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Forecasting Fines for Health and Safety in Employment Offences in New Zealand

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Abstract: Sentences for employers convicted of offences under NZ health and safety law have been subject to constraints from two main sources (i) legislation; and (ii) guideline judgment cases. Their effect is to effectively split sentencing into three distinct time periods, viz., the period following the introduction of the De Spa Guidelines to the implementation of the Sentencing Act 2002, the second following the joint implementation of the Sentencing Act and the Health and Safety in Employment Amendment Act to the Hanham & Philp Guideline judgment in December 2008, and the third is the post Hanham & Philp Guideline period. This article builds on previous work that analyses the various factors relevant to HSE sentencing, concentrating on the second and third periods. Among other results, this work shows that for period 3, although harm continues to play an important role in explaining sentences of reparation, its previous role in directly explaining levels of fines is replaced by various levels of employer culpability. The Hanham & Philp decisions incorporated harm in determining culpability and District Court judges appear to follow this judgment closely in this respect. The present article illustrates forecasted sentences for periods 2 and 3, and, for the forecasts of period 3 penalties using second period weights, finds that fines would have been frequently lower, often substantially so, than those that occurred, consistent with the Hanham & Philp Guidelines. Reparations, however, are largely unaffected.

Keywords: Health & Safety Offences, Judicial Guidelines, Forecasting Fines

JEL Classifications: K32

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1 Introduction

This paper is a companion to the authors' results of estimating a fairly comprehensive model of health and safety in employment ("HSE") sentencing in New Zealand for three periods, the last two of which include that following the joint implementation (in May 2003) of the Sentencing Act 2002 and the HSE Amendment Act 2002 through to the Hanham & Philp guideline judgment of a Full Bench of the High Court in December 2008[1] ("period 2"), followed by a period following this judgment through to April 2012 ("period 3").[2]

The Hanham & Philp Guidelines resulted from successful appeals by the (then) Department of Labour[3] in three cases considered together, with fines substantially increased in all cases, in part a belated response to a five-fold increase in the maximum fines introduced in the HSE Amendment Act 2002. These guidelines reviewed and modified the previous De Spa Guidelines introduced in 1993[4] that were codified (with little change) by the amendment as s 51A HSE Act 1992. One major change of the new guidelines included the establishment of three ranges of substantial starting points, based on assessments of employer culpability, for sentences of fines. Another was the introduction of a suggested allowance of 10 – 15 percent for reparation awards when considering discounts from the starting points for fines, much lower than the "dollar-for-dollar" discounting widely followed in judicial decisions in the second period examined.[5]

In Woodfield, Hickson and Menclova (2013), we find that the contributions to the magnitude of fines made by the explanatory variables typically substantially increase during period 3 in comparison to period 2, while all levels of employer culpability (relative to 'medium' culpability) become statistically significant determinants of fines in period 3, confirming a strong influence of the Hanham & Philp Guidelines on sentencing policy. Although the 'fatal' harm variable (relative to 'high' harm) is a highly important determinant of fines in period 2, it is not significant at all in period 3, while 'low-medium' harm is only significant in period 3. A switch between an important direct role for harm in determining fines in favour of using harm as one of

[1] *Department of Labour v Hanham & Philp Contractors Limited & Ors* [2008] 6 NZELR 79.
[2] For our earlier results, see Menclova and Woodfield (2011, 2013) and Woodfield, Hickson and Menclova (2013).
[3] Incorporated in the Ministry of Business, Innovation and Employment on 1 July, 2012.
[4] *Department of Labour v De Spa and Co Ltd*. [1994] 1 ERNZ 339.
[5] For critical discussions of this practice, see Gordon and Woodfield (2006), Clark (2008) and Mason (2008).

a number of factors used to assess culpability as outlined in *Hanham &Philp* (at [54]) appears to have received wide support by District Court judges.

In this paper, we analyse the ability of the most general of our empirical models (called the 'full' model, and being the most comprehensive of our specifications) to forecast fines for individual cases in each of the two periods examined. Only case-level results and some illustrations of individual cases are reported, although similar forecasting analysis is available for fines where a s 6 offence is the sole relevant charge, and forecasts are also available for reparations and for total financial liability. The article is organised as follows. Section 2 analyses our forecasts of fines and discusses some individual outliers and serious cases by way of illustrating results and their possible policy implications. Section 3 discusses the uses of our forecasts that might be made by the parties affected by HSE legislation, while section 4 summarizes some issues that we believe are important for the design of future forecasting work in this field. A brief conclusion is contained in Section 5.

2 Forecasting Using the Full Model

In this section, we use estimates of the full model for various forecasting exercises at the level of individual cases.

2.1 Forecasting the *Hanham & Philp* Appeal Cases

First, we examine aspects of the three appeal cases addressed in *Hanham & Philp*. *Hanham & Philp Contractors* were charged in respect of an accident where an employee fell from height on a building site. *Cookie Time* were charged in respect of an injury resulting from inadequately guarded machinery in the food manufacturing sector. *Black Reef Mine* involved a fatality in the mining sector. Injuries from falling and those resulting from inadequately guarded machinery are relatively common, while fatal injuries constitute the most serious harms.

In *Hanham & Philp Contractors*, the defendant pleaded guilty to a s 18(1)(a) offence after an employee contractor fell from a patently inadequate wooden scaffold that their foreman had erected on a building site, suffering injury. The defendants were ordered to pay a fine of $5,000 plus costs and a solicitor's fee along with reparation of $12,000. The injuries were sufficiently serious to prevent the employee's return to work other than for light duties for twelve months and could have even been fatal given the distance of the victim's fall. The defendants had met the shortfall of the victim's accident compensation payments for much of the time off work.

In *Cookie Time*, the defendant was fined $15,000 along with a reparation award of $5,000 after pleading guilty to a s 6 charge. Their employee victim's right arm became caught in an operating conveyor belt mechanism when cleaning a roller in the system. The machine was

inadequately guarded. The risk had been identified but was not acted upon until after the accident, and the potential existed for more serious harm than that suffered. The victim suffered a midshaft fracture of the radius bone and was unable to work for 3 months. The defendant made accident compensation top-up payments prior to her return to work.

In *Black Reef Mine*, the small company pleaded guilty to a s 6 charge following a fatal accident to an employee miner. A s 18(1)(a) charge relating to the failure of a principal to ensure the safety of its independently contracted mine manager was also laid.[6] The mine manager (who survived unhurt) and the employee victim were working underground and explosive charges set created a sudden inflow of water from an adjacent mine. The DC judge sentenced the defendant to pay the victim's widow $30,000 reparation (of a total of $50,000) for emotional harm along with a share of funeral costs. The emotional harm reparation was increased to $55,000 (i.e., nearly doubled), while the fine of $10,000 was doubled to $20,000. The HC considered the accident to have been easily avoidable using the procedure of pre-drilling and considered the company's financial capacity greater than that evaluated by the DC judge. The fine would otherwise have been $70,000 were it to have been financially capable of paying all of its reparations and appropriate fines.

As appellant, the main submission of the Department of Labour was that the fines imposed at DC level in the three cases were manifestly inadequate and failed to reflect the five-fold increase in the maximum fine for s 50 offences enacted in the amended HSE Act. Interestingly, in all three cases the respective DC judges had set starting points for fines although there was no requirement that they do so. These starting points included $23,000 in *Hanham & Philp Contractors*, the range of $20,000 - $25,000 in *Cookie Time*, and $30,000 in *Black Reef Mine*.

2.1.1 Period 2 Forecasts of *Hanham & Philp* Appeal Cases

In *Hanham & Philp*, the High Court made distinct, if not unrelated, decisions, first to raise the levels of employer culpability assessed by the DC judges in each of the cases under appeal, and, second, to introduce ranges of relatively high starting points for fines based solely on employer culpability and to reject dollar-for-dollar discounting of fines to account for reparations in favour of a modest allowance for this factor. As a consequence, the actual fines imposed by DC judges complying with the new guideline judgment would be expected to be substantially greater than those imposed for similar cases in period 2. A question, however, arises as to the level of culpability that DC judges would typically assess in each appeal case. One hypothesis is that their assessment would simply match that of the DC judges. Another hypothesis, which has some appeal if it is accepted that HC judges attempt to assess facts of a case in a manner similar to that of DC judges at large, is that a typical DC judge would have

[6] A s 19 charge relating to the failure of the mine manager to take sufficient steps to ensure his own safety and that of others was laid and a similar charge was laid against a consulting geologist.

assessed culpability at levels similar to that of the HC judges. Thus, we assess period 2 forecasts of fines imposed in the three appeal cases using both DC and HC assessments of facts of each case, but do not permit the introduction of mandatory starting points for fines for this exercise.

Table 1. Actual Fines Imposed for the *Hanham & Philp* Cases

	District Court	*High Court*
Hanham & Philp	5,000	50,000
Cookie Time	15,000	40,000
Black Reef Mine	10,000	20,000

Table 2. Full Model Forecasts of Fines Using Period 2 Coefficients and District Court and High Court Assessments of Facts of the Case

	District Court Assessments			*High Court Assessments*		
	Forecast Using P2 Coefficients	DC Forecast Error	HC Forecast Error	Forecast Using P2 Coefficients	DC Forecast Error	HC Forecast Error
Hanham & Philp	9,379	- 4,379	40,621	19,644	- 14,644	30,356
Cookie Time	13,265	1,735	26,735	16,877	- 1,877	23,123
Black Reef Mine	7,055	2,945	12,945	46,249	- 36,249	-26,249

Fines imposed by the District Courts and the High Court in the *Hanham & Philp* appeal cases are listed in Table 1. The analysis of the forecasts of fines in period 2 in these cases using the period 2 coefficients estimated from the full model is contained in Table 2. To understand these results, consider Row 1 in Table 2. The first cell shows the *ex post* forecast of the fine for *Hanham & Philp Contractors* made by the full model in period 2 using the DC assessment of facts as $9,379. Defining forecast error as the difference between a fine and the forecasted value of this fine, cell 2 shows that there was a $4,379 over-prediction of the fine of $5,000 imposed by the District Court. The third cell shows a massive under-prediction (equal to $40,621 = $50,000 - $9,379) of the revised fine imposed by the HC. The fourth cell shows the forecasted fine when HC assessments of the facts are used. In particular, the DC judge in *Hanham & Philp Contractors* did not assess culpability directly and the level of culpability is accordingly coded by us as ‘unknown.’ In the HC, the judges assessed culpability as medium-high. The effect is to

raise the forecasted DC fine by over $10,000 (to $19,644), and the magnitude of the over-prediction of the DC fine shown in cell 5 by a similar amount to $14,644 (= $5,000 - $19,644). Offsetting this is the equivalent reduction in the size of the under-prediction in the HC forecast error to $30,356 as shown in cell 6.

This permits the HC forecast error under DC assessments ($40,621) to be decomposed into two components if the HC assessment of facts is what typical DC judges would have adopted. The first component of $10,265 represents the amount of the fine set by the HC that is attributable to the DC judge in the trial case fixing a fine that is lower by this amount than his (hypothetical) peers who are assumed to assess culpability in a similar manner to the HC judges. The amount of $30,356 then represents the effect of imposing a relatively high culpability-based starting point for the fine along with a maximum 15 percent allowance to account for reparations. In *Hanham & Philp Contractors*, the HC set a starting point for the fine at $125,000. In comparison, the starting point set in the DC was a mere 18 percent of this amount. Further, reparation was set at $12,000 in the DC and, if dollar-for-dollar discounting had been applied, the fine would have been reduced by $12,000 on this account. If the maximum discount rate of 15 percent suggested by the HC had instead been applied, the fine would have been discounted by a mere $1,800.

The remaining cases can be interpreted in a similar manner. In *Cookie Time*, using the DC assessment of facts, the full model generates a modest under-prediction of $1,735 for the DC forecast but this under-prediction increases sharply to $26,735 when the HC fine is substituted for the DC fine. When HC assessments of facts are used, the forecast increases by only a small amount, from $13,265 to $16,877, changing the modest under-prediction to a similar-sized over-prediction of the DC fine. The forecast error of the HC fine is now smaller at $23,123 than when DC assessments are analysed, but the difference is not very marked. In *Cookie Time*, the HC judges did not consider the DC judge to be entirely clear in her assessment of culpability but thought it was at a relatively low level. Instead, they revised the assessment upwards to the "cusp of medium and high bands." We coded DC culpability as low-medium and HC culpability as medium-high, and are somewhat surprised by the small differences when using HC assessments of facts rather than those of the DC.

In *Black Reef Mine*, using DC assessments the model under-predicts the modest DC fine of $10,000 by nearly 30 percent. The HC under-prediction of $12,945 is $10,000 larger than for the DC, reflecting the decision of the HC to double the DC fine. When HC assessments are used, however, the forecast fine leaps to $46,249 and there is a substantial over-prediction of both the DC and HC fines. The latter results arise since although the fine was doubled by the HC, it was doubled from a relatively low level and its percentage increase was well below either of *Hanham & Philp Contractors* or *Cookie Time*. Even after the fine was doubled, the fine was only 28 percent of the amount that would have been imposed on a defendant with sufficient resources to pay it. *Black Reef Mine* differs from the other two cases in that the fine in both Courts strongly

reflects the limited financial capacity of the company and the primacy given to reparations which were substantially larger for *Black Reef Mine* than for the other companies. Regarding culpability, the HC raised its level from medium-high (as assessed by the DC) to high. The combination of high culpability and an accident involving a fatality when using period 2 coefficients to make forecasts would be largely responsible for driving the forecasted fine to a high level.

2.1.2 Period 3 Forecasts of *Hanham & Philp* Appeal Cases

Period 3 forecasts of fines in the three *Hanham & Philp* cases are shown in Table 3. These forecasts retrospectively predict the High Court's decisions. In Menclova and Woodfield (2011), our models generally retrospectively predicted the High Court's decision in relation to total financial liability in the *De Spa* appeal case well. We considered that by and large, DC judges had followed the De Spa Guidelines quite closely and that our back-forecasted sentences would typically be likely to survive appeals.

Table 3. Full Model Forecasts of Fines Using Period 3 Coefficients and District Court and High Court Assessments of Facts of the Case

	District Court Assessments			*High Court Assessments*			
	Forecast Using P3 Coefficients	DC Forecast Error	HC Forecast Error	Forecast Using P3 Coefficients	DC Forecast Error	HC Forecast Error	Error as % HC Fine
Hanham & Philp	39,821	- 34,821	10,179	43,008	- 38,008	6,992	14
Cookie Time	28,260	- 13,260	26,740	54,004	- 39,004	- 14,004	35
Black Reef Mine	32,066	- 22,066	- 12066	36,633	- 26,633	- 16,633	83

Using DC assessments of facts, the forecasts of fines using period 3 coefficient estimates in Column 1 of Table 3 are very much greater than their counterparts using period 2 estimated coefficients. Further, whereas Table 2 shows modest under-predictions of fines in two of the three cases, Column 2 of Table 3 shows that for period 3, the forecast errors are of far greater magnitude than are their period 2 counterparts and involve over-predictions in all cases. Column 3 of Table 3 also shows substantial differences for period 3 errors in forecasting fines imposed in the HC compared to period 2. Although the HC fines in *Hanham & Philp Contractors* and *Cookie Time* are under-predicted by $10,179 and $11,740, respectively, using period 3 back-forecasts, the magnitudes of these forecast errors are much smaller than their counterparts ($40,621 and $26,735, respectively), in period 2.

Turning to the forecasts when HC assessments of facts are used, we find that all forecasts are greater than when using the DC assessments, a result that was also found for period 2. For *Hanham & Philp Contractors* and *Black Reef Mine*, both the absolute and percentage increases are much smaller for period 3 than for period 2. For *Cookie Time*, however, the increases are much larger than for period 2 so that the DC forecast error for period 3 shows an over-prediction of $39,004 compared to $1,877 for period 2. Column 6 of Table 3, however, shows an under-prediction of $6,992 for *Hanham & Philp Contractors* and an over-prediction of $14,004 for *Cookie Time* using period 3 coefficients. As percentages of HC fines, these represent 14 percent and 35 percent, respectively. For *Black Reef Mine*, both DC and HC fines are over-predicted with a $16,633 (83 percent) over-prediction of the HC fine. This case, however, is the only one among the *De Spa* and *Hanham & Philp* appeals for which the defendant was adjudged to have limited financial capacity, the presence of which we have coded by a binary variable. Unfortunately, such a procedure provides no information on the extent of the incapacity of such employers and, consequently, we have limited confidence in the ability of our model to accurately predict fines in these cases. Had *Black Reef Mine* been capable of paying the HC's suggested appropriate fine of $70,000, however, our model would have back-forecasted a fine of $47,873, a $22,127 (31 percent) under-prediction of the (hypothetical) actual fine, yielding a considerably improved forecasting result.

2.2 Forecasting Fines More Generally

Our view is that our full model offers a reasonably acceptable explanation of the variability in HSE fines imposed in the District Courts. If a model has reasonable explanatory power in a given period, it follows that its *ex post* forecasts for the same period should also be reasonably accurate, although its *ex ante* forecasting ability for future periods is another matter. Nevertheless, any considerable unexplained variation in fines is a cause for some concern. Some of this might be removed if our database were more refined.[7] Some residual variation, however, may be due to so-called "unwarranted" variation in sentences. Unfortunately, there is little agreement as to what properly constitutes unwarranted sentencing variation as a concept. Rather than attempt to distinguish unwarranted from warranted sentencing variation, our work focuses on what we are able to explain rather than what we are not. Our forecasting results, however, may be able to throw some light on what others may consider to be unwarranted variation.

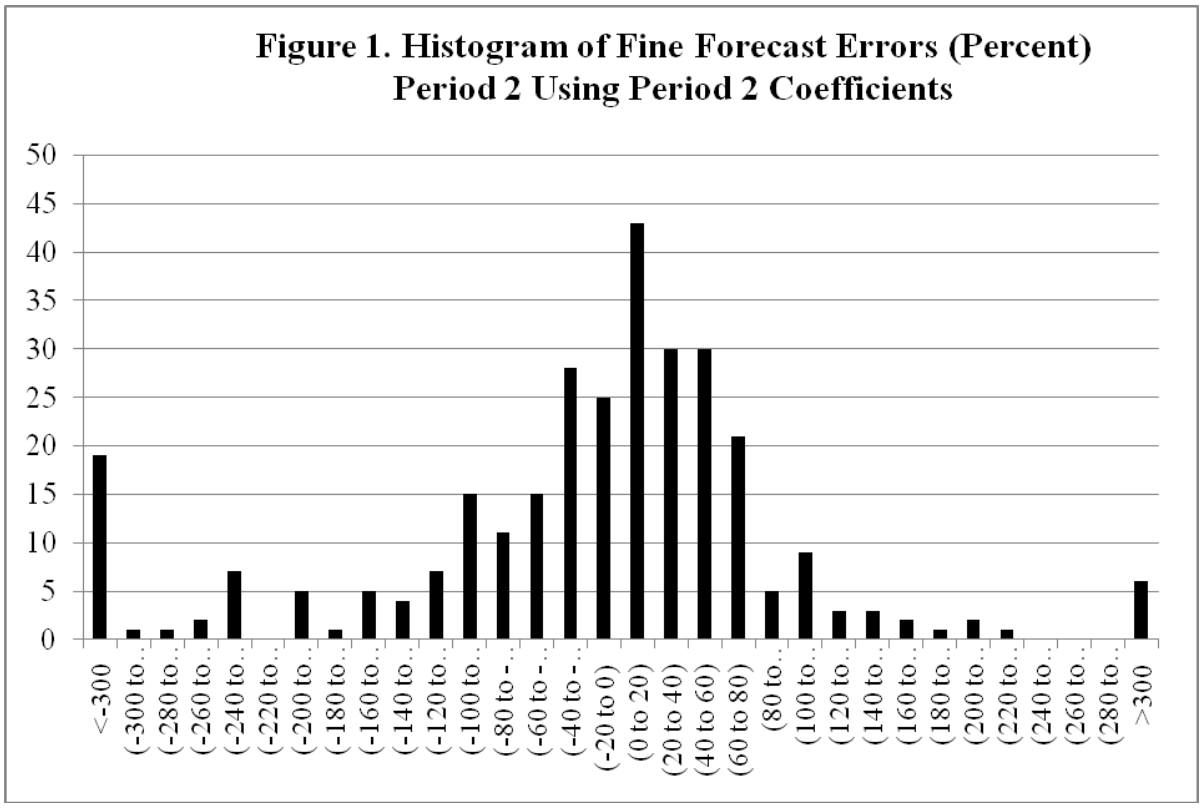
2.2.1 *Ex Post* Forecasting Period 2 Fines

We begin with a discussion of *ex post* period 2 forecasts where the actual values of the explanatory variables from the full model in period 2 are combined with the estimated coefficients for this period to yield predictions of what the level of fines would have been if a

[7] See section 5 of Woodfield, Hickson and Menclova (2013) and section 4 below for discussion of this issue.

representative DC judge had conducted the sentencing exercise. For any charge/case, the difference between the actual and forecast values of a period 2 fine is simply the residual generated in the process of estimating the coefficients of the full model using period 2 data.

Analysis of period 2 forecasts shows that the full model under-predicts the actual fine in 55 percent of the 318 cases involving a nonzero forecast error, the remainder being over-predictions. While a comprehensive analysis of forecast errors is beyond the scope of this paper, we indicate the distribution of percentage forecast errors of fines in Figure 1 and discuss the characteristics of several forecasting outliers.



2.2.2 Cases Where Fines are Zero

It is likely that some fines will be zero given that some employers will be sufficiently impecunious that they cannot do more than meet their reparation liability and perhaps not even that. Unfortunately, we are generally able only to detect the presence of an employer's limited financial capacity rather than the extent of such a constraint. Absent limited capacity, fines should generally be imposed if the court is permitted to do so.

We found that in four of the 16 zero fine cases the courts were constrained under s 8(3) Crown Organisations (Criminal Liability) Act 2002 from imposing a fine on the Crown entities involved. Two of these were District Health Boards, the third was the Public Trust Office, and

the fourth was the Department of Conservation. The injuries in these cases were serious, including a serious crushing injury, another involving multiple fractures, a fatality, and the fourth involving carbon monoxide poisoning of two employee victims. The mean reparation awarded in these cases was $18,375 and the mean fine predicted to be imposed on an otherwise liable convicted defendant with similar case characteristics was $13,375.

In three of the remaining zero fine cases, we found that predicted fines were at very modest levels. In another, the predicted fine was only slightly above $1,000 and the level of culpability was in the low-medium range. For the remaining cases, the mean predicted fine was $6,596 although four exceeded $10,000 and one was negative and above the mean in magnitude. An attribute common to half of these cases was the presence of low-medium culpability including a case where the defendant made an offer of a voluntary payment exceeding the reparation sought by the informant by $50,000. The judge imposed a zero fine in the circumstances. In one zero-fine case where culpability was assessed as low-medium, the forecasted fine was $6,783 but the victim died from a 5.5 metre fall and eight practicable steps had not been taken by the defendant company. The directors were congratulated on the comprehensive remedial action and acknowledgment of wrongdoing.

Another case has aspects that are interesting in the light of the preferred sentencing process set out in *Hanham & Philp*. In *Millard*, a manufacturer of small lightweight metal products was charged along with its working director in respect of injuries suffered by two employees resulting from lengthy exposure to vibrating machinery.[8] An aggravating feature was that the defendants were put on notice given injury symptoms but failed to satisfactorily deal with the problem. Starting points were collectively set at $30,000 and reparations totalling $20,000 were ordered. No fines, however, were imposed, Barry J. arguing (at [21]) that reparation by way of amends "eclipses the interests of imposing fines" in such a case. The starting points, however, appear to relate to the judge's view as to total financial liability and, after allowing credits for mitigation, allocated all of this liability by way of reparation. Culpability was not specified by the judge, and the forecasted total fines are in excess of $27,000.

2.2.3 Evidently Serious Outliers

Cases involving evidently serious outliers involving fines that fell short of their forecast values by at least 150 percent are now illustrated. First, The Prayer and Power Training Trust Centre was fined $2,500 on five s 6 charges when an employee engaged in demolition roofing work with no fall protection fell 7.2 metres through a skylight and was fatally injured.[9] Four of

[8] *Department of Labour v Millard Manufacturing (1977) Limited and Howard Mervyn Millard*, CRI 2005-085-006842-43, DC Wellington, 14 December 2005.
[9] *Department of Labour v The Prayer and Power Training Trust Centre*, CRN 06070500157-161, DC Tauranga, 18 July 2006.

the charges arose when the defendant (who subcontracted labour to a contractor) exposed two employees on each of two days to this falling hazard. No reparation award was made. Culpability was assessed as high. The sentencing judge acknowledged the unique position of the Trust and its commendable work assisting former prison inmates and reasoned that such work might be compromised if the usual approach to sentencing was taken. The employer had limited resources to meet penalties, and attended a restorative justice conference to which weight was given in sentencing. The trivial nature of the level of the fine is emphasized by a comparison with the forecast of $30,871. It is not clear to us that 'commendable work' would be treated with such similar sympathy by other DC judges, and it is clear that 'commendable work' does not extend sufficiently far in the safety domain and does not extend at all to compensating the victim's dependants. This decision raises the serious issues of the dilution of incentives to take adequate safety precautions and the potential for highly divergent fines and reparation awards.

Second, in Big Tuff Pallets Ltd, the fine of $1,500 for a s 17 offence compares unfavourably with a forecast value of $21,811.[10] The injured employee had a finger tip amputated by a docking saw, the accident was not notified, and the defendant interfered with the accident scene. However, no charges were brought in respect of pre-accident breaches of duty and the remaining issues had resulted on account of the inadvertence of the defendant. It is much less surprising that in this case the fine was set at a very modest level.

Gary David Haddow was the mine manager referred above in *Black Reef Mine*, which involved a fatality. Mr Haddow, who was an independent contractor for a very small firm, was fined $2,000 along with reparation of $11,000 (his share along with two related defendants) on a s 18 charge.[11] The forecasted fine was $22,541 and although the sentencing judge considered culpability to be lower than that of the mining company and that there had also been a contributory factor of a consulting geologist, the forecast error appears to us to be relatively large.

In Stockade Pastoral Farms Ltd, the defendant was fined $1,000 (reparation was zero) when the victim suffered a fractured rib when kicked by a cow during milking.[12] The accident, however, was similar to Big Tuff Pallets discussed above and the sole s 25(3)(a) charge was for accident notification failure, a relatively minor offence. Although the forecasted fine was $20,134, this is another example for which the heterogeneity of seriousness of charges is not well accounted.

2.2.4 A Sample of Cases Involving Potentially High Fines

[10] *Department of Labour v Big Tuff Pallets Limited*, CRN 06092501036, DC Manukau, 2 June 2006.
[11] *Department of Labour v Black Reef Mine; Gary David Haddow; "C" (Name Suppressed)*, DC Greymouth, 29 January 2008.
[12] *Department of Labour v Stockade Pastoral Farms Limited*. CRI-2004-081-000115, DC Waipukurau, 30 November 2005.

Here, we consider three serious cases involving potentially high levels of fines. The first, V Boothby Contractors Ltd, involved a fatal accident to an employee of another organisation (The Prayer and Power Training Trust Centre, fn. 9 *supra*) who fell from a roof during demolition work some 7.2 metres through a skylight to the ground.[13] The risk of falling occurred on two days and the accident occurred on the second day. Boothby had hired three subcontractors to provide labour. Harding J. convicted the defendant on six s 18(1)(a) charges (including 5 incidents in addition to the accident) and seven further charges were withdrawn following a plea bargain. Culpability was assessed as high, and a fine of $16,000 was imposed along with reparation of $15,000. Many mitigating factors were found, although general deterrence was included as a sentencing factor of some importance by the judge. The small company attended a restorative justice conference to which specific weight was accorded in sentencing. The company's limited financial capacity was also recognized. The forecasted fine of $30,668 was 92 percent greater than the actual fine in spite of our accounting for limited financial capacity by way of a dummy variable, but it is difficult to assess whether the fine could be viewed as being "manifestly inadequate" without more precise information on defendant's financial limitations.

The second case, Sealord Group Ltd, involved a fatal accident at sea when an untrained employee became entrapped in the auger of a fishmeal cooking machine.[14] Zohrab J. considered the entrapment risk a clearly identifiable hazard that should have been eliminated or minimized. No proper training for employees was available and an accident appeared highly likely to occur at some stage. Culpability was rated as medium-high. Our forecast of the fine is a very modest $14,226. Sealord Group were fined a similarly $10,000 in total on s 13 and s 6 charges (for which the starting points for fines were, respectively, $100,000 and $150,000) and a reparation order of $195,000 was entered. The company had ample financial capacity and the very modest fine imposed is most likely the very heavy discounting of the fine for the large reparation award, although there were a number of mitigating circumstances and credit was given for the strong turnout of company personnel in court. The only slightly higher forecasted fine suggests that there was little idiosyncratic about the judge's sentence.

In Owens Cargo Ltd, a rope used to adjust the height of a work platform broke and the victim fell into the path of a moving logging truck.[15] His legs were crushed and he suffered compound fractures along with a crushed right hand, fractured ribs and extensive bruising. Amputation was considered during his period in hospital. Owens Cargo initially defended a (rare) s 49 charge but changed their plea after evidence was presented. A starting point of $300,000 was chosen, reflecting in part the doubled maximum fine relative to a s 50 sentencing

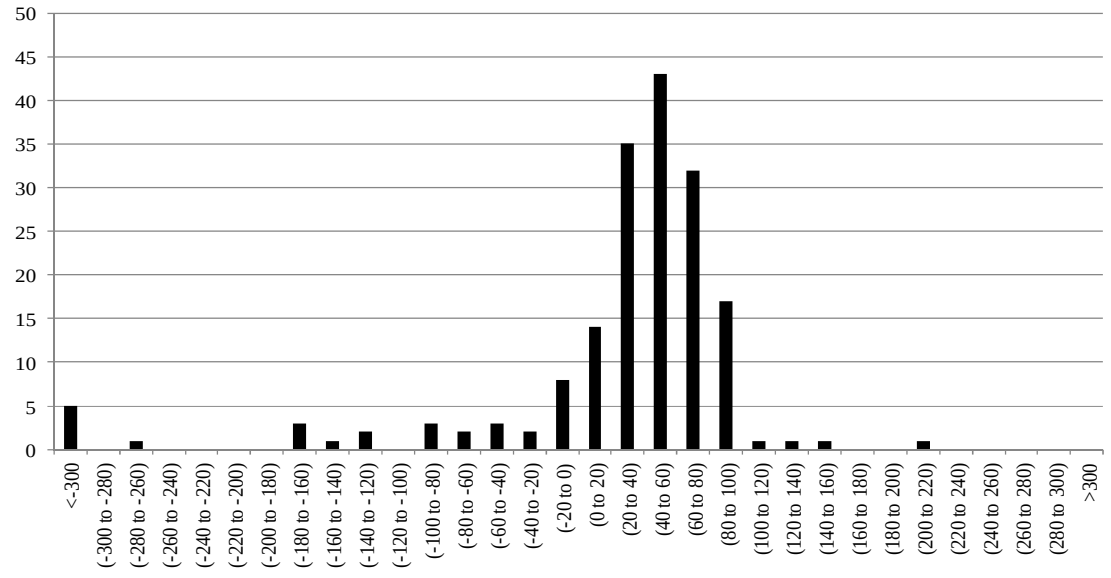
[13] *Department of Labour v V Boothby Contractors Limited*, CRN 06070500162-174, DC Tauranga, 18 July 2006.
[14] *Maritime Safety Authority v Sealord Group Limited*, [2007] DCR 90, CRI 2005-042-732, DC Nelson, 24 June 2005.
[15] *Department of Labour v The Owens Cargo Company Limited*, CRN 07016500579, DC Gisborne, 9 May 2008.

offence. The company, a large firm with a poor safety record, had made a voluntary payment of $30,000 and had topped up the employee's accident compensation payments. Culpability was assessed as high since the site manager had known of deficiencies and ignored them. Senior management were less than well-informed but were still liable under s 49 which contains a constructive knowledge test. The company was fined $150,000 with reparations $22,000. The forecasted fine was only $103,651 although this is likely to mainly reflect the predominance of s 50 offences in our database. We assigned the level of harm as high, but would have made it at the higher end of this level if a finer gradation had been available. Although the forecasted fine is 31 percent below the fine imposed, the idiosyncratic fact of it being a s 49 case seemed unlikely to attract an appeal.[16]

2.2.5 Ex Ante Prediction of Period 3 Fines Using Period 2 Estimated Coefficients

In this section, we analyse the ability of our model estimated for period 2 to predict the fines imposed by DC judges in period 3. Clearly, if DC judges generally complied with the Hanham & Philp Guidelines, we would expect to find that the model systematically under-predicts the period 3 fines in the majority of cases. Figure 2 shows the distribution of percentage forecast errors for cases where fines are nonzero, and is concentrated in a region of positive values. The mean fine imposed during period 3 is $33,476 while the mean forecast error (actual fine – forecasted fine) is $21,088.

Figure 2. Histogram of Fine Forecast Errors (Percent) Period 3 Using Period 2 Coefficients



[16] Only 12 cases (and 16 of the 2438 charges) in our master database involve sentencing under s 49.

Some 77 percent of the 184 observations have positive forecast errors and of the 42 cases involving over-prediction of fines, eight have zero fines and nine over-predict fines by more than 150 percent. On average, however, there appears to be considerable under-prediction of fines. The mean forecast error as a percentage of the corresponding fine if only nonzero fines are included is only 7 percent, but if percentage forecast errors exceeding 150 percent in magnitude are excluded as outliers, this figure increases to 41 percent. Thus, we do not consider that our model estimated for period 2 is very suitable for forecasting post *Hanham & Philp* fines imposed by DC judges subject to the Hanham & Philp Guidelines.

Of the eight zero fine cases in period 3, the situation is fairly similar to that of period 2. Three cases involved Crown entities which cannot be fined. Of the remainder, three defendant companies were in liquidation and making reparation payments awarded would have exhausted their resources. In another case, however, the degree of negligence of the victim was seen as sufficiently high as to remove any penalty for the defendant whose culpability was seen as minimal, an aspect described by the sentencing judge as unique.

In apparent outlier cases where negative forecast errors exceed 150 percent of the fine imposed, serious financial limitations are generally present. For example, in Isaac Nasawaqa Smith, zero reparation was awarded against a self-employed roofing contractor whose employee was severely injured following a fall through an unguarded skylight and who had not been supplied with fall arrest equipment.[17] The contractor was fined $1,000. In Murray Donald Clinton, the director of a cleaning company was also fined $1,000 and no reparation order was made.[18] The company had ceased trading and the defendant, dependant on a sickness benefit, was no longer working. Cemac Construction Ltd. and Timoko Roofing Ltd. were similar, both involving serious fall injuries.[19] Cemac had little, if any ability to make significant reparation or fine payments while the reparations in *Timoko* were maintained at $20,000 rather than being raised and an admittedly notional fine of $5,000 was imposed, the same amounts as in *Cemac*. In Hugh Michael Wilson, the defendant was an agent of a company dealing in aerials and was fined $5,000 with reparations of $10,000 when an employee fell and suffered serious injuries while installing a SKY dish.[20] A claim of financial limitations was accepted by the Court. In Trevor Neil Dreaver, the sole director of a company that was also charged was fined a notional $1,500 which was deducted from the company's endpoint fine.[21] As a great friend of the fatally injured victim, the director found continuing in business untenable and an offer of $35,000 had been made to the victim's dependants (whom the director had supported). In Woolley Roofing Ltd., an endpoint fine of $57,000 was reduced to a "token" fine of $8,000 for a company described as

[17] *Department of Labour v Isaac Nasawaqa Smith*, DC Auckland, 7 May 2009.
[18] *Department of Labour v Murray Donald Clinton*, CRN 09092503894, DC Manukau, 13 May 2010.
[19] *Department of Labour v Cemac Construction Limited*, CRI 2009-019-004628, DC Hamilton, 19 February 2010, and *Department of Labour v Timoko Roofing Limited*, CRN 08092504630, DC Manukau, 5 March 2009.
[20] *Department of Labour v Hugh Michael Wilson T/A Marmic Installations*, CRI-2011-085-002281, DC Wellington, 20 June 2011.
[21] *Department of Labour v Trevor Neil Dreaver*, CRI-2010-042-1094, DC Nelson, 24 September 2009.

having a very poor financial position.[22] The company's director was related to the victim and an offer of $40,000 as a loan had been made, which was accepted by the court as the amount of reparation awarded.

The remaining outlier involving substantial over-prediction of fines is the highly-publicised 2008 case *Department of Labour v The Sir Edmund Hillary Outdoor Pursuits Centre of New Zealand*, [2010] DCR 26. *Hillary* involved the defendant (a charitable trust) permitting a school party to enter the Maungatepopo Gorge for a canyoning expedition. The defendant's young and inexperienced instructor led a group of high school students and a teacher in an upstream gorge walk. They became trapped by rising water during their return, and took refuge on a small ledge for an hour to wait for water to subside. It became no longer safe to remain there, and they attempted to float down the gorge aiming to be rescued by the instructor. Seven group members drowned during this process, while the instructor and four students survived. In assessing culpability as high, Kiernan J. argued that a high degree of workplace risk entailed a high degree of responsibility to ensure the safety and supervision of employees and those they were supervising, especially groups of children. The tragedy was argued to be avoidable. The Trust, a highly experienced organisation with acknowledged expertise in the field had neither registered with the New Zealand Met Service to receive severe weather warnings (they would have received three such warnings) nor consulted its website to determine weather conditions at the time. Neither had they set off to provide assistance to the party when conditions rapidly deteriorated. The Trust acknowledged their deficiencies, aggravating features of which included a breach of trust, the particular vulnerability of young persons, and the extent of the harm suffered.

The Trust pleaded guilty to s 6 and s 15 charges, and, following the setting of starting points at $150,000 for each charge, (reduced to $80,000 for each charge for mitigating circumstances), was fined $20,000 on each charge while a reparation order of $440,000 was applied to the s 6 charge. The defendant carried reparation insurance which covered approximately three-quarters of the reparations awarded. Our forecast of the fine using period 2 coefficients is $101,814, yielding a substantial over-prediction (of $60,814) amounting to a 155 percent forecast error of the fine during a period where over three-quarters of predicted forecast errors involve under-predictions. The judge addressed the issue of limited financial capacity reported by the chief executive officer of the Trust, but no specific conclusions on this issue are provided in the judgment. The judge's endpoint fine of $80,000 on each charge was reduced by 75 percent (at [99]) "principally because of the defendant's status as a charitable trust," noting that the schoolchildren of New Zealand were beneficiaries of the Trust. We are unable to determine from this decision what was the financial capacity of the Trust to pay a fine of any given amount, not a particularly satisfactory state of affairs.

[22] *Department of Labour v Woolley Roofing Limited*, CRN 10044502099, DC North Shore, 6 October 2011.

Some concern would arise if a charitable trust is treated with particular leniency because it is a non-profit organisation *per se*. In *Hillary* (at [53]), Kiernan J. noted that counsel for the defendant argued in favour of a zero fine since the purpose a fine had already been served by the defendant's having "already amply been held accountable, has been deterred, and has already incurred considerable expense in the aftermath," the consequence being that no fine was needed to "bite." This rather misses the point. A major need for a substantial fine as a deterrent is to deter the emergence of easily avoidable serious harms prior to their occurrence, and we would support the removal of prompt remedial action as a mitigating factor meriting a discounted fine from the HSE Act and its replacement with an increase in the fine which becomes greater, the longer is the absence of remediation. The incentive should be for all employers to meet the Act's provisions fully or face the consequences. If organisations face inadequate fines, their incentives to take adequate precautions are diluted and this holds whether they are non-profit organisations or not, and if not, if they can correctly anticipate that they will receive heavy discounts for financial limitations. By not meeting their legal obligations, such employers gain a competitive cost advantage over those who do and have a further incentive to conceal their true financial capacity.

Further, it appears that most small employers who claim financial limitations when charged with HSE offences do not carry reparation insurance. Given the decision in *Street Smart*, however, the very employers who would be most likely to carry such insurance on the grounds of their degree of risk aversion have a reduced incentive to do so since the reparation payments they would otherwise pay absent insurance are effectively transferred in whole or part to the payment of fines. The attitude of many commentators is hostile to the ability to insure against reparations given that safety incentives will be compromised as a result. Given the primacy of reparation over fines in the Sentencing Act, however, others recognise that insurance offers (mainly emotional harm) compensation for accident victims and their dependants that might be unavailable to employees of financially struggling firms. Judges holding this view are inclined to discount fines on this basis when reparation insurance is held. If the protection of seriously harmed employees of small, impecunious employers is to be achieved it may be superior to share compensation between the employer and insurance, the latter made compulsory if necessary. The dilution of incentives for safety precautions arising from reparation insurance will be offset by the additional incentives arising when employers are exposed to higher fines when they can pay more than their share of reparations. Further, 'small' employers might be required to post a substantial bond (perhaps based on industry-wide accidents rates and mean fines imposed) prior to being permitted to operate. While many employers may not start up operations in these circumstances, it raises the important question of whether New Zealand's massive dominance of small employers is necessarily desirable.

The judiciary also occasionally gives generous treatment to small, relatively impoverished employers on the grounds that their importance in small communities is such that

their failure would cause excess social hardship. These decisions, however, seem at odds with the dynamics of business life more generally. Many small enterprises fail because demand falls, costs increase, or expectations of their success are over-optimistic. Others move location, including offshore. But more importantly, the failure of a business for any reason does not destroy the physical resources invested, which can generally be purchased by others. Trading and employment may cease, but only temporarily.

A second complex case involving multiple victims is *Department of Labour v Icepack Coolstores Limited Anors*, CRI 2009-019-011343, Hamilton DC, 15 December 2009. Firemen attending a callout entered a coolstore with the permission of the defendant's site manager who failed to warn that a potentially hazardous hydrocarbon refrigerant had been installed. Leaking gas at the site ignited for some reason, causing an explosion that effectively demolished almost the entire plant, with minor damage to adjacent neighbourhood properties. The site manager (also a director) authorised the security guard who called the fire service to permit the entry of the firemen. The s 6 charge brought against Icepack, however, related to the failure to provide a safe working environment for Icepack's employees, none of whom were harmed in this accident. Icepack pleaded guilty to this charge, and was fined $30,000. Although culpability was assessed at low-medium for all charges faced by Icepack, it was recognised that the potential for fatal or severe harm to employees was great, as is witnessed by the harm that befell other parties to this accident. A starting point of $50,000 was adopted for the s 6 charge. Icepack also pleaded guilty to two s 16 charges, and was fined $3,600 on each of these charges. A starting point of $10,000 was adopted for each of these charges, which is the maximum permissible fine for an offence involving a breach of duty by a person who controls a workplace.

As in *Hillary*, the sentencing procedures outlined in *Hanham & Philp* were expressly applied. Discounts of 30 percent for a relatively early guilty plea, 10 percent for co-operation, and 15 percent for reparations to be paid through the directors were allowed. The directors offered an amount of $95,000 from their personal resources as reparations (amends), all of which was applied to the first s 16 charge. There may even have been a shortfall just for this charge since total reparations (to be shared with the second defendant at rates subject to the discretion of the Court) were assessed at $270,000. The company did not hold reparation insurance, and had financial limitations. The fine predicted by our model using period 2 coefficients is $15,293, an under-prediction of the actual total fine of $37,200 by 59 percent.

Icepack had 2 co-defendants. The first was Mobile Refrigeration Specialists Ltd. which had installed the refrigeration equipment. The outcome of the fire at the Icepack coolstore was extremely serious for the firemen involved, as is evident from the following list of injuries.

Victims - 1: Fatal blast injuries. 2: Extensive burns to 71% of body. Six months hospitalization. Induced coma 10 weeks. Some permanent sight loss. Needed to wear pressure garments for 2

years. Highly unlikely to return to work. 3: Severe injuries to face - 600 internal stitches. Some permanent damage. Severe concussion - loss of memory 6-8 weeeks. Unknown if he can return to work. 4: Severe burns to head, face and hands. Six weeks in hospital. Amputation of one little finger. 5: Broken ribs, blast lung, severe scalp and facial laceration requiring 23 stitches to face, off work for more than 9 months. 6: Burns to 15% of body and partial thickness burns to face, scalp, and neck. Concussion and hearing loss. Undergoing therapy and outpatient plastic surgery. 7: Long-term hearing loss and burns to face and hands. Stitches under chin. Must wear gloves to protect hands. Lost sensation to fingertips. 8: Burns to left side of face, forehead, hands, and ears. Some hearing loss to left ear. Unable to work for 4 weeks.

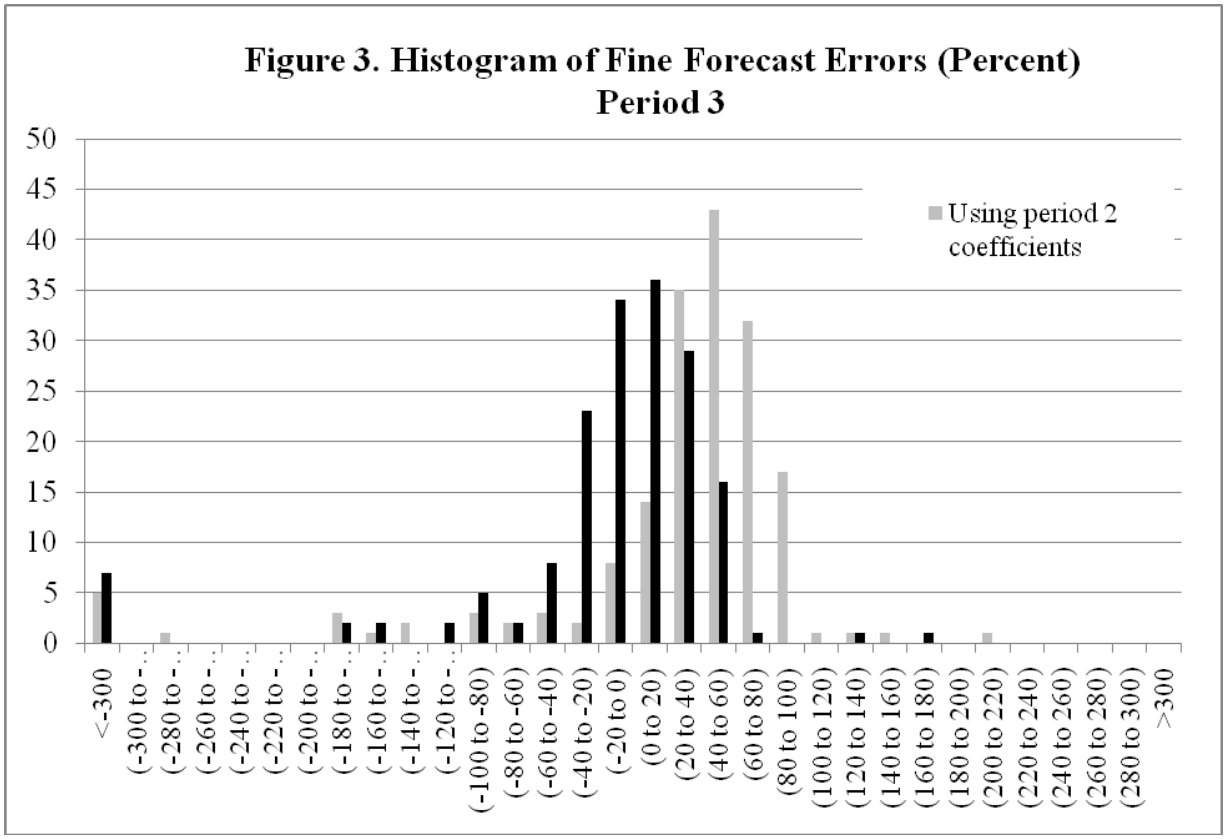
Mobile Refrigeration was fined $56,200 on s 15 and r 18 charges (although the fine for breach of the regulation was notional), and faced a reparation order of $175,000. Culpability was assessed as high, the judge considering the defendant out of his depth in respect of technology new to applications in New Zealand. The defendant had failed to meet industry standards and operated an inadequate gas detection system. Icepack had relied on the defendant's expertise, and was a major customer of the defendant.

Icepack's second co-defendant was Wayne Grattan, described as effectively the managing director of Icepack and who faced a s 6 charge for acquiescing in the s 6 charge faced by the company. He faced a similar assessment of culpability and starting point as Icepack and was fined $30,000 (having made a personal contribution to the reparation awarded against Icepack).

Our model predicted the fines in *Mobile Refrigeration* and *Grattan* as $59,982 and $26,046 respectively, representing a 7 percent over-prediction of the fine in *Mobile Refrigeration* and a 13 percent under-prediction in *Grattan*. We were quite surprised by the accuracy of these *ex ante* predictions using period 2 coefficients. The prediction for the fine faced by Icepack for the three charges for which they were convicted was 59 percent smaller than the actual fines, but included were two s 16 charges with a modest cap of $10,000 for each, an idiosyncratic sentencing factor not accounted for in our model.

2.2.6 Ex Post Prediction of Period 3 Fines Using Period 3 Estimated Coefficients

The distribution of percentage forecast errors resulting from the *ex post* predictions of period 3 fines using period 3 estimated coefficients to construct the forecasts is shown in Figure 3. This figure also shows the distribution of percentage forecast errors resulting from the *ex ante* predictions of period 3 fines using period 2 estimated coefficients to construct the forecasts.



A comparison of the two distributions is instructive. For the results using period 2 coefficients the distribution is heavily skewed to the right of zero. In comparison, the forecasts using period 3 coefficients show the mass of forecast errors reasonably close to zero and with only a small indication of rightward skewness.

When period 2 coefficients are used to forecast period 3 fines, a significant majority (77 percent) of the resulting forecast errors are positive, indicating under-prediction of the actual fines imposed, while the mean forecasted fine is $20,875. The 77 percent under-prediction rate and mean forecasted fine of $20,875 using period 2 coefficients contrasts strongly with an under-prediction rate of 47 percent and a mean forecasted fine of $32,679 when period 3 coefficients are used for forecasting. As previously noted, the mean fine imposed during period 3 is $33,476, well above the forecasted value using period 2 coefficients but only slightly above the mean forecasted fine using period 3 coefficients.[23] These results are expected if DC judges generally comply with the Hanham & Philp Guidelines.

Both of the above distributions contain a number of outliers involving substantial over-predictions of actual fines in period 3 and, not unexpectedly, involve the same cases for period 2 and period 3 coefficient-based forecasts. In general, the percentage over-predictions of period 3

[23] We acknowledge that *ex ante* forecasting is likely to produce higher forecast errors than *ex post* forecasting.

fines when period 3 coefficient estimates are used are substantially greater. For cases described as outliers involving positive actual fines and percentage over-prediction rates in excess of 150 percent, all but two cases (*Wilson* and *Hillary*) show a substantial increase in over-prediction rates when using period 3 coefficients. In comparison, the forecasts generated using period 3 coefficients produces a mean percentage over-prediction rate for negative forecast error outliers of 1,345 percent compared to a rate of 886 percent using period 2 coefficients. On average, therefore, the combination of relatively high starting points for fines together with removing full discounting of fines when accounting for reparations leads to increases in the predicted fines for most outlier cases. All of these exhibit very low fines, less than $10,000. In *Hillary*, however, the situation is rather different. There, the fine imposed was five times the largest imposed in any other outlier case. The resulting percentage over-prediction error falls from 155 percent to 46 percent when period 3 coefficients are used. The decision to use culpability levels partly influenced by harm levels rather than separate culpability and harm levels in determining starting points for fines may have the effect of making the collective imposed fines for the two charges in *Hillary* appear much more appropriate than in the pre *Hanham & Philp* period. Further, it is not evident that the issue of financial capacity was fully addressed in *Hillary*, and given that the sentencing date post-dated the HC decision in *Street Smart*, there should be no reason arising from period 2 dollar-for-dollar discounting practices to explain why the fines set for each charge, viz., $20,000, should lie so far below their respective starting points, viz., $150,000. *Hillary* is a case where the most dramatic feature is the demise of seven young persons. The defendant carried reparation insurance which, in the event, covered some three quarters of the total amount awarded. While inadequate to fully cover reparation obligations, *Hillary* would hardly be the circumstances to try and endorse the social desirability of contracts with terms that place relatively small weight on moral hazard.

In respect to *Icepack*, the percentage forecast errors for each of the three defendants are not too different when using the period 3 coefficients. For both Icepack and Grattan, the forecasted fines continue to lie below their actual values, the percentage under-prediction falling from 59 percent to 34 percent for Icepack and rising from 13 percent to 32 percent for Grattan. The forecast error for Mobile Refrigeration again lies close to zero but its sign switches from a 7 percent over-prediction to a 12 percent under-prediction. On the face of it, the fine of $56,200 for Mobile Refrigeration seems to be a somewhat small proportion of the starting point of $140,000. For the substantive charge, viz., s 15, discounts of 30 percent for an early (in the circumstances, if not immediate) guilty plea, 10 percent for cooperation, and 20 percent for the "substantial" reparation sum of $175,000 were allowed. Although *Mobile Refrigeration* post-dated the HC decision in *Street Smart*, the sentencing judge had no need to adjust the fine on the basis of this decision since Mobile Refrigeration were financially capable of meeting a fine. Instead, however, the judge gave some credit on the basis that Mobile Refrigeration carried reparations insurance "for some years." The degree of cover offered by this policy is unknown to us and the company was also described by the judge as a "small company, with one person working in it."

In the event, our model using period 3 coefficients made a small under-estimate of the fine imposed and could hardly be used as a basis for a defendant's appeal against the quantum of fine.[24]

2.2.7 The Impact of *Hanham & Philp* on Sentencing at an Aggregated Level

Some general forecasting impacts of the Hanham & Philp Guidelines at the aggregated level rather than individual level are shown in Table 4.

Table 4. The Impact of *Hanham & Philp* on Sentences

S 6 Charges	Period 3 Actual Mean	Period 3 Forecast Mean	Difference	Period 2 Actual Mean
Fines	$33,907	$23,776	$10,142	$13,312
Reparations	$23,168	$21,405	$1,763	$13,283
Total Liability	$56,997	$45,171	$11,826	$26,595

Case Level	Period 3 Actual Mean	Period 3 Forecast Mean	Difference	Period 2 Actual Mean
Fines	$33,476	$21,088	$12,389	$12,756
Reparations	$22,571	$21,211	$1,359	$14,786
Total Liability	$55,991	$42,299	$13,262	$28,742

Column 3 of Table 4 lists the period 3 forecast means for the various components of sentences, the forecasts applying period 2 estimated coefficients from the full model to generate period 3 forecasts. The forecast errors in column 4 are uniformly positive, so that forecasted mean fines, mean reparations, and mean total liability all under-predict their realised values for both s 6 charges and at the case level. While the model predicts substantial increases in both fines and

[24] As it transpired, in *Mobile Refrigeration Specialists Limited v Department of Labour* CRI 2009-419-94, HC Hamilton, 29 March 2010, Mobile Refrigeration (together with Waikato Coldstorage Ltd., formerly known as Icepack Coolstores Ltd.) appealed against the quantum of fines. The issue turned on the matter of whether the DC judge had properly taken the financial circumstances of the two companies into account when setting the fines for Mobile Refrigeration and Icepack, and that the companies should have been treated as stand-alone entities when setting the fines. In the HC, the DC starting points were accepted, but the DC judge had not explicitly stated why he had made no reductions in the fines although he seemed well aware of the financial limitations of the companies. But there was limited evidence of financial incapacity brought by the companies in the lower court and the fines were not manifestly excessive. Heath J. found no error of law and dismissed the appeals. We coded Icepack as having limited capacity in part because a major contribution to reparations had been made by the directors from their personal resources and that Icepack was insolvent. This did not appear to be the case for Mobile Refrigeration which was coded as having the capacity to meet the fine imposed.

reparations in period 3, the forecast errors for fines are much greater than for reparations even though the magnitudes of mean period 2 fines and reparations are very similar in magnitude for s 6 charges and are reasonably similar at the case level as well. The under-predictions of total liability are largely due to the under-predictions of fines.

3 Uses for Forecasts of Fines

A major motivation of our work examining HSE sentencing concerns the issue of sentencing consistency. Given the absence of agreement as to what constitutes unwarranted sentencing consistency and the broad categories of circumstances that are covered by many HSE offences (including the most common s 6 offence), we agree with the need to examine the full circumstances of individual cases to detect reasons for apparent inconsistencies. The forecasts of fines generated by our statistical model of sentencing could help guide potential appellants on whether or not to proceed. In explaining differences between actual fines and forecast fines, the forecasts could be of major assistance in providing a benchmark for assessing the worth of idiosyncratic case-specific factors not fully captured by our model. Once we have access to a judicial decision or sentencing note in a case, or even a Return on Prosecution, we are able to quickly provide our benchmark of the fine that would be imposed by the representative DC judge given the relevant information provided.

There is also potential for use of our forecasts by the courts. For example, High Court judges could use our DC forecasted fines to assist in guiding appeal baseline fine settings with further consideration of idiosyncratic facts of the case if the HC tries to mimic representative DC judgments. While this may be relevant for many appeal cases it is clearly not so for guideline appeal cases such as those examined in *Hanham & Philp*. Here, the HC judges could have simply adjusted fines in the three cases (and reparations in the case of *Black Reef Mine*) in response to a reassessment of culpability levels (and the degree of financial incapacity in *Black Reef Mine*). But they went much further than this by introducing a new formal range of starting points at relatively high levels and by removing the general ability to fully discount fines by the amounts of reparations awarded. These further changes were clearly designed to impose more severe sentencing constraints on future sentencing behaviour and, as such, constitute a guideline judgment.

Our forecasts could also be useful for the parties in District Court proceedings. Given the adversarial nature of such proceedings, DC judges typically face very different recommendations regarding starting points for fines from counsel representing the informant and the defendant/s respectively. This largely arises because of differing suggested assessments of culpability levels, but judges can generally make up their own minds on this matter by examining the facts of the case. In many cases, a middle ground is accepted. Having decided on culpability and a starting

point, however, DC judges might find it useful to consider the forecasts generated by our model that represent sentences that representative DC judges would impose given our ability to capture the values of sentencing factors that are required by legislation to be taken into account. Using our forecasts as benchmarks (to be justifiably adjusted by the consideration of case-specific idiosyncratic items not well captured by our model) is likely to help provide sentencing decisions that are in line with general practice and, consequently, be appeal-proof. One does not imagine that judges enjoy losing appeals against their decisions.

Finally, legal counsel on both sides might find our forecasts useful as benchmarks in producing their own predictions of expected sentencing outcomes for particular cases when providing legal advice for their employers.

4 Forecasting Design Issues

The model estimates and the subsequent forecasts produced in this article are based on a reasonably comprehensive specification of the sentencing process. Considerable sentencing variation, however, remains unexplained by our analysis. There are a number of reasons for this which could be addressed in a quest to provide more accurate statistical results than we have achieved, and are discussed in section 5 of Woodfield, Hickson and Menclova (2013). Of particular relevance to the goal of accurate forecasting are the following.

- The courts' inclusion and reporting of endpoint fines in cases involving financial limitations and their routine inclusion (along with starting points) in Returns on Prosecution. A major benefit should be the reduction in the number of seriously under-predicted fines where, typically, serious financial limitations are paramount.
- A clear indication whether deterrence is included as a sentencing factor and if, so, a clear distinction between whether (or both) general deterrence or specific deterrence is relevant. Returns on Prosecution, for example, do not currently make such a distinction. Forecasting accuracy is unlikely to be aided if deterrence effects are not properly captured in the estimation process, and deterrence variables rarely have much explanatory power in our estimated model.
- Given that approximately four out of five levels of harm are recorded as 'high' in our database, a finer gradation of harm than the three broad bands of 'fatal', 'high' and 'low-medium' harm is recommended.

5 Concluding Remarks

Using a fairly comprehensive empirical model of sentencing factors, this article has used the most general specification of our model to forecast fines at the case level in periods prior to and following the introduction of the Hanham & Philp Guidelines in December 2008. We find that a considerable majority of the later period forecasted fines using earlier period estimated

coefficients from our most general model involve under-predictions, a result that is not apparent when later period coefficients are used for forecasting the same period's fines. This reinforces our view that there is strong evidence in support of the continued use of HSE sentencing guidelines to induce District Court judges to change their sentencing behaviour, particularly where the guidelines (and subsequent appeal cases) provide a more structured approach.

As with estimation issues, however, more accurate forecasts using our analysis will most likely call for some modifications to be made to the available data. The latter would require a slightly more systematic and transparent treatment of sentencing factors by the judiciary, along with a slightly more consistent and detailed reporting in Returns on Prosecutions. Access to a comprehensive electronic database of judicial decisions and sentencing notes would be preferable. Some residual variation in sentencing, however, will always occur. To distinguish "warranted" from "unwarranted" variation, analysis of individual cases appears inevitable. In the present paper, we have illustrated some features of a number of cases that appear to us to be obvious outliers in terms of their estimated forecast errors. Where serious under-predictions of fines occur, some employers are Crown entities that cannot be fined while others receive favourable treatment due mainly to their charitable status. For the rest, there is usually an accepted inability to pay fines (and sometimes reparations as well) at an appropriate level, and in Woodfield, Hickson and Menclova (2013) we have suggested some possible remedies in this context.

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