NOMINAL WAGE RIGIDITY IN AUSTRALIA

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Research Discussion Paper
2000-08

November 2000

Economic Research Department
Reserve Bank of Australia

We would like to thank the staff of Mercer Cullen Egan Dell, particularly Jenny Butcher, Lee-Joseph Custodio, Matthew Drinan and Paul Gilet, for allowing us to use their data set and sharing with us valuable institutional knowledge about wage formation in Australia. We would also like to thank Adam Cagliarini, David Gruen, John Simon, Guy Debelle and other colleagues from the Reserve Bank for helpful comments. The views expressed herein are those of the authors and do not necessarily reflect those of the Reserve Bank of Australia.

Abstract

The existence of downward nominal price and wage rigidity has been used to argue against the adoption of zero inflation targets. A good deal is known about the nature and extent of price flexibility in Australia. However, little is known about nominal wage flexibility since investigations have been hindered by a lack of suitable data. Using a unique and unpublished microdata set, we find strong evidence of downward nominal wage rigidity. The idea that firms are able to circumvent wage rigidity by varying broader forms of remuneration is not supported by our study. We find that these broad measures are still skewed away from pay cuts, though to a lesser extent than wages. Not all of the observed rigidity is binding, though, since skewness away from wage cuts appears to occur for reasons other than downward wage rigidity. However, the extent of rigidity we do observe lends support to the pursuit of small positive rates of inflation as an objective of monetary policy.

JEL Classification Numbers: E24, J36
Keywords: nominal wage rigidity, skewness away from wage cuts

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1. Introduction

The assumption that prices and wages in an economy are sticky has a long tradition in economics and has been central to the development of many macroeconomic debates. Foremost, it implies that nominal shocks, such as changes in monetary policy, can have real economic effects. In recent years, the existence of sticky prices and wages has been used to argue against the adoption of a zero inflation target (Akerlof, Dickens and Perry 1996). This is because, in the presence of such nominal rigidities, a small positive rate of inflation can facilitate the real relative price and wage adjustments necessary for the efficient allocation of resources; but if inflation is zero (or very low), these adjustments may not be adequate.

It is also usually assumed that prices and wages tend to be less flexible *downward* than upward (Tobin 1972). There has been considerable investigation of the nature and extent of price flexibility, and the results support this type of asymmetry to varying degrees.[1] Much less work, however, has been done on wage flexibility. Rather than appeal to empirical evidence, it has been traditional to simply assume that wages are rigid downwards due to social conventions and notions of fairness (Kahneman, Knetsch and Thaler 1986).

In recent years, though, interest in the actual degree of wage flexibility has increased, sparked by questions about the rationale for observed nominal rigidities and whether their effects are exacerbated by low inflation (Kahn 1997). In particular, it has rekindled interest in whether the long-run Phillips curve is non-vertical because, when inflation is very low, downward nominal wage rigidity

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[1] See Golob (1993), Balke and Wynne (1996), Roger (1995) and Kearns (1998). However, Kearns (1998) finds that the degree of stickiness in Australian consumer prices is relatively low. Furthermore, others have shown that asymmetric price stickiness in Australia may not represent an aversion to price falls but could be explained as the optimising response of firms to their microeconomic environment and the types of shocks they face (De Abreu Lourenco and Gruen 1995).

inhibits the adjustment of real wages to shocks and causes unemployment to rise (Akerlof *et al* 1996).[2]

The purpose of this paper is to identify the nature and extent of downward nominal wage rigidity in Australia, observe how this has changed during the transition to a low-inflation environment and assess its implications for the real economy.

The paper is organised as follows. First, it discusses why downward wage rigidity is likely and how explanations for such behaviour have evolved from simple notions of fairness to become more rationally based. Second, it explores some of the measurement issues involved in the choice of wage data and demonstrates the desirable properties of a panel of occupational wage data from Mercer Cullen Egan Dell that spans periods of high and low inflation in Australia. Third, it presents evidence on skewness away from wage cuts. Finally, the pervasiveness of nominal wage rigidity is assessed.

2. The Rationale for Downward Wage Rigidity

In his presidential address to the American Economic Society in 1984, Charles Schultze emphasised that one of the main disagreements in macroeconomics is why nominal wages are sticky in the face of aggregate demand shocks (Schultze 1985). While a unified theory of nominal wage rigidity is yet to be developed (Stiglitz 1999), various schools of thought offer a rationale for observed stickiness in nominal wages.

A helpful starting point for explaining possible reasons for rigidity is to consider the kind of world in which perfect wage flexibility is a useful paradigm.[3] This is a stylised world where goods and labour are homogeneous, economic agents are price takers, quantities adjust quickly, information is complete and expectations about future events can be formed from the recurrent nature of past events. Here,

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[2] These inquiries have evolved from an earlier theoretical literature that sought to demonstrate how, following a shock to nominal demand, small nominal frictions can significantly amplify the business cycle. See, for example, Akerlof and Yellen (1985).

[3] Schultze (1985) provides a comprehensive review of the various strands of literature on implicit contracts and highlights their implications for wage rigidity.

work effort can be easily monitored and valued, and workers are interchangeable, since their marginal revenue product is the same regardless of the firm to which they are attached. Finally, there is no advantage of continuity of association between workers and firms. Of course, in reality, each of these characteristics is usually violated in some way and, in consequence, wage rigidity is observed.

Most historical explanations of observed stickiness in nominal wages tended to rely on imperfect information in the form of money illusion, where workers resist nominal wage reductions but fail to perceive that inflation erodes real wages. This approach has been unappealing because it also implies irrationality.[4] Keynes (1936) emphasised that because of imperfect mobility of labour, workers resist falls in nominal wages, since those who consent to such a reduction will suffer a fall in their *relative* real wage. Sociological studies have focused on the difficulty in assessing work effort and identify the perceived entitlements of workers and employers that determine 'rules of fairness' for the setting of wages (Kahneman *et al* 1986; Bewley and Brainard 1993).

Recourse to notions of fairness has, however, been criticised, not because of evidence against it, but because of its weak theoretical grounding. Consequently, New Keynesians have attempted to reconcile observed wage stickiness with rational optimising behaviour. Strictly speaking, their focus is on rational sources of *real* or relative wage stickiness, but it is often argued that these sources of rigidity also imply nominal wage stickiness.[5] Some stem from the idea of an efficiency wage, where nominal wage cuts encourage adverse selection of inferior workers, shirking and excessive labour turnover, all of which detract from the efficiency of the firm. However, most sources of rigidity stem directly from the

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4 See Tobin (1972) for an historical perspective.

5 There is considerable tension in the literature on this issue. Given sticky relative wages, aggregate nominal wages can vary if each wage is indexed to a nominal variable or if workers have rational expectations about the equilibrium path of aggregate nominal wages and change their wages accordingly. Consequently, New Keynesian theories of *real* wage rigidity do not have clear implications for nominal wages. However, as emphasised by Schultze (1985) and Blanchard (2000), if wages move sluggishly in response to the relative conditions facing individual firms, they will also move sluggishly in response to conditions facing all firms, especially in the presence of Knightian uncertainty, and so produce aggregate *nominal* wage stickiness. Consequently, New Keynesian ideas are often borrowed to explain nominal wage rigidity.

large returns to continuity of association between workers and firms.[6] Realising the gains from these associations requires explicit or implicit contracts.

The existence of a wage contract that requires periodic renegotiation necessarily introduces inertia into wage movements, but this observed stickiness may be optimal for those who enter the contract. It may be optimal in the presence of risks, such as probable fluctuations in labour demand, for risk-neutral firms to offer insurance to risk-averse workers in the form of stable income. Alternatively, wage stickiness may be optimal in the presence of uncertainty. While some changes in economic conditions have a known probability at the time contracts are negotiated, others are not predictable, so it is in the interests of workers and firms to adjust wages after the size and permanency of the changes have been assessed. Consequently, nominal wages remain sticky, compared with the predictions of an auction market. But, even if the size and permanency of the change have been assessed, there are 'menu' costs associated with changing wages (sometimes referred to as 'haggling' costs).[7] It is optimal for wages to be revised only when the benefits of such change exceed the costs associated with renegotiation.

Thus, for a host of reasons that may be optimal for individual agents, nominal wage rigidities can arise. The macro consequences, on the other hand, are clearly sub-optimal, especially when inflation is so low that the real effects of such rigidity are amplified. Understanding the nature and extent of nominal wage rigidity can, therefore, usefully inform monetary policy.

However, despite its importance, there has been very little exploration of nominal wage rigidity in Australia.[8] Certainly, until recently, there has been a general lack of data with which to examine the dispersion of wage changes. This, combined with a history of centrally determined wages, had encouraged a presumption that

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6 For example, when continuity of association is broken, workers incur search and transition costs. On the other hand, firms lose non-transferable firm-specific skills and incur the costs of selecting and monitoring the performance of new workers.

7 The idea of menu costs was developed with respect to setting prices, and is most often associated with Ball and Mankiw (1992a, 1992b). The principles of menu costs have since been applied to wage setting (see, for example, Kahn (1997)).

8 To the extent that there has been analysis of wage flexibility in Australia, it has focussed on aggregate real wage flexibility (see, for example, Keating (1983)) or relative wages (see Fahrer and Pease (1994)).

nominal wages are highly rigid, at least downwards. But changes in the wage bargaining system that allow for more market-determined wage outcomes, combined with new sources of wage data, suggest that investigating the nature and extent of wage rigidity will be more fruitful. Furthermore, the shift to a low-inflation environment has made such an investigation more important.

In the following section, we draw on lessons from overseas studies of nominal wage behaviour, identify some of the measurement issues that can distort measured wage changes, and motivate the choice of data for our examination of the Australian experience.

3. Interpreting Nominal Wage Changes

3.1 Overseas Studies

There is a burgeoning empirical literature on nominal wage behaviour in the United States. Despite the array of studies, however, there is no consensus about the extent of wage rigidity. This lack of consensus stems from debate about the information content of the data sources that are used. Some US studies utilise firm-level data collected from payrolls and find a variety of outcomes, with Wilson (1999) and Altonji and Devereux (1999) finding strong evidence that wage changes are truncated at zero while others, such as Blinder and Choi (1990), find a surprising frequency of wage cuts. The inconsistent results of firm-level studies suggest that firm-specific shocks and their timing may be important, so that the results should not be generalised.

Nationally representative studies are more prominent in the literature. A substantial number draw on household information from individuals interviewed in the US Panel Study of Income Dynamics (PSID). They tend to find a clear asymmetry in wage-change distributions with bunching at zero change, but still identify a non-trivial share of workers who receive nominal pay cuts. However, at issue is whether or not the observed falls in pay are indicative of reporting error.[9] Authors have constructed various hypothetical wage-change distributions based on

[9] Primarily because validation tests showed that the individuals interviewed in the PSID reported different earnings than did their employers.

alternative treatments of reporting error, and drawn quite different conclusions about the actual wage-change distribution in the United States (McLaughlin 1994; Akerlof *et al* 1996; Kahn 1997).[10]

A recent innovation has been to identify wage-change distributions from the US employment cost index. This provides nationally representative information but, because it draws on *employers'* records, avoids the reporting errors associated with surveys of householders. Using this approach, Lebow, Saks and Wilson (1999) find stronger evidence of skewness away from wage cuts than those studies based on the PSID or other household surveys.

Similar exercises contrasting evidence from an employment cost index with household survey data have been conducted for New Zealand, where there was particular interest in the degree of wage flexibility following the adoption of an inflation target and the introduction of the *Employment Contracts Act 1991* (Chapple 1996; Cassino 1995). While some non-trivial nominal wage cuts have been identified, most studies report a clear asymmetry of wage changes with an over-representation of zero wage changes. Again, wage data from an employment cost index tend to display greater skewness away from nominal wage cuts than data taken from household surveys.

The disparate results of the US and New Zealand studies highlight the sensitivity of estimates of the dispersion of wage changes to data sources and methods and invite a review of the measurement issues that accompany the choice of alternative sources of Australian wage data.

3.2 Choosing Suitable Wage Data

An ideal measure of wage rates would be the hourly cost of employing constant-quality labour to perform a given job. Most published measures of wages, however, differ from this ideal. Many standard series of earnings are collected as a

[10] In the same tradition as the PSID studies, wage rigidity has also been analysed using the British Household Panel Study, resulting in the recent and surprising claim that wage rigidity in the United Kingdom is far less pronounced than in the United States (Smith 2000).

level of earnings per *person*.[11] For a variety of reasons, these measures of average earnings can change, even if hourly wage rates remain constant, and can give false signals about wage flexibility.

For example, a change in the average *hours* of paid work will change earnings per person, even if hourly wage rates remain constant. Similarly, if different classes of employees have different levels of earnings, changes in the *composition* of the workforce will change average earnings independently of changes in wage rates. Furthermore, *sampling* problems may arise, where new respondents enter the wage survey, but have different characteristics and wage levels to those that have exited, inducing volatility into measured wages growth that does not reflect changes in wage rates. Finally, over time, the workforce tends to progress, or '*drift*', to higher-paid jobs, or enjoy salary increments in existing jobs, so that earnings per person tend to rise even if entry-level wage rates for given jobs remain unchanged.

Each of these effects makes earnings per person a biased measure of wages growth. When present, they distort the mean rate of measured wages growth, but may also distort the distribution of wage changes, obscuring the true nature and extent of wage rigidity. Increasingly, the implications of these measurement issues are gaining attention in the academic literature (Abraham, Spletzer and Stewart 1999; Krueger 1999).

In Australia, the problems associated with measures of earnings per person motivated the development of the Statistician's new Wage Cost Index (WCI), which aims to measure changes in wage rates for a precisely defined fixed basket of jobs, controlling for the quantity and quality of work done.[12] Consequently, the index is unaffected by changes in hours worked, compositional changes in employment or wages drift (although it may be affected by sampling problems). In fact, the focus on pricing labour to constant quality brings the WCI closer to the

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[11] Until recently, this was also the case in Australia. For a general discussion of the various measures of average earnings see Reserve Bank of Australia (1996).

[12] For details of the design of the index see ABS (1998). In brief, pricing to constant quality requires removing from the index salary increments that are due to age, experience, work performance, change in qualifications etc, as these types of payments proxy measurable quality change. A change in the salary range for a selected job is treated as a 'genuine' price change and is recorded in the index.

analytical concept of a wage rate than the employment cost indices used in most other overseas studies of wage behaviour.[13]

The WCI is, therefore, the preferred series for the examination of nominal wage behaviour. However, a detailed distribution of wage changes underlying the series is not publicly available. Furthermore, the series commences in December 1997, precluding examination of how the relationship between changes in inflation and nominal wage rigidity has evolved.[14] This limited time series is disappointing, since identifying how wage-change distributions respond to changes in inflation is central to identifying whether the nominal rigidity is more binding, and therefore costly, when inflation is low.

The approach taken in this paper is to use a data set from Mercer Cullen Egan Dell (MCED) that, while inferior to the WCI, still has a number of desirable properties. Furthermore, it is available in a time series that spans periods of high and low inflation.

3.3 The Mercer Cullen Egan Dell Survey

For more than 30 years, Mercer Cullen Egan Dell has conducted a series of regular surveys of remuneration. The main purpose of these surveys is to provide clients with information about prevailing market rates of pay for specific job descriptions. Reflecting this, MCED conducts detailed job-matching exercises across participating firms in each survey to identify over 450 different positions for which remuneration can be compared. (Positions for which award-only rates apply are excluded from the sample.) Drawing on payroll information, firms then report the remuneration for each employee in that position. Remuneration is broken down into base pay and total pay. Since the mid 1980s, pay for those who have remained

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[13] For example, the US employment cost index includes various payments that are clearly related to performance, and so does not price to constant quality. The New Zealand labour cost index does, however, price to constant quality and quantity in a manner similar to Australia's WCI.

[14] The Melbourne Institute has also developed a series of growth in wage rates that is loosely modelled on the WCI, but draws on less reliable household information. Furthermore, while it permits valuable insights into the characteristics of those wage earners at each point in the distribution of wage changes, it too is available over a relatively short period. See Melbourne Institute (1997, pp 4–5).

employed in a given position between surveys (same incumbents or 'stayers') is separately identified from pay for all individuals in that position. The mean and the quartiles of the distribution of earnings are published. However, we utilise the unit data underlying the published survey results (see Appendix A).

The MCED data have a number of desirable features. First, the reliance on payroll information about employees' earnings avoids many of the reporting problems that arise when employees are surveyed directly.[15] Second, tracing the pay for specific jobs rather than individuals provides a significant step towards pricing labour to constant quality.[16] Third, the distinction between base pay and total pay permits an examination of wage flexibility for different classes of earnings. Fourth, and most useful, is the focus on the pay of those who have remained employed in a given position between surveys.

The measured earnings of stayers are unaffected by compositional change in the sample of respondents. For example, even with a fixed basket of jobs, compositional change often stems from changes in the experience of those who occupy the jobs. An increase in the share of experienced workers, who tend to have higher levels of earnings than less experienced workers, raises average earnings for the full sample, but has no effect on the average earnings of the stayers. Focusing on stayers also avoids the sampling problems that arise when employees who exit the survey have different characteristics and levels of earnings to those who replace them. Consequently, the reported changes in earnings should reflect actual wages growth rather than changes in the features of the sample.[17]

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[15] Not only do validation studies reveal that employees tend to report lower levels of earnings than do their employers, they are less informed about the value of their non-wage remuneration. Furthermore, employees can claim to have remained in the same job when they have, in fact, remained with the same employer, or within the same industry, and performed different tasks.

[16] Although, failure to remove certain salary increments means that changes in market rates for specific jobs will, to some extent, reflect changes in the quality of labour. For example, in the MCED survey, base pay excludes increments that relate to performance, but not tenure. Yet changes in tenure (a proxy for experience) represent a change in the quality of labour.

[17] With the exception of wage cost indices, wage data are usually designed to provide an efficient estimator of the *level* of earnings rather than their *growth*. Since analysis of the distribution of wage changes requires an efficient estimator of wages *growth*, it is helpful to identify the stayers since they form a matched sample. A matched sample eliminates *cohort* variability – that is, the variation in measured wages growth that stems from comparing

Finally, the exclusion of positions characterised by award-only rates of pay removes a class of earnings that has an inherent institutional rigidity and comprises a diminishing share of wage income. Consequently, our analysis is confined to market-determined wages.

The MCED data are not, however, calculated on an hourly basis, so that if work effort varies substantially over time, some distortions in wages growth may arise.[18] Furthermore, they are not based on a random sample but on a sample of firms that *choose* to participate in the survey, so that they can subscribe to information about prevailing wage rates. As it turns out, wage rates for skilled jobs in large firms are over-represented in the survey. But the coverage of the survey is, by any measure, broad and the number of observations is large, with a pooled sample of around 80,000 useable observations of annual wage changes. Consequently, useful inferences can be made about the distribution of wage changes in the market sector.

4. The Distribution of Wage Changes in Australia

To identify the nature and extent of downward nominal wage rigidity, we begin by examining the distribution of wage changes using data from the MCED remuneration survey. We examine ways of measuring the extent of skewness away from wage cuts. We then examine how skewness has varied over time and with changes in inflation.

4.1 Skewness away from Wage Cuts

Figure 1 shows the distribution of annual wage changes, when pooled over the entire sample period, from March 1987 to December 1999, compared with a normal distribution with the same mean and standard deviation. If downward rigidity exists, we would expect to see a positively skewed distribution in which there are relatively few nominal wage cuts and a truncation of the distribution at

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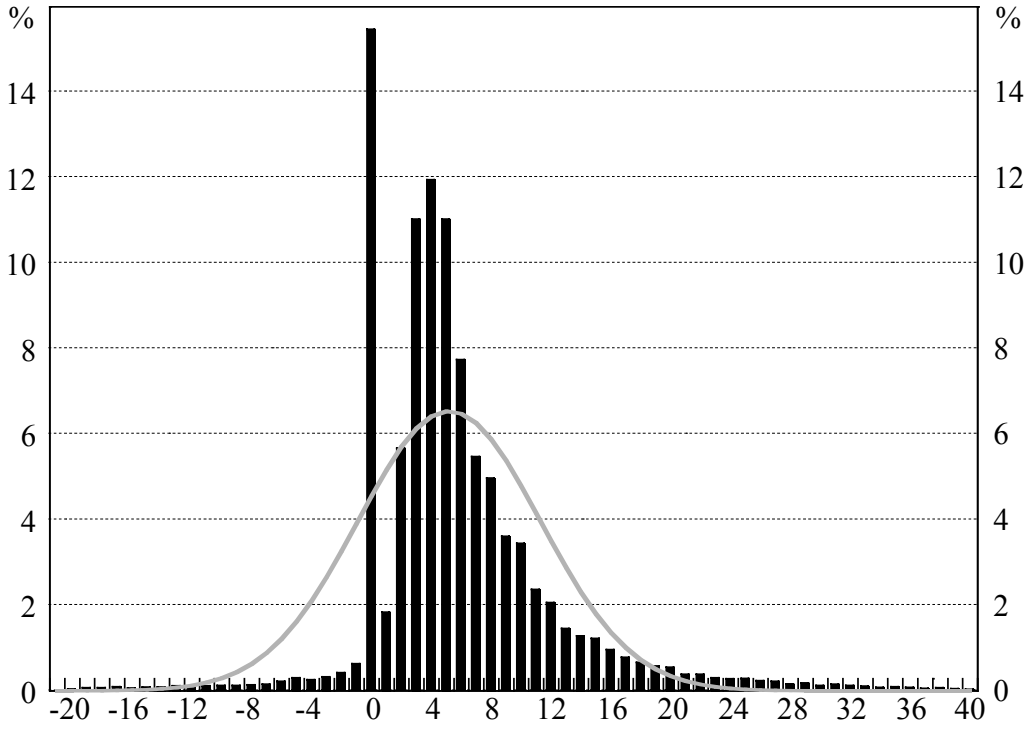
cohorts with different characteristics. We find that the reduction in cohort variability more than offsets the increase in *sampling* variability that arises from not using the full sample of respondents. For a review of these issues see Fuller (1990).

[18] In particular, if there is a rise in hours of unpaid work, our data will overstate growth in true wage rates and may mask some nominal wage falls.

zero. This is borne out by the data. Of the observations, only 3.5 per cent are negative and almost 15 per cent are concentrated at zero. In fact, we also observe 'holes' in the distribution around zero, consistent with the idea that rigidity serves to censor small would-be wage cuts (and rises) at zero.

Figure 1: Distribution of Annual Wage Changes

Full sample



Other studies have found that the incidence of zero wage changes is often inflated by the rounding of small wage changes to zero, or the calculation of wage changes over a period that does not span contract renegotiation.[19] However, the MCED data are not rounded, so we can separately identify near-zero observations.[20] Furthermore, we calculate annual wage changes according to the annual salary review dates used by each firm and allow for an average lag in contract renegotiation. Consequently, the spike that we observe at zero should provide a good indication of the absence of annual wage changes.

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[19] Smith (2000) conducts a detailed analysis of these influences, along with measurement error.

[20] In fact, we find that close to 95 per cent of observations in the zero bar, defined by the interval from –0.5 per cent to 0.5 per cent, are exact zeros.

While skewness in the distribution of wage changes in Australia is clearly evident from visual inspection of our data, summary measures of the extent of skewness can permit a more accurate analysis of the distribution of wage changes. A variety of approaches to measuring the skewness of wage changes have been employed in the literature.[21] Each has its advantages and disadvantages, but viewed together can provide useful corroborating evidence about the proximate extent of downward nominal wage rigidity. We consider some of the main measures and present some results, initially for our pooled sample (see Table 1).

Table 1: Summary Statistics for Wage-change Distribution
Full sample: March 1987 to December 1999

Skewness coefficient	1.34
Mean-median difference (% pts)	1.11
LSW statistic (% pts)	15.75
Kahn-type test (frequency with which a percentile lies above zero relative to below zero, %)	92.00
Share of observations = 0 (%)	14.70
Share of observations < 0 (%)	3.50

The skewness coefficient, the ratio of the third central moment of a variable to its cubed standard deviation, is perhaps the most familiar measure of asymmetry. Positive values of this coefficient indicate a positively skewed distribution. The wage-change distribution has a skewness coefficient of 1.34, representing considerable asymmetry. The skewness coefficient is, however, of limited use for the examination of wage changes. It is extremely sensitive to observations in the tails of the distribution as these inflate the magnitude of the third central moment. Since wage-change distributions usually have fat tails, skewness coefficients calculated for them tend to vary considerably from one period to the next (Crawford and Harrison 1997; Lebow, Stockton and Wascher 1995). Furthermore, the coefficient identifies positive skewness arising from asymmetry in *any* part of the distribution, not just from a lack of nominal wage cuts.

[21] Lebow, Saks and Wilson (1999) discuss a number of approaches and summarise their robustness to particular influences.

Since one of the consequences of positive skewness is that the mean lies to the right of the median, a simple alternative measure of skewness is the mean-median difference (Hotelling and Solomons 1932; McLaughlin 1999). If a distribution is symmetric, the mean-median difference will be zero; if it is positively skewed, the difference will be positive. The difference test is less sensitive to outliers than the skewness coefficient, since extreme observations tend to affect only the mean.[22] As reported in Table 1, the mean-median difference is positive. Once again, though, the test has the disadvantage of identifying any type of asymmetry rather than that due specifically to a lack of nominal wage cuts.

Other measures of skewness specifically identify asymmetry due to a shortage of observations below zero. Lebow, Stockton and Wascher (1995), hereafter LSW, calculate the cumulative frequency of the wage-change distribution that is above twice the median minus the cumulative frequency of the distribution below zero.[23] Because twice the median and zero are at equal distances from the median, the LSW statistic will be zero for a symmetric distribution and positive when there is a shortage of nominal wage falls. We find that the distribution below zero is significantly 'thinner' than that above twice the median, yielding a positive LSW statistic. However, the LSW approach has an implicit assumption that in the absence of rigidity, the right-hand tail of the wage-change distribution would be the 'mirror image' of the left-hand tail. Should the distribution of wage changes be positively skewed for other reasons, the LSW statistic will overstate the extent of downward nominal rigidity.

Kahn (1997) is able to relax the mirror image assumption by comparing the frequency of wage changes at a given point on the wage-change distribution over time. While the Kahn test is cumbersome to perform, the idea underlying it is simple. In essence, those points on the wage-change distribution that record wage falls in one period and wage rises in another are identified. If at those points, wage changes are positive more often than they are negative, there is evidence of downward nominal wage rigidity. We find, for example, that at the 5th percentile,

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[22] More precisely, the median will not be affected by the *value* of extreme observations, but it will be affected if the *number* of extreme observations is over-represented in one tail of the distribution, although this effect is fairly small in the distributions we observe.

[23] $LSW = [1 - F(2 \times median)] - F(0)$, where F is the cumulative frequency. De Abreu Lourenco and Gruen (1995) calculate a similar statistic with respect to prices, but focus on the mean.

92 per cent of wage changes are positive.[24] (Too few points on the distribution behave in this way to permit calculation of a Kahn test statistic.) Despite relaxing the mirror image assumption, though, the Kahn test has the implicit assumption that, in the absence of rigidity, the distribution of wage changes would be the same in all years.[25]

None of the available summary measures of asymmetry will be ideal in every circumstance, but the evidence of skewness away from nominal wage cuts is clear. However, while this is strongly suggestive of downward rigidity, it is not proof of it. More persuasive evidence of downward rigidity is whether the skewness becomes more pronounced as inflation falls, since this implies that an increasing share of wage changes are censored at zero.

5. Further Evidence of Downward Nominal Wage Rigidity

5.1 The Relationship with Inflation

To identify whether there are conspicuous differences in the distribution of wage changes in different inflation environments, in Figure 2 we break up our sample into three periods that roughly capture episodes of high, sharply falling and low, stable inflation. At first glance, the features of the distribution of wage changes are different in a high-inflation period. The distribution is clearly more dispersed during the high-inflation episode than when inflation is either falling or low. This is especially so when we make an adjustment for the fact that the spike at zero in the high-inflation episode is affected by changes to tax legislation that encouraged firms to hold base salary fixed when offering employees fringe benefits.[26]

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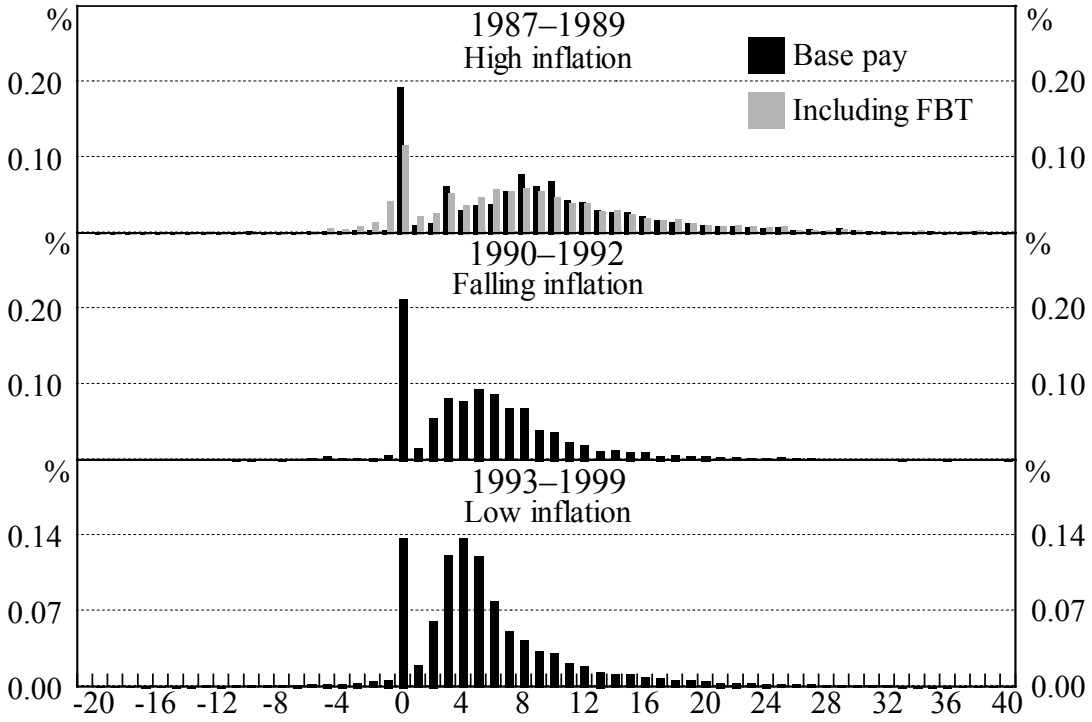
[24] We only find clear evidence of points on the distribution containing negative values in one period and positive values in another after removing the absolute zeros from the sample. Those who apply the Kahn (1997) test formally, control for the massing of observations at zero due to factors other than downward nominal rigidity.

[25] This is likely to be invalid since, for example, the underlying distribution of wage changes shifts to the right in periods of high inflation.

[26] With the initial introduction of the Fringe Benefits Tax in 1988, employers incurred a tax liability for the provision of fringe benefits and many chose not to increase base pay when benefits that attracted the new tax were awarded (MCED, Director of Databases, personal communication, 12 May 2000). Consequently, a more useful indicator of the share of wages

Figure 2: Wage Changes and Inflation



Summary statistics of the distribution are particularly useful because they can show us how the skewness of annual wage changes has evolved over time. In Figure 3, we present three standard measures of skewness. All point to a general increase in skewness and have the common feature that the rise in skewness is most pronounced during the early 1990s. There has been a general fall in inflation over the period, with a sharp decline in the early 1990s. Consequently, we find a clear negative correlation between the various measures of skewness of wage changes and inflation, consistent with downward nominal wage rigidity (Table 2). This is the case when we consider headline inflation and core inflation (measured by the median price change). The skewness of annual wage changes is also negatively correlated with the inflation expectations for that year. In fact, this correlation is stronger than that between skewness and headline inflation.

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that recorded no change can be found from a broader measure of earnings that includes the cost to employers of Fringe Benefits Tax (see Figure 2).

Figure 3: Skewness of Wage Changes over Time

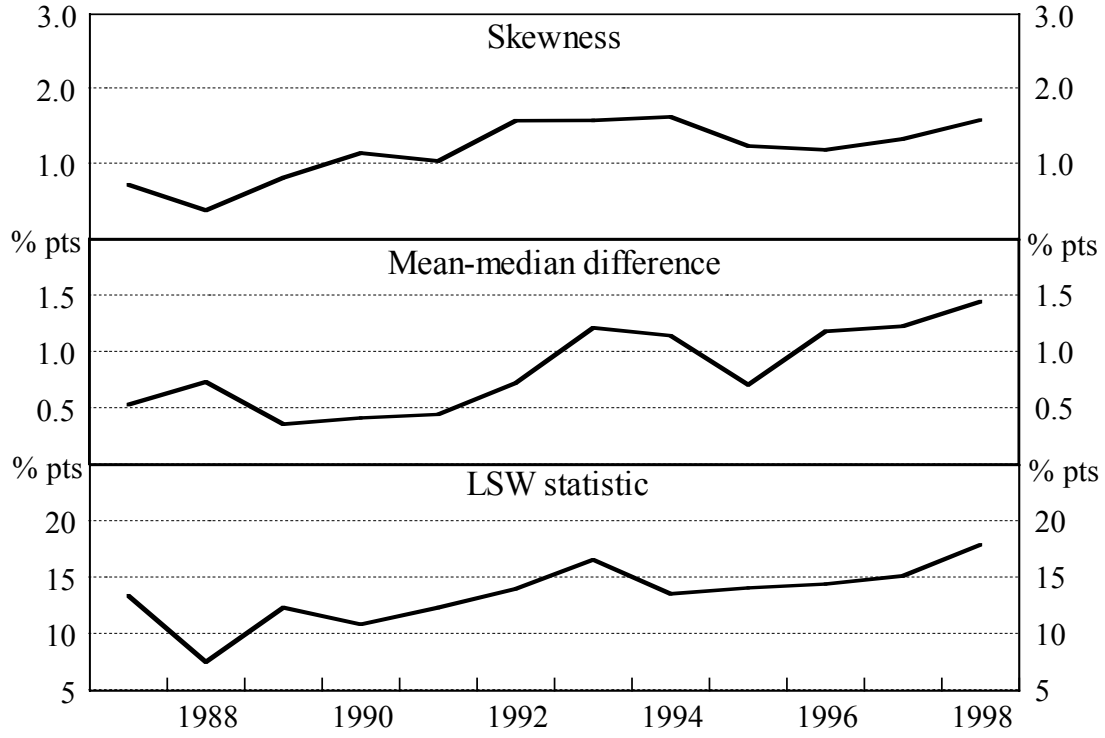

Table 2: Correlation with Inflation

Full sample: March 1987 to December 1999

	Headline inflation	Core inflation	Inflation expectations *
Skewness coefficient	–0.69	–0.85	–0.84
Mean-median difference	–0.50	–0.61	–0.59
LSW statistic	–0.60	–0.65	–0.68

Note: * Inflation expectations are measured by the Melbourne Institute series.

5.2 Skewness Near the Median

While an inverse relationship between skewness and inflation is compelling evidence that downward nominal wage rigidity exists, an indication of the *extent* of this rigidity is important for assessing its macroeconomic consequences. The usual thought experiment is to ask 'what would the wage-change distribution look like in the absence of rigidity?'. The difference between this counterfactual distribution and the actual distribution captures the extent of wage rigidity.

What should the counterfactual distribution look like? Most attempts have posited that it is symmetric, with Card and Hyslop (1997) providing the most prominent example. But while we cannot ever know what the counterfactual distribution looks like, it may be too restrictive to assume that it is symmetric. It is possible that even if wages were perfectly flexible, shocks to wages may not be symmetrical, so that the underlying distribution of wage changes is skewed. If, as a result, the underlying distribution of wage changes is positively skewed, imposing a mirror-image assumption will exaggerate estimates of downward nominal wage rigidity.

McLaughlin (1999) argues that if a shortage of wage cuts were the main source of skewness, then wage changes close to the median should be symmetric, since these positive observations are not affected by factors that prevent nominal wages from falling. If, instead, skewness is present near the median, it implies that the distribution of wage changes is skewed for reasons other than downward nominal rigidity.

We trim 20 per cent of observations from both tails of the full sample distribution of wage changes. That is, we trim the left-hand tail that encompasses the zero and near-zero observations that may be affected by downward nominal rigidity, and we trim the right-hand tail that encompasses extremely high observations that can inflate measures of skewness. This leaves a central core of observations around the median. We find that there is some skewness near the median, indicated by a small

positive skewness coefficient, suggesting a possible role for factors other than downward nominal rigidity in the distribution of wage changes.[27]

6. Whose Wages are Rigid?

An important question is whether downward rigidity of wages is a general feature of our labour market or confined to particular classes of worker. We find that while there is a general tendency for wages to be sticky downwards, the extent of downward rigidity is not uniform across all groups of workers. We focus on the distribution of wage changes for seven of the broad 'job families' that are separately identified by MCED. These include: senior executives; corporate staff, finance and accounting; information technology; clerical, administration and human resources; engineering and technical trades; sales and marketing; and production and supply.[28]

We find that, in each year of our sample, three job families consistently have among the most highly skewed distributions of wage changes. Their precise ranking will vary with the particular measure of skewness used. We focus here on the mean-median difference, simply because it provides a set of rankings that is similar in each year of our sample. Using this measure, the wages for those working in information technology tend to be the most skewed away from wage cuts, followed closely by senior executives and those in the corporate staff, finance and accounting category (Table 3). These job families represent skilled occupations with relatively high productivity, so that skewness away from wage cuts might be expected. They also represent occupations for which there is a greater tendency to have individual contracts. The evidence of skewness away from wage cuts shown here is consistent with recent findings on downward nominal rigidity of wages among those on individual contracts (Charlton 2000).

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[27] The skewness coefficient of the core observations for the full sample period is 0.37. Even where 30 per cent of observations are trimmed from both tails, a small degree of skewness is evident.

[28] Other job families are available, but not on a consistent basis over our full sample period, or with adequate sample size.

Table 3: Skewness of Wage Changes by Job Family
Annual averages of full sample

Job family	Mean-median difference (% pts)
Information technology	1.19
Senior executives	1.00
Corporate staff, finance and accounting	0.84
Engineering and technical trade	0.72
Clerical, administration and human resources	0.62
Sales and marketing	0.59
Production and supply	0.58

7. Are Broader Measures of Remuneration More Flexible?

While changes in wages have displayed features of downward rigidity, it is possible that firms are able to vary other forms of remuneration – which may be less important or visible to workers than base pay – to achieve desired adjustments in total labour costs. Indeed, there is some evidence to suggest that effects of nominal wage rigidity are at least partly overcome in this way (see, for example, Lebow *et al* (1999)).

A broad measure of remuneration is available over our full sample period and we call it total pay.[29] It does, however, exclude bonuses, commissions and incentive schemes, as these have only been collected in recent years and not all respondents reveal full details. Furthermore, they can be difficult to value (especially when they include stock-based compensation).

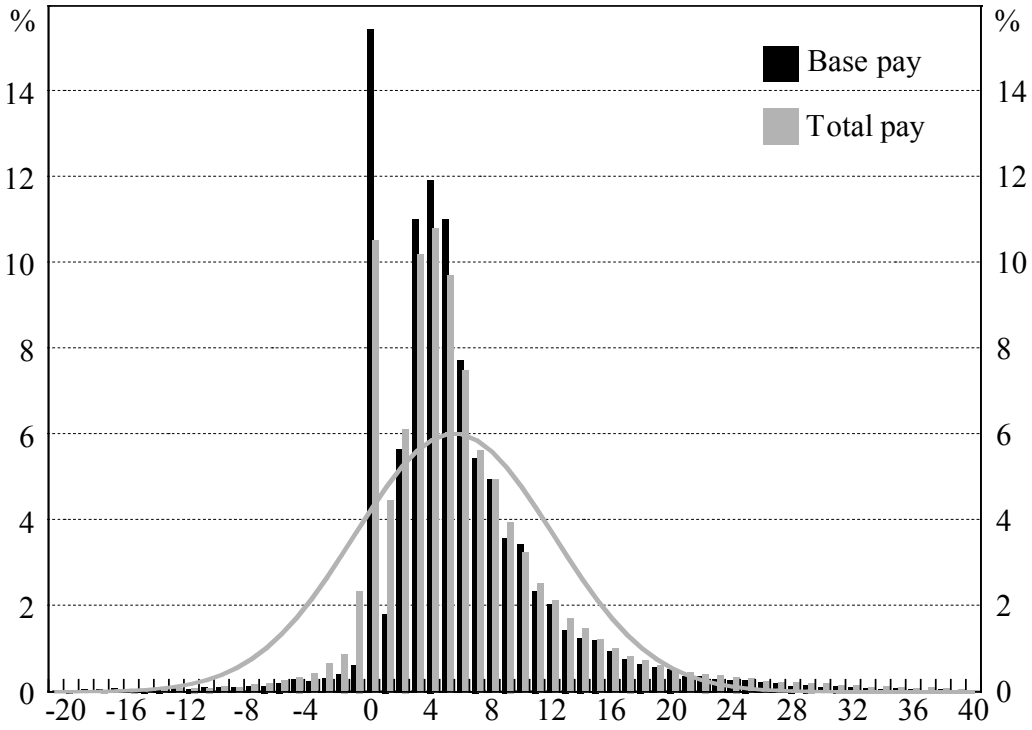
As shown in Figure 4, for the entire sample, the distribution of total pay is wider than for wages. Of these observations, around 8 per cent are negative (more than twice the proportion for wages) and the spike at zero has been reduced to 10.5 per cent (from 15 per cent). However, while the distribution is slightly more dispersed than that for wages, it is still quite positively skewed. Furthermore, we

[29] It includes all allowances, superannuation, loan benefits, company cars and the costs incurred by the employer through fringe benefits tax, as described in Appendix A.

find that the degree of skewness is also negatively correlated with inflation, suggesting that total pay is also rigid downwards, just to a lesser extent than wages.

Figure 4: Distribution of Annual Changes in Total Pay

Full sample



Would a greater reduction in rigidity be obtained if our measure of remuneration included explicit performance-based earnings? We try and establish whether variations in explicit performance-based pay omitted from our data set would overturn our finding that broad measures of earnings also display some downward rigidity.

Given that performance payments are not available from MCED on a consistent basis through time, we focus on one recent period. For 1998–99 only, we identify annual changes in two broad measures of earnings: our existing measure and one that also includes actual annual bonuses, commissions and incentive schemes. The distribution of annual changes is slightly more dispersed for the measure that includes bonuses, but the difference is trivial (see Appendix B). Even though around 60 per cent of the employees in our sample receive some form of performance payment, the share of employees who receive highly variable performance payments is too small to generate a distribution that looks

substantially different to that we have presented for total pay.[30] Consequently, our result stays intact: broader measures of earnings display downward rigidity, but to a lesser extent than wages.

Should we be surprised that broader measures of earnings also display skewness away from pay cuts? A broader measure of earnings will only be more inherently flexible if the non-wage components represent 'pay at risk' that may either rise *or* fall in accordance with employees' performance. Bonuses are a good example of pay at risk. However, many reward systems are asymmetric; rewards are given for good performance but penalties are not applied for bad performance. Consequently, the level of earnings may increase following a reward for performance, but remain unchanged in the subsequent year when performance is not rewarded. These asymmetric types of reward systems contribute to downward nominal rigidity even for broad measures of earnings and would appear to play a role in explaining our results.

The finding that broad measures of earnings also display some downward rigidity is important. It implies that non-wage forms of remuneration, at least in their current form, do relatively little to counter the downward rigidity observed in wages. Furthermore, it is contrary to the findings of overseas studies which emphasise the reduction in rigidity imparted by non-wage forms of remuneration.[31]

8. Assessment

The labour market in Australia displays clear features of downward nominal rigidity, for both wages and, to a lesser extent, broader measures of earnings. The

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[30] The Statistician also identifies 'payment by measured result', but this makes little contribution to either the level or growth in various measures of aggregate earnings, consistent with the results presented in Appendix B.

[31] It is, therefore, tempting to conclude that nominal wages in Australia may be more rigid downwards than those in other countries, particularly the US. However, such international comparisons are fraught with difficulties given the differences in the measurement of nominal wages. The apparent flexibility in wages or non-wage remuneration in other studies may stem from measurement problems, some of which are avoided by the special features of the MCED Survey.

importance of this depends, in the first instance, on whether some of the observed rigidity is artificial.

The incidence of zero wage changes may be inflated by the prevalence of long-term contracts. We have focused on the distribution of annual wage changes. Although these changes are calculated over a window that allows for different salary review dates by firms, and typical lags in contract renegotiation, many contracts are for periods of two years or more. These longer-term contracts do not always provide for a wage rise in each year of the contract. Some lead to a wage increase only when they are renegotiated, resulting in relatively infrequent step-wise increases in the level of wages that add to the concentration of observations at zero and positive skewness of the distribution. This pattern of wage setting is a feature of many individual contracts and wage earners with these contracts are likely to be over-represented in our sample. This might lead to estimates of skewness that are biased upwards and overstatement about the extent of downward nominal rigidity.

We may also observe nominal wage rigidity because of the self-selection evident in reported wage changes. We observe only the distribution of *accepted* wage offers to those remaining in the same job. Some wage offers are not accepted and an employee quits. Since such offers are more likely to be below the median (that is, below the 'wage norm'), the resulting distribution becomes positively skewed.[32] There is an additional reason why self-selection might be a source of skewness in our data. Some participants in the survey are seeking information about prevailing rates of pay for a given job, with an intention of offering a wage above the median to retain valued staff. Consequently, if wage changes below the median were truncated by staff turnover, analysing a sample of stayers would lead to estimates of skewness that are biased upwards. Again, this would lead to overstatement about the extent of downward nominal wage rigidity.

So, part of the rigidity we observe is artificial. But when we assess the economic consequences of rigidity, other factors warrant consideration. Foremost, there are ways in which employers may prevent downward nominal wage rigidity from affecting their compensation costs. For example, they may vary working arrangements, in particular the span of working hours that are considered to be

[32] The effects of self-selection on skewness have been identified by Weiss and Landau (1984).

standard. Alternatively, they may promote or terminate staff to achieve desired adjustments in their wage bills, especially if wages tend to rise with tenure more so than productivity (Wilson 1999). We have also observed downward nominal rigidity in an environment of positive inflation and sustained growth in productivity. Perhaps it is unreasonable to expect that nominal wage cuts would occur in this environment, other than for firms in distress (Gordon 1996; Poole 1999).

So how can we tell if the rigidity we observe matters? While a growing body of empirical evidence suggests that downward nominal wage rigidity is a pervasive feature of economies, there is much less evidence about the effects of this rigidity. At the micro level, analysis of its effects on layoffs, promotions and relative wage growth is inconclusive (Altonji and Devereux 1999). So too is analysis of its effects at the macro level. There are those, such as Gordon (1996), who find the Phillips curve to be unaffected by rigidity and 'resolutely linear', and those who find it to be non-linear, even in the long run (Akerlof *et al* 1996).

Identifying the effects of downward nominal wage rigidity in Australia warrants a separate inquiry that is recommended for further research. However, there is evidence to suggest that the short-run Phillips curve for Australia might be a curve rather than a line (Debelle and Vickery 1997; Gruen, Pagan and Thompson 1999). This implies that the economy might function less efficiently at zero inflation than it does at the small positive rates of inflation that are consistent with the current inflation target.

9. Conclusions

There has been a longstanding presumption that downward nominal wage rigidity is pronounced in Australia but, until now, a lack of appropriate data has precluded an empirical investigation. The main novelty of this paper is to utilise a newly available data set and demonstrate the nature and extent of nominal wage rigidity in Australia. The results add to the large body of evidence that nominal wages are rigid downwards. More important is the finding that broad measures of earnings also display downward rigidity, just to a lesser extent than wages. This suggests

only a small role for variations in non-wage remuneration to offset the effects of wage rigidity.

Part of the observed rigidity can be described as artificial, due to the effects of contract duration and self-selection, and part may not be binding if employers can find other ways of securing desired adjustment in their labour costs. However, there is a possibility that the remaining nominal frictions, even if rationally based, lead to sub-optimal macro outcomes. We might query whether the extent of nominal wage rigidity we have observed would survive regime changes in the inflation environment or other macroeconomic conditions. But if 'we suspect that wage rigidity is deeply rooted, not ephemeral or characteristic of a particular set of institutions or legal structures ... policy should be framed recognising its existence' (Akerlof *et al* 1996, pp 51–52). The extent of rigidity we observe in Australia suggests that small positive rates of inflation, rather than absolute price stability, may be helpful in facilitating the adjustment of real output and employment to shocks.

Appendix A: Data

Mercer Cullen Egan Dell compile the *Quarterly Salary Review* and other surveys from the payroll records of approximately 700 firms from 24 industries across Australia. The contributing firms do not form a stratified random sample, but are those who subscribe to salary advice from MCED.

All survey contributors receive a set of benchmark position descriptions to which they match their own employees. If at least 80 per cent of the duties correspond to the benchmark positions, the salary information is included in the survey. Remuneration data for non-residents and contractors are not included. Salary information is separately identified for all employees and same incumbents, who have remained in a given job between survey periods.

Information is collected about the following forms of salary:

Base salary: annual salary excluding allowances or additional payments.

Total cash: base salary plus vehicle and entertainment allowances; parking; annual leave loading; private travel; superannuation (salary sacrifice); other cash payments.

Employment cost: total cash plus the remuneration cost of company cars; company contributions to superannuation; loan benefits; the cost of Fringe Benefits Tax.

Total employee reward: employment cost plus actual bonus, commission or incentive payments.

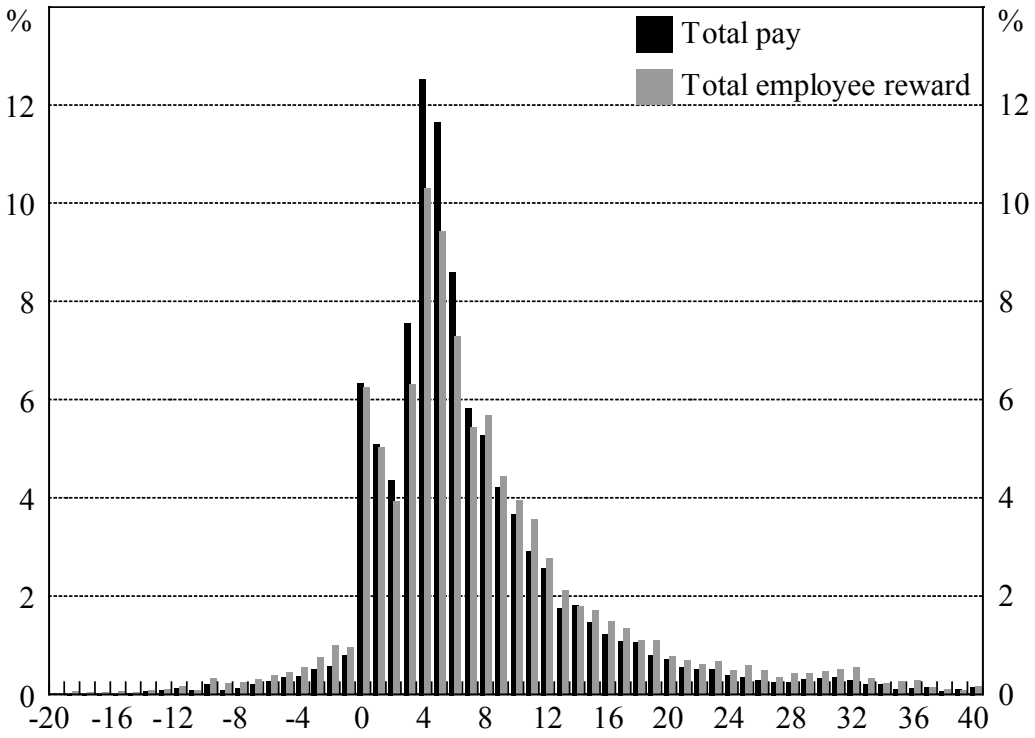
In this paper, we use **base salary** as the measure of **wages** and **employment cost** as the measure of **total pay**. We separately identify performance pay by comparing employment cost with total employee reward.

Appendix B: Comparing Broad Measures of Remuneration

To establish whether our broad measure of earnings, total pay, would display greater flexibility if it included explicit performance-based pay, we compare the distribution of changes in total pay with total employee reward. (Total employee reward equals total pay plus bonuses, commissions and incentive payments.) As shown in Figure B1, the differences are slight and do not overturn our result that broader measures of earnings also display downward rigidity.

Figure B1: Distribution of Changes in Total Pay and Total Employee Reward

1998–1999



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