decrement model potentially underestimates the effect of income in and out of employment on the probability of finding a job.

Follow up studies (e.g. Narendranathan and Stewart 1993*a*, Arulampalam and Stewart 1995, Böheim and Taylor 2000) continue this rich line of investigation on other data sets (for instance, more recently on the first seven waves of the BHPS 1991-1997). Nonetheless, it is worth noting that this type of modelling framework requires reliable and accurate duration data and in general it is not applicable to LFS type data sets. Further, the log-linear nature of many micro-economic factors on the transitions are questionable. Also, statistical significance

of the effects can only be evaluated in relative terms and thus the results are strongly dependent on the grouping of the factors.

Arulampalam et al. (2000) investigate dynamic models of the determinants of unemployment persistence and recurrence using the first 5 waves of the BHPS. They model the unobservable individual propensity to be unemployed as a function of individual characteristics and previous unemployment duration while allowing for unobserved heterogeneity. They propose a model that is fitted to the BHPS data by maximum likelihood methods. The estimation proceeds in a two stage process: first a reduced form model is estimated, as a simple *probit* model; next they generate the *probit generalized error* and add this to the model as an extra regressor. The results show that strong state dependence exists with respect to the previous period of unemployment duration for most but the youngest (i.e. below 25) age groups. Thus, the authors find that for younger men less then a quarter of their unemployment persistence is down to state dependence, whereas for the more mature this effect could be as high as 40 %. Also the authors find evidence that the unemployment of young men is independent of the business cycle.

7.2 Sickness

One of the most comprehensive research on non-participation in the labour market due to sickness in the UK has been carried out by Barmby et al. (1999). It investigates the sickness absence rate[14] series over the period of 1984 to 1997 based on the LFS data. This research shows that the sickness rate for full-time employees is characterized by a stable constant rate of approximately 3.2 % across the UK. Analyzing a rich set of decompositions of the LFS data by various socio-economic factors, like family, type of work, geographical region, industry or occupation, etc., the authors find a strong seasonal pattern (i.e. worst turnout during December and best during May) and clear regional differences (i.e. greater rates in the North of the UK). In terms of industry and occupational differences, the authors find evidence that the worst affected are the workers in the heavy and public sector industries.

Complementing the above, Ercolani (2000) also analyzes sickness absence rates observed over a long period in the UK, making use of the succession of LFS winter 1993/94 to winter 1997/98 data sets. In this research, the sickness absence rates are envisaged in the form of a so-called multivariate Tobit model. In the Tobit model formulation the *partially observable* propensity for sickness absence (PSA) is defined as the sum of two terms: an *unobservable*

[14]The basic sickness absent rate is defined as the ratio between the number of absent hours over the number of contracted hours in the reference week, taken over all full-time employees in the sample. The reference period in this paper is also extended to month, quarter or year.

underlying propensity for sickness absence (UPSA) and a normally distributed random health shock[15]. In turn, the UPSA is modelled by a linear combination of personal and macro-economic characteristics. Ercolani makes use of complex modelling considerations that treat the LFS data on sickness absence in the reference week as resulting from a doubly censored sampling process. That is, the realized (i.e. observed) propensity for sickness absence (RPSA) for those individuals in the sample who experience no absence is treated as censored at 0 and, conversely, for those who were observed absent over the whole week as right censored at 1.

The results of Ercolani (2000) indicate that this type of model has a poor overall fit to the LFS data sets, possibly due to the heavily censored data. Nevertheless, the author find that the parsimonious parameters, which describe the UPSA, are consistent with the descriptive statistics contained in the data. We note that the inadequate fit is not surprising given that only a fraction of the right hand side tail of the RPSA distribution is observable. Indeed it becomes very difficult to verify the modelling assumptions and to make reliable parameter estimates from the model. Still, it is a worthwhile effort to develop a modelling framework that makes use of the information collected in the reference week and avoids the retrospective (last year) data, because of the significant bias associated to misreporting error.

Analyzing the fitted parameters Ercolani (2000) finds that the lowest absent rates occur approximately at the late 30s, that is "at 28 and 21 years from statutory retirement age" for men and women respectively. The author points out that the age profile parameters are more significant for men than for women based on the given LFS data. Further, it appears from the model that short term illness is correlated with long term illnesses, in particular with the stress related ones. In terms of work type and industry, the results show that the 'public sector' workers have greater sickness absence rates than those in the 'private sector'. Similarly, those in managerial positions have the lowest rates in contrast to those in working as machine operatives, which in turn explains the poor experiences of those in the 'Manufacturing' industry. Finally, the author found the parameters related to the regions of residence less systematic and thus more difficult to interpret.

7.3 Industrial disputes

Apparently, there is a relative lack of contemporary research into the effect of industrial disputes on worklife expectancy. However, Haberman and Bloomfield (1990) note that the worktime lost due to industrial disputes in the 1970s and 1980s was insignificant in comparison to the

[15]The modified Tobit model considered here follows directly from the methodology first proposed by Tobin (1958). The author notes that one might expect that the distribution of the health shocks to be skewed to the right and thus the detrimental health shocks to have a greater effect on the employees sickness absence

other two contingencies investigated (i.e. unemployment and sickness). This feature is likely to be extended to the economic period of 1990s, which experienced a steady economic growth and improved industrial relations.

7.4 Early Retirement

It appears that in the UK, the risk of work time lost due to early retirement is relatively insignificant compared to the risk of unemployment and sickness. However, there is a growing concern that the rate of participation of the workers close to retirement age is falling steadily, leading to an increased risk of taking out early retirement. This and similar aspects of the relationship between retirement and labour market participation in the UK are investigated by Blundell and Johnson (1997), and later revisited in Blundell and Johnson (1998). In the latter article, the authors discuss the main elements of the UK social-security system and the role of disability benefit that contribute to the rising risk of early retirement. Thus, the authors show that the participation rates of men in the labour market drop rapidly from around 80 %, for those in their late 40s, to about 60 %, for those in their late 50s. Unsurprisingly, the authors find that the risk of exit into early retirement increases significantly for men in their early 50s. In the case of women workers, the effect of a sharp decrease of participation rates in their 50s (from 60 % to 30 %) is further accentuated by an increased proportion in part-time employment.

Nonetheless, the type of pension held clearly influences the probability of exit from active economic state to early retirement. Blundell and Johnson (1997) make use of the UK Retirement Survey to show that there is distinctly different exit behaviour between those covered by private and state pensions. The authors maintain that occupational pension schemes (OPS), provided by the private sector, create less incentives to leave employment before the early retirement age of 55, but encourage exits after this age. In contrast, the state pension allows early exit well before this age virtually without penalizing the expected level of retirement income. This is demonstrated by significantly greater probabilities of remaining active for those covered by an OPS, but this decreases at a faster rate after the age 55 compared to those on a state pension. The authors also note that a greater proportion of those not covered by an OPS are low skilled workers who are likely to find it increasingly difficult to retain full-time employment in their older ages, thus have a greater propensity to take early retirement.

8 Other multiple state modelling

Provided that one can observe labour force transitions between well defined economic states at regular or irregular times, the primary aim is to model the conditional transition probabilities that account for various individual characteristics. This allows us to make forecasts about the individual worklife histories and to estimate the total times spent in different economic states before final separation (i.e. death or retirement). The main advantage of the multiple state Markov framework over the traditional working life table approach is that one can incorporate the effects of observed (and unobserved) factors, like age, gender, marital status, type of work or geographical area, etc., and crucially can also make estimates conditional on the starting state. There have been put forward many modelling frameworks of estimating the underlying multi–state Markov chain process, making use of the available cross-sectional or longitudinal data sets. In the following, we present some of the most recent multivariate modelling approaches and some empirical results, that have been applied to UK labour market data sets.

Bradley et al. (2001, 2003) investigate the extent in which social exclusion is mirrored in the labour market mobility of the UK workers between professional hierarchies. Thus the authors are looking for empirical evidence that social exclusion exists towards low skilled workers, which is demonstrated firstly by greater unemployment probabilities and secondly by lower chances of transition to higher skilled employment states (both from the employed and the unemployed states). The authors make use of the first 7 waves (1991 – 1997) of the BHPS data to carry out a *multi-state multi-spell* analysis of the transition intensities between a given set of economic states. The paper complements earlier investigations that consider poverty in terms of household income dynamics in the UK[16].

In the above papers, Bradley et al. emphasize the importance of dynamic analysis of labour force behaviour and making use of longitudinal socio-economic data sets. Their research focus on the determinants of unemployment duration in a context of labour market dynamics based on worklife histories, as opposed to snapshot prevalence rates from cross-sectional observations. The authors investigate the "persistent" and "recurrent" nature of the social marginalisation by the means of a five-state semi-parametric competing risk model, which is defined by 3 employment states, differentiated by broad types of skill levels (low, intermediate and high), and further 2 states corresponding to unemployment and out of the labour market. They claim that there is a trend in the current literature towards disaggregation of the basic economic states and they implement a statistical test devised by Crouchley and Oskrochi (2000) to analyze the appropriateness of the chosen multi-state model. Further statistical tests, so-called marginal

[16]For instance, Stewart and Swaffield (1999) demonstrate the existence of "low pay, no pay cycle" for some marginalized group of workers.

effects, of the observed transitions in the model are also introduce to compare the overall likelihoods (across all individuals in the sample and all observed durations) of movements within the chosen state space. Thus the authors investigate the "labour market transition behaviour" of the UK workforce, conditional on individual factors like past experience, educational attainment or contract type, but also on macro-economic factors, and find evidence that the low skilled workers are "trapped in a vicious circle of low skilled employment, unemployment and labour market withdrawal".

More recently, Cappellari and Jenkins (2003) extend the examination of the social handicap of low pay/no pay cycle to a longer economic period of 10 years of BHPS data (1991 – 2000). The authors aim is to examine the causes of the segmentation of the labour market, which in their opinion could be partly due to individual characteristics (i.e. heterogeneity), but also, more concernedly, due to state dependence (i.e. the longer a person spends in a suppressed economic state the less likely is to be able to progress to a higher economic status). Thus, they suggest a *multinomial probit* modelling framework for evaluating the effects[17]. The model suggested by Cappellari and Jenkins allows for the correlations between individual characteristics and the selection into employment (i.e. dependent on the type of job), and also considers issues related to sample attrition. Unsurprisingly, the authors find evidence for dependence between the well known factors (like educational attainment, job skills or health) and the probability of transitions from unemployment to low paid employment. Nonetheless, their results also indicate a significant state dependence of these transitions, even when controlling for the effects of individual characteristics. Further, the authors show that the sample attrition is stronger among the unemployed and low paid respondents (40 % and 22 % respectively), compared to those in high-paid jobs (13 %), and they argue that this could introduce a significant bias when unaccounted for.

The above multivariate modelling frameworks provide very useful results in terms of measuring the effects of socio-economic factors on the transition probabilities, that could be applicable to the calculation of individual-specific multipliers (i.e. worklife expectancy). Nevertheless, it appears that in Europe, and certainly in the UK, labour market literature the focus is overwhelmingly on assessing the social implications or devising adequate policy making strategies, with little interest on determining the worklife expectancy values. In contrast, the US forensic economist literature has provided an abundant volume of research into the dynamic multivariate modelling of the expected time in various economic states. Specifically, since the introduction of the first increment-decrement worklife tables by the Bureau of Labor Statistics (BLS) in 1982 (described in Smith 1982) the applied methodologies have improved rapidly. Shortly

[17]Note that, alternatively, Chib and Greenberg (1998) discuss classical and-Bayesian inference for the multivariate probit model. They provide examples, among others, related to labour force participation.

after the first publication, the BLS have extended their initial methodology to allow for the effects of race and education, when controlling also for gender (see Smith 1986), and made use of a larger population survey data sets. Follow up empirical investigations by Ciecka et al. (1995, 2000) adopted a similar methodology (e.g. using yearly interval population survey data and 9^{th} order moving average smoothing of the transition probabilities), but to a broadened age ranges and making use of up to date labour force data sets. Alternatively, other publications such as Skoog and Ciecka (2001*a*,*b*, 2002) considers the probabilistic properties of the worklife expectancy estimators and other implications of the Markov framework in modelling the labour force dynamics. Further, Ciecka et al. (1997) provides a valuable assessment of how the worklife expectancy compares with the alternative measure of *median years to retirement*, which is calculated from labour force participation rates, and thus this study highlights the advantages of the dynamic versus the stationary labour market modelling.

Millimet et al. (2003) finds the traditional relative frequency approach adopted by the BLS (see Smith 1986) inadequate to account for a wider spectrum of individual differences in labour market activity and introduces a multi state *logit* model formulation. The authors claim that the new methodology captures considerably more information on the transition behaviour of sub-groups of the population within the same multi state Markov framework. In addition, Millimet et al. points out the inconsistency between the state definitions applied in the BLS model and the worklife expectancy measure. That is, in the BLS multiple state model the active economic state includes the unemployed workers, and therefore their worklife expectancy measure does not strictly represent the expected number of years generating earnings. The authors make use of 9 years of Current Population Survey data of the US (from 1992 to 2000) to estimate 2 and 3 state logit models, allowing for personal characteristics like: age, gender, education, race, marital status, occupation and also for some interaction variables. The authors tabulate the age specific worklife expectancy outcomes by different combinations of gender, race and education levels. It appears that their results are not significantly different from the values published by the BLS when considering for the methodological differences.

9 Discussion and Conclusions

While the multi-state methodology applied to LFS type data (preferably longitudinal in character) provide undoubtedly a more accurate picture of the labour force dynamics than the traditional approaches, it is worth noting that it could be slightly misleading in the context of future loss of earnings. A significant part of the inactivity due to sickness or unemployment might be due to short-term leave of absence that is covered by normal employment or state benefit arrangements, and so it would be unfair to deduct an equivalent loss from the stream

of future income. However, precisely the short-term movements in and out of active economic state explain the prediction of Haberman and Bloomfield (1990) that the multiple state model methodology would result in lower reduction factors than the improved working life table (irrespective of the initial economic status). That is, the lower reduction factors are likely to result due to short term absences from the labour market which imply no, or only a partial, loss of income. While sickness benefit data do allow for this effect, as there is a waiting period (similar to the deferred period in Income Protection Insurance), the LFS gives no or little indication of the benefits received while off sick or unemployed.

Thus, as a consequence of the dynamic modelling of the labour force movements using the LFS observations, the amount of compensation for future loss of earnings would be potentially reduced. That is, multipliers based on the multiple state model approach would be lower than under the classic working life table approach, unless other aspects would be allowed for in the calculations, like further economic and earnings growth. As noted in the discussion of Haberman and Bloomfield (1990): "the assessment of damages award, either explicitly or implicitly, makes assumptions about: (...) the future rate of increase of the plaintiff's salary, both before and after injury; ..."[18] and in subsequent written contributions the authors confirm that the multiple state methodology could allow to introduce a "salary function that depended also on the time spent in State 1 (in the labour force)". Nevertheless, there has been an unvarying reluctance by the courts in England and Wales to consider in their rulings further economic and salary growths (i.e. in addition to inflation).

The overall effect of the adoption of the Ogden Tables on the Insurance Industry as a whole, is that it is likely that the costs, and therefore the premiums, of liability insurance and unemployment insurance will increase significantly in the near future. At the same time, this will have unfavorable retrospective effects on reserves and hence on the profitability of the liability business as well. However, the reevaluation of the loss of earnings multipliers by a dynamic labour force model could bring some balance to this effect, since it also imply lower participation rates for a large proportion of the claimants. Bell and Taub (1998) make comparisons between two methodologies of estimating the future loss of earnings. Both methodologies are based on the approach put forward by Alter and Becker (1985) for calculating the worklife expectancy. The first method, referred to as the "expected worklife approach", corresponds to the multiplier–multiplicand system used in England and Wales, without economy wide growth rate; whereas the second method considered, referred to as the "transition probability approach", corresponds to the approach used by Lewis et al. (2002). The authors note that "Under the expected worklife approach, future earnings are calculated by assuming that the victim will be in

[18] Opening of the discussion of Haberman and Bloomfield (1990) at the Institute of Actuaries by R. K. Cornwell, F.I.A.A.

the labor force without interruption for the number of years equal to the total number of active years he could have expected over his remaining life. With the transition probability approach, the victim is assumed to be in and out of the labor force each year over his lifetime based on the age-specific transition probabilities". The authors show analytically that the final award should be greater using the transition probability approach if (for all ages) the combined economy and individual growth rate is greater than the discount rate, and vice-versa. Nonetheless, they find empirical evidence using US earnings data that the transition probability approach would yield lower awards than the expected worklife approach. They reported that the reason for this was that the estimated age-specific growth rates turned out to be smaller, for some years, than the applied discount rate of 6 %. Hence "The years in which the net discount rate was negative were not sufficient to dominate those years in which it was positive".

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