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Wage inequality and neoliberalism: insights from quantile regression

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Abstract

This paper examines wage inequality in Australia from 1982 to 2010 using income distribution data from the Australian Bureau of Statistics. The analysis shows that wage inequality grew steadily during this period, and that the growth was particularly strong from 1996 onward. Through the use of quantile regression it is possible to decompose the growth in inequality into three components: changes in the wage structure, changes in workforce characteristics, and a residual ('unobservables'). The results of this analysis are conclusive among male full-time employees: despite the conventional wisdom that the changing nature of the workforce contributed to the growth of inequality, I find that the changes in the wage structure were overwhelming responsible. The results among female full-time employees are similar, but not as conclusive. The paper locates these findings within an analysis of neoliberalism in Australia and suggests that deindustrialisation and financialisation appear to be closely related to increased inequality.

Did the rise of neoliberalism in the 1980s lead to greater economic inequality?[1] Writing in 2002, two United States economists observed: "inequality is a bigger problem at the end of the nearly 20-year experiment with unregulated global capitalism than it was before deregulation became the rule."(Weller and Hersh 2002: A15). A number of cross-national studies conducted during the late 1990s endorsed this view and showed that inequality had grown in nearly all Western countries, particularly those which embraced neoliberalism most fully (Gottschalk and Smeeding 1997). An extensive literature examining wage inequality had already emerged during the 1990s, particularly in the United States (Blau and Kahn 1996; Freeman

[1] This paper makes use of confidentialised unit records files (CURFs) provided by the Australia Bureau of Statistics under the ABS/AVCC CURF Agreement. I would also like to thank a number of people for their generosity in taking time to comment on an earlier draft of this paper: Caroline Alcorso, Grant Belchamber, Murray Goot, Frank Stilwell, and Roger Wilkins.

1996; DiNardo, Fortin and Lemieux 1996; Katz and Krueger 1992; Gossling, Machin and Meghir 2000; Galbraith 1998), and the onset of the Global Financial Crisis (GFC) and subsequent economic stagnation in Europe spurred another burst of research (Galbraith 2012; Jenkins, Brandolini, Micklewright and Nolan 2013). In many cases, the growth in inequality had reversed an historical trend towards greater equality which had been taking place in many countries since the end of the Second World War. The extent of the growth in inequality seemed to reflect the extent of neoliberalism. In the United States and Britain, for example, the growth of inequality was both sudden and large in scale, while in countries like Sweden and Canada, the changes were more modest (MacPhail 2000).

Timing is one thing, causality is another. In Australia in 1993, Peter Saunders posed the question of whether economic deregulation was the cause of increasing income inequality. At that stage the data was still tentative, but Saunders concluded that a case could be made for the link:

> The comparative evidence presented here is consistent with the view that increased inequality in the 1980s (which has clearly taken place) is associated with—most probably caused by—the increased deregulation which has been occurring. The evidence presented to support this view is all circumstantial, but at least the jury is still out and I am confident that a strong prima facie case has been presented and that a guilty verdict will eventually be forthcoming (Saunders 1993: 42).

Saunders used data from a range of countries, including Australia, but his analysis was limited to the 1980s. In this paper I analyse data covering the last three decades, a period long enough to discern clear trends and patterns. I restrict myself to wage inequality, rather than the broader field of income inequality, and I conclude that Saunders' intuition was indeed well founded.

Introduction

Saunders had in mind the deregulation associated with 'economic rationalism' during the late 1980s. Since that time our understanding of the political and economic forces behind that process have been much deepened and the term 'neoliberalism' is now more commonly employed. The accounts of neoliberalism to be found in the literature are quite varied but the defining characteristics include: financialisation, trade liberalisation, deindustrialisation, deregulation, privatisation, and the privileging of market principles over activities of the state. For a recent overview of neoliberalism see Cahill, Edwards and Stilwell (2012), and for a succinct account of the Australian experience see Quiggin (2012). For some writers, the underlying logic of neoliberalism is the re-assertion of the economic and political power of the capitalist class (Duménil and Lévy 2004; Duménil and Lévy 2011; Duménil and Lévy 2012; Harvey 2005). Neoliberalism has also been seen as heralding a new stage in capital accumulation, in which profitability is now primarily geared to financial transactions rather than the production of commodities (McMurtry 1999; Harvey 2010). Economic historian Robert Brenner (2006) has located neoliberalism within the context of the 'long downturn', beginning in 1973, in which a crisis of profitability, induced by excess capacity, brought about intensified capitalist competition.

The response by capitalist firms, assisted by governments, has ushered in the familiar contours of neoliberalism: deregulation, privatization and trade liberalisation in particular.

The wage inequality which has become such a distinctive feature of the last 30 years also became a topic of much inquiry during the 1990s. In the United States, a number of explanations were advanced to account for this: technical change, the growth in international trade, the weakening of the labour movement and the persistence of chronic unemployment. It is worth noting that the technical change argument was largely seen as 'neutral', in so far as it reflected a kind of natural progress in technological development. In some cases, the emphasis was on computers, in other cases, it was more a general emphasis on 'higher level skills', epitomised in the popularity of Robert Reich's (1992) notion of the 'symbolic analyst'. Proponents of this view argued that the 1980s had seen the widespread adoption of new technology, particularly computers, and this had led to strong growth in the more highly skilled occupations, which in turn led to growing wage inequality. The term used for this was 'skill biased technical change' and this perspective gained dominance among mainstream economists because it suited their human capital model of the labour market (Juhn, Murphy and Pierce 1993; Levy and Murnane 1992). Within this framework, workers are paid according to their marginal productivity and if technology raises this for some groups of workers, vis-a-vis others, then a growing dispersion of wages will result. One of the fiercest critics of this explanation was James Galbraith (1998, 2012) who labelled it 'the skills fallacy'. Instead of technical change, Galbraith emphasised unemployment as the driving force behind the growth of inequality. He argued that the onset of recessionary cycles from the 1970s onwards coincided with increasing levels of wage inequality in the US labour market. This was compounded by poor monetary policy, an over-valued currency, and political resistance to raising the minimum wage (Galbraith 1998; see also Waltman 2000; Waltman 2004). In his later research, Galbraith emphasised financialisation, and asset-price inflation, as core elements in the more recent expansion of inequality (Galbraith 2012).

Prior to the 1990s researchers had already begun to highlight the impact of deindustrialisation on the labour market, and the decline in the strength of organised labour during the 1980s. As trade liberalisation unfolded, job losses resulted from import competition and from jobs being sent off-shore. Because many of the blue-collar jobs which were lost were relatively well paid, inequality accelerated (Bluestone and Harrison 1982). Many of the lost jobs had also been unionised jobs. In research published during the early 1990s Richard Freeman attributed about 20 per cent of the increase in wages dispersion during the 1980s to declines in union density (cited in Borland 1996: 238) and David Card found similar results in his research (Card 1996).

Research on the emergence of wage inequality in Australia tracked the American debates. Some researchers accepted the technical change and 'higher level skills' arguments with little difficulty, while others dug deeper, looking for political and institutional underpinnings. In the case of the former, some researchers linked the increase in wages inequality with the growth of more highly skilled occupations. However, unlike the United States, the earnings premiums associated with degree holding (the 'returns to education') had not increased during the 1980s but

had either plateaued or declined over time (Gregory 1993: 74; Norris and McLean 1999: 29) and this trend continued into the 2000s (Coelli and Wilkins 2009).[2] Some studies which used more innovative approaches to measuring skills than simple educational attainment were able to link the growth in wage inequality with changing returns to skill (Pappas 2001).

Researchers who emphasised the growth in high skilled jobs sometimes argued that pay relativities played little role in the growth of wage inequality (Norris and McLean 1999; Keating 2003). An emphasis on static wage relativities was also evident in one of the few studies which explicitly examined the links between trade liberalisation and inequality. Murtough, Pearson and Wreford (1998) employed a macro model of the Australian economy (the Monash model) to gauge the effect on wages and employment of reductions in trade barriers in the period between the mid 1980s and mid 1990s. They concluded that there was no evidence for such a link, except in a number of sub-sectors (such as textiles, clothing and footwear). Like Murtough, Pearson and Wreford (1998) Gaston (1998) also concluded that trade liberalisation had more of an impact on employment than on wages.

What is at stake in this contrast between wage relativities and the growth in high skilled jobs? A considerable amount, both analytically and in policy terms. As with the technical change argument, the employment growth argument suggests that wage inequality is a 'natural' consequence of modernising the economy and that policy needs to focus on expanding access to skills and training (Pappas 2001; Keating 2003). In the short term, these policy responses are likely to worsen inequality, but in the long term they are expected to moderate it (Keating 2003: 392). By way of contrast, an emphasis on wage relativities—or changing wage structures in the terminology of this paper—points in a different direction, away from the 'natural' towards the political and the institutional and it gives credence to the argument that neoliberalism has increased inequality. As will be apparent shortly, this paper seeks to establish the extent to which changing wage structures have caused increased inequality in Australia.

It is important to appreciate that the 'employment growth' arguments have not been divorced from institutional analysis. In a seminal study, Bob Gregory found that large numbers of male jobs had disappeared from the middle of the wage distribution, and he partly attributed this to the large decline of manufacturing jobs which had taken place in the late 1970s and the 1980s. Many of these jobs had been located in the middle of the wage distribution; hence the 'hollowing out' of the middle (Gregory 1993: 68). But Gregory also observed that the dispersion in wages was occurring *within* and not *across* occupations. This suggested that the notion of a disappearing middle income group did not automatically equate to a hollowing out in the occupational structure. Rather there were declines in *both* middle and low paid occupations, but at the same time there had been growth in low paid

[2] Though the return to university degrees among women began to increase slightly in the early 1990s (Borland 1999: 186–188) and research by Coelli and Wilkins (2009) suggested that changes in the higher education system (particularly among teachers and nurses) have produced misleading results.

jobs.[3] Gregory suggested that workers who might ordinarily have been employed in jobs in the middle of the wage distribution—such as manufacturing jobs—would have moved into lower paying jobs, 'bumping off' the lower skilled workers from the wages ladder. This overall explanation for the disappearing middle, which emphasised the decline in manufacturing jobs, clearly fitted the deindustrialisation thesis. Moreover, it did not neatly translate into a polarisation of skill, occupation or education which some of the 'natural' employment growth arguments favoured.

Another group of researchers (King, Rimmer and Rimmer 1992) labelled this pattern the 'law of the shrinking middle' and offered an explicitly institutional analysis. They argued that the decline in manufacturing jobs and the rise in sales work had played a key role in the growth of inequality. They also emphasised a number of key institutional changes which had taken place during the 1980s and early 1990s and which were closely tied to neoliberalism and the struggle between workers and employers. In particular, they emphasised the 'managerial drive for flexibility' which had been facilitated by the Accord. In their analysis, this polarisation in wages was due to three forms of flexibility. 'Wage flexibility' led to declining wages among the more vulnerable sections of the workforce. Similarly, 'numerical flexibility' led to a growth in part-time work, outsourcing and the use of contractors and sub-contractors. Finally, 'functional flexibility', associated with the top of the labour market, was responsible for the growth in more highly paid and multi-skilled workers (King, Rimmer and Rimmer 1992: 410).

An institutional basis for wage inequality was also apparent in Jeff Borland's study on the links between falling union density and rising inequality. He found that the Accord had stabilised wages among union employees but that inequality had grown amongst the non-union workforce. In particular, certain groups who were outside the reach of the Accord were able to increase their wages beyond the guidelines set by the Accord. Borland concluded that the decline in union density between 1986 and 1994 accounted for about 30 per cent of the wages dispersion for male employees (Borland 1996: 245–246).

In this paper I explicitly pose the contrast between changes in the wage structure and changes in workforce characteristics. The former reflects many of the institutional changes associated with neoliberalism—particularly deregulation of the labour market—while the latter is more consistent with the 'natural' employment growth argument. If it can be shown that changes in the wage structure have been more important than changing workforce characteristics, then the case linking neoliberalism with inequality is a stronger one.

[3] Whether there had been an actual growth in low paid jobs was source of controversy during the 1990s. Part of this debate hinges on a methodological artifact: a situation where relative wages change more than employment numbers. For example, if there has been an absolute increase in high skill jobs and an absolute decline in low skill jobs—as most of the evidence suggests there has been—this can lead to a decline in the relative wages of the low skilled workers. As a result, more workers get caught up in the low pay definitional net, since the boundary for being low paid is pegged to median wages, and this cut-off is raised by the increase in high skilled jobs. If the median remains stagnant, as it did in the United States during the 1980s, then the results are not ambiguous. In Australia, however, median wages did increase during this period. How one accounts for inflation over time, and which techniques are used, both seem to influence the conclusions drawn. See, for example, the debate between Belchamber and Gregory concerning the correct way to deflate wages over time: (Belchamber 1996; Gregory 1996).

The growth in inequality: 1982 to 2010

A number of Australian researchers have examined wage inequality in Australia since the late 1970s. An early study by Norris (1977) found little evidence of growing inequality prior to the 1980s, but studies from the 1990s by Gregory (1993), King, Rimmer and Rimmer (1992) and McGuire (1993) found that the situation had changed during the 1980s. By the late 1990s a trend towards increased wage inequality was well established in research by Borland (1999) and Norris and McLean (1999), and the period after 2000 saw further evidence emerging (Pappas 2001; Keating 2003; Wilkins 2013). My overview of wage inequality is largely consistent with the broad findings in this literature. The differences which emerge are in terms of analysis and interpretation.

I now outline the broad patterns of inequality, using data from the various Income Distribution Surveys conducted by the Australian Bureau of Statistics (ABS) since the early 1980s. I then introduce the tools for my analysis, quantile regression and the decomposition of wage densities, and then present the findings for the period 1982 to 1996 and 1996 to 2010, a division which reflects an important watershed in this 28 year period.[4] I conclude the paper with a discussion of the links between neoliberalism and wage inequality.

The ABS Income Distribution Survey (IDS) has had a number of different names over time but has been conducted regularly every few years and with enough consistency to allow for the construction of a useful time series dataset.[5] The population is adult full-time employees—with the exception of one set of graphs which include part-timers—and I use the terms 'employee' and 'worker' interchangeably throughout this paper. It is important to keep in mind that these ABS data are cross-sectional, not longitudinal. We are not following the same group of workers over time, even though the mode of expression in what follows sometimes makes it sound like we are tracking a cohort of workers. Throughout this paper the perspective is one based on *locations* within the wage structure, not particular individuals (for the importance of wage structures, as opposed to individuals, see Galbraith (1998) and Watson (2005)).

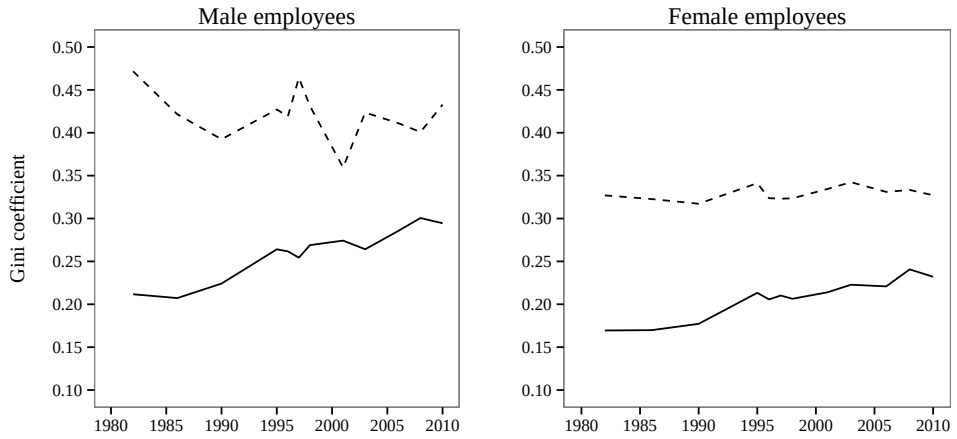
What trajectory has wage inequality followed over the last three decades? One classic measure of inequality is the Gini coefficient which is shown in Figure 1 for both male and female employees for the period from 1982 to 2010. It is clear that wage inequality grew strongly among full-time employees during this period, with inequality greater among men than women and also growing faster. Despite some volatility, the long-term trend amongst the part-time workforce appears static,

[4] The analysis in this paper was carried out using the R statistical language (R Core Team 2013). The quantile regressions made use of Roger Koenker's `quantreg` package (Koenker 2013) and the kernel density plots were produced using the `ggplot2` package (Wickham 2009).

[5] These data, and the data which follow throughout this paper, come from the author's calculations using the unit record files of the ABS *Income Distribution Survey* (IDS). They cover the period from 1982 to 2010 (and the name of the survey changes slightly in some years). As well as the IDS, other studies of wage inequality use the ABS *Labour Force Survey* (LFS) or the ABS *Employee Earnings and Hours* survey (EEH). While the precise magnitude of the results depend on the data source, the overall conclusions about the extent of inequality do not appear to depend on the choice of data source, according to some authors (for example Borland 1999: 181).

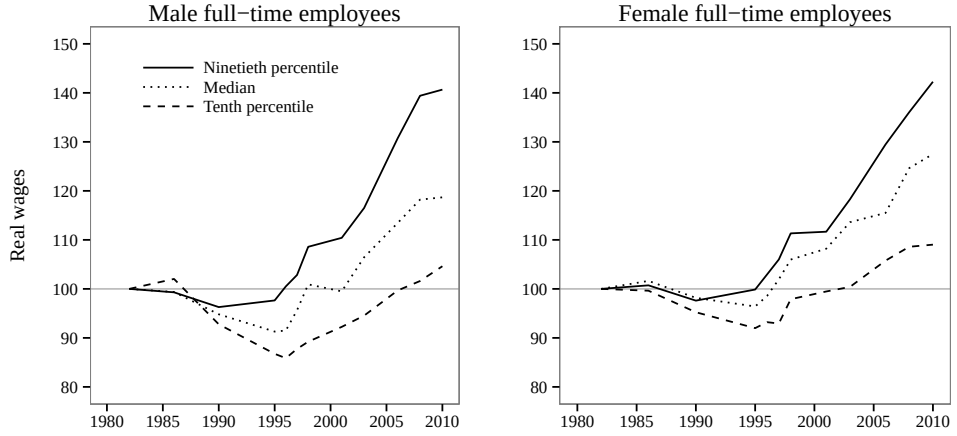
though the levels of inequality are much higher than for the full-time workforce. A study by Borland and Kennedy (1998b) concluded that the changes in wage inequality for part-time employees were similar to those for full-time employees, but a more recent study (Greenville, Pobke and Rogers 2013) suggested the growth over time had been relatively stable. Clearly, in the case of male part-time employees, the choice of starting point and end point imply different conclusions about the long-term trend. Another common inequality measure—the Theil index—tells the same story as the Gini.

Figure 1 Gini coefficients



Note: The Gini coefficient for weekly wages for full-time adult employees (solid line) and for the hourly rate of pay for part-time adult employees (dashed line). *Source:* Based on data from ABS IDS 1982 to 2010.

Figure 2 Real wages and inequality



Note: Weekly wages for full-time adult employees. Note that wages are adjusted by the CPI and then indexed to a common starting point of 100 for 1982. *Source:* Based on data from ABS IDS 1982 to 2010.

In terms of inequality, Figure 2 shows a large dispersion in real wages (CPI adjusted) from the early 1990s onwards, evident in the diverging lines. Particularly after 2000, the dispersion grew very strongly, such that by 2010 employees in the ninetieth percentile had experienced wages growth, in real terms, of more than 40 per cent since the early 1980s. On the other hand, those on median wages had experienced about 15 per cent growth (men) and 25 per cent growth (women). Finally,

those at the tenth percentile had gained just 5 per cent (men) and 8 per cent (women) during that 28 year period.

Percentile locations provide a useful schema for dividing the labour market into 'those at the top', 'those in the middle' and 'those at the bottom'. This allows one to examine how both inequality and real wages changed over time. Figure 2 suggests that nearly all employees experienced declining real wages for most of the 1980s and early 1990s. This reflected both a policy of wage restraint (the Prices and Incomes Accord) and a subsequent recessionary period during the early 1990s. For both men and women at the top of the labour market, this decline in real wages ended in 1995 and the period since has been one of strong wages growth. For those in the middle, the wait was slightly longer. Among women, their real wages had returned to the level of the early 1980s by about 1996 and among men they had revived by 1998. Meanwhile, the wages of workers at the bottom of the labour market stagnated. In the case of men, real wages had fallen so far—by as much as 15 per cent—that it took until 2006 for them to reach the level of the early 1980s. For women, the fall had not been as great—about 8 per cent—and they returned to their earlier level by about 2004.

The changes since 1996 are quite remarkable for such a relatively short period of time and raise questions about data integrity. Roger Wilkins (2013) argues that changes in the data collection methods, definitions and concepts of the ABS income surveys make their direct comparability over time problematic, and he suggests that the sharp rise in inequality after 2005 lacks credibility. His main criticisms attach to the annual income data, rather than the weekly wages data, which is the basis for the analysis in this paper. To test this concern, a comparable dataset based on the Household, Income and Labour Dynamics in Australia (HILDA) survey was analysed for the period 2001 to 2010. The results of this comparison did indeed confirm Wilkins' concerns. While the comparison between the IDS and HILDA data were very close for female full-time employees, among the male full-time workforce the extent of inequality was greater in the IDS data. This showed up in comparisons using the Gini coefficient, as well as in the trajectory of real wages at the 90th percentile, and to some extent, at the median. The story at the bottom of the labour market, at the 10th percentile, showed little difference. Do these data concerns have implications for the analysis in this paper? It would seem the answer is no. When the IDS data for 2010 is replaced by the HILDA data for 2010, the wage distributions for both men and women remain almost identical. Similarly, the decomposition results (to be discussed later) are almost identical in magnitude and the substantive arguments of this paper are strengthened, rather than weakened, by the use of the HILDA data.[6]

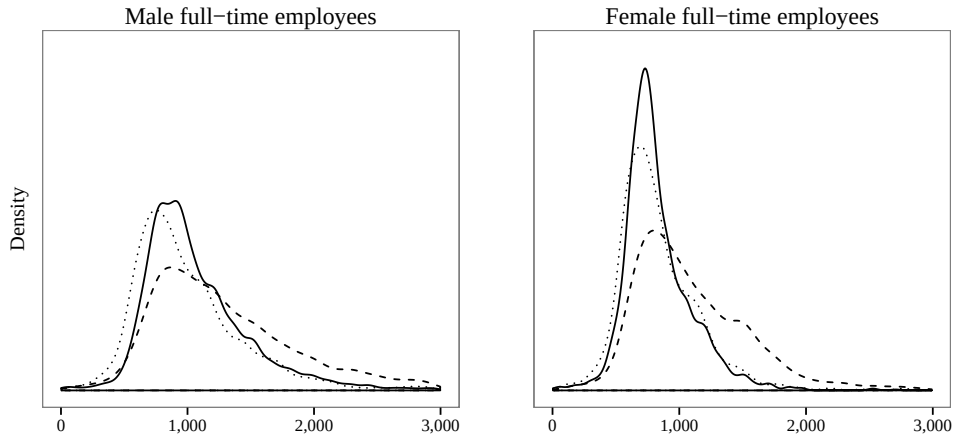
[6] The decomposition proportions for men in Table 2 are very close, and those for women, in Table 3, are even more strongly in favour of the coefficients. The visual differences between density plots from the IDS and the HILDA data are imperceptible. The results are not shown here, but are available from the author. This analysis made use of the unit record data from the HILDA Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). The findings and views based on this analysis are those of the author and should not be attributed to either FaHCSIA or the MIAESR.

Concerns about data integrity have greater implications for developments at the top of the labour market, particularly among men. The parlous situation at the bottom of the labour market, on the other hand, appears incontestable. It is worth reflecting for a moment on just how profound is this three-decade trend of static wages at the bottom of the labour market. In reviewing a similar trend among low wage youth in the United States, Juhn, Murphy and Pierce (1993: 421) observed that there had been 'no increase in economic opportunity as measured by weekly wage rates in about two and one-half decades'. In other words, from the 1980s onwards the US labour market had not functioned as a source of 'shared prosperity' (Palley 2012), but rather had become a motor of inequality. It would seem that the same metaphor applies just as much to the Australian labour market.

The extent to which this story of wage stagnation at the bottom of the labour market has influenced standards of living depends on broader measures of well-being, particularly household income and housing affordability. These in turn hinge on questions of taxation, government welfare transfers, household composition, provision of public housing and the state of the rental market. All are beyond the scope of this paper, though a number of studies have explicitly pursued these themes. Writing during the 1990s Harding and Landt (1992) and Harding (1997) argued that despite substantial increases in market-based income inequality, these were largely offset by the tax system and government welfare payments. For example, in the period between 1983 and 1991, 'the incomes of the vast majority of social security recipients, after taking account of inflation, increased sharply' (Harding and Landt 1992: 44).

Returning to the issue of wage inequality, the core concern of this paper, it is clear that the picture presented so far has been based on summary measures, all of which are sensitive to different parts of the wage distribution (see, for example, Jenkins and Kerm 2009). Fortunately, it is possible to examine the distribution *as a whole*, and see how that changed over time. In Figure 3 the distribution of wages is shown for the three keys years: 1982 (solid line), 1996 (dotted line) and 2010 (dashed line). The graphs are kernel densities, a useful device for illustrating inequality and the basis for the decomposition methods used in this paper. In these graphs, steeper, narrower curves indicates less inequality while flatter, wider ones indicates more inequality. A direct comparison between male and female full-time employees shows quite starkly the much greater level of inequality among the former, though over time this difference weakened. Looking just at the male weekly wage in the first panel shows that inequality changed slightly between 1982 and 1996. The most distinctive change was that the distribution moved backwards in dollar terms, largely due to the wage restraint of the Accord and the impact of the recession of the early 1990s. This had a more severe impact at the bottom of the labour market—as we saw earlier—and this is evident in the bulge at the far left of the distribution. In the case of women, shown in the second panel, the overall pattern was the same, but less pronounced. The more dramatic changes occurred in the second period, from 1996 to 2010. The shape of the distribution altered radically becoming far more unequal. There was an upward movement in wages overall—again, something we saw earlier—but for those at the bottom of the distribution the improvement was trivial. Indeed, among men the very lowest paid appeared to still be behind their location in 1982. The emergence of large pockets of high wage individuals in the upper parts of the distribution was particularly notable in this period.

Figure 3 Distribution of real weekly wages 1982, 1996 and 2010



Note: Kernel density graphs for the weekly wages of full-time employees for 1982 (solid), 1996 (dotted) and 2010 (dashed). Wages are truncated at $3000 per week for readability (and have no effect on the remainder of the distribution). The data are converted to constant dollars using the CPI, with 2010 as the base year. Note that the y-axis scale for both males and females is the same, thereby allowing direct comparison.*Source:* Based on data from ABS IDS 1982, 1996 and 2010.

What emerges clearly from these ABS data is that the 1990s were a watershed for the growth of wage inequality in Australia. Prior to that decade the growth in inequality was subdued, but the recession of the early 1990s gave inequality a boost, and it continued to accelerate throughout the rest of the decade before 'exploding' during the 2000s. These changes were largely driven by high wage increases at the top of the labour market alongside stagnation at the bottom. International research suggests that recessions make inequality worse (Jenkins, Brandolini, Micklewright and Nolan 2013), and that would seem to have been the story in Australia during the early 1990s. During the remainder of that decade the labour market moved relentlessly away from centralised wage fixing to decentralised enterprise-based bargaining, and the period after 1996 was accompanied by increased labour market deregulation under the auspices of the Howard conservative government, with the period between 2005 and 2007 accompanied by almost unfettered 'free market' labour market policies in the form of *Work Choices*. While this chronology helps locate the changing profile of wage inequality within the neoliberal time frame, we also need a deeper analysis of the ways in which the neoliberal project influenced wage outcomes in Australia. These wage data are necessarily observational in character, so causal associations must remain inconclusive (Rosenbaum 2002). It is possible, however, to move beyond descriptive analogies and by constructing counterfactual decompositions of the wage distribution advance our understanding of these links.

Analysing wage inequality

Decomposition using quantile regression

Most of the analysis of wage inequality over the last 30 years has made use of linear regression modelling, but in recent years quantile regression has become increasingly important. Roger Koenker, one of the pioneers of the adoption of quantile regression methods over the last two decades, has argued elegantly:

> Much of the early history of social statistics … can be viewed as the a search for the "average man"—that improbable man without qualities who could be comfortable with his feet in the ice chest and his hands in the oven … [But] There have been many prominent statistical voices who … reveled in the heterogeneity of statistical life … [quantile regression provides] a deeper view into the data … Conditioning covariates may well shift the location, the central tendency, of the distribution of the response variable, but they may also alter its scale or change its entire shape (Koenker 2005: 293)

It is instructive that much of the analysis of inequality over the last thirty years has been fixated on averages. Several studies have argued that *average* pay relativities for 'skill' or occupation, for example, have not changed in Australia over this period, and thus the driving force for inequality must be be found in the changing characteristics of the workforce, particularly the large increase in more highly 'skilled' workers. Similarly, a number of analyses have confirmed that the returns on tertiary education have not changed over the last thirty years—in stark comparison to the situation in the United States—but again these studies have generally relied on *averages*, that is, the conditional mean results from linear regression models.

Early attempts to analyse wage inequality which moved beyond a focus on averages included pioneering research by DiNardo, Fortin and Lemieux (1996), who used semiparametric kernel density estimation methods. Advances in the methodology of quantile regression (Koenker 2005; Buchinsky 1998) have seen this approach extended in recent years to the analysis of wage inequality, with a number of useful semiparametric studies by Gardeazabal and Ugidos (2005), Machado and Mata (2005) and Melly (2005). In this paper I follow the broad approach of Machado and Mata (2005) who analysed wage inequality in Portugal for the period 1986 to 1995. I implement my wage densities in a different fashion but I follow their mode of presentation. Drawing on Koenker's work Machado and Mata (2005: 447) showed how one could model wages using quantile regression and thereby provide 'a full characterization of the conditional distribution of wages in much the same way as ordinary sample quantiles characterize a marginal distribution'. What's more the quantile regression coefficients could be interpreted as rates of return of various worker characteristics at different points in the conditional wage distribution. As a result, this approach provides an ideal vehicle for exploring changing wage inequality over time.

Data and method

The analysis which follows makes use of the same datasets used earlier, that is the ABS *Income Distribution Surveys*, and the populations are also the same, that is, male and female full-time adult employees. The dependent variable in the quantile regressions is the log of real weekly wages (adjusted using the CPI). The regressors are age, age squared, tertiary education, industry, occupation and state dummies. These last three sets of dummy variables are coded using deviation coding, which means that the coefficients can be interpreted as deviations from the group mean, rather than with respect to the omitted category. Major changes in occupational coding systems over this period (CCLO to ASCO to ANZSCO) make consistency a formidable challenge, but reducing the categories to a smaller subset partly overcomes this problem. Grappling with changes within major groups (such as professionals) remains problematic. Similarly, industry has been made consistent by collapsing some divisions, though fortunately the conceptual basis of industry classification has changed only moderately over the years. One hybrid required for this analysis was 'human services', a combination of education, health and community services. Another omnibus was 'finance etc', shorthand for finance and insurance, property and business services.

Table 1 Descriptive statistics, full-time employees

	Male			Female		
	1982	1996	2010	1982	1996	2010
Age (years)	37.7	38.7	40.6	33.8	37.4	39.1
Tertiary education (%)	9.9	18.0	27.9	9.8	21.9	38.4
Occupation (%)						
Managers	10.1	12.5	17.2	2.7	6.1	14.0
Professionals	11.5	17.0	22.0	23.2	19.8	33.0
Technicians & trade workers	34.7	25.8	22.5	11.4	10.8	3.8
Clerical, sales and service workers	18.8	17.6	17.0	57.3	50.3	41.6
Labourers & machinery ops & drivers	24.8	27.2	21.3	5.4	13.1	7.6
Industry (%)						
Agriculture etc	2.4	2.4	2.0	0.7	0.7	0.7
Mining	2.9	1.9	3.4	0.4	0.6	1.0
Manufacturing	26.4	23.9	16.3	18.3	12.1	7.7
Utilities	4.6	1.8	2.3	0.5	0.9	0.7
Construction	7.0	8.1	11.6	1.2	1.8	1.7
Wholesale & retail	14.5	17.5	13.1	16.0	15.2	12.7
Transport	8.5	6.4	7.3	2.5	2.5	2.7
Communication	3.7	3.7	2.4	2.4	1.5	2.3
Finance & business services	7.1	12.2	15.4	11.6	17.2	19.7
Government	8.6	7.1	8.7	7.1	8.0	11.7
Education, health & community	11.4	8.0	9.4	34.0	29.1	30.5
Recreation, accomm, other serv	2.9	6.9	8.1	5.4	10.5	8.5

Notes: Data weighted by population weights. *Source:* ABS IDS 1982, 1996 and 2010. *Population:* Full-time employees.

The changing composition of full-time employees is shown in Table 1. The average age of men and women was much greater in 2010. For men, there had been a three-fold increase in the proportion with tertiary qualifications since 1982. Among women, the increase had been four-fold. Professional and managerial occupations had increased significantly while the proportions of technicians and trades workers had declined considerably.

Several industry changes were particularly notable. The share held by manufacturing among men dropped from 26 per cent in 1982 to 16 per cent in 2010, with most of that reduction occurring in the later half of the period. Among women, the decline was from 18 per cent to 8 per cent. By way of contrast, finance, insurance, property and business services more than doubled among men between 1982 and 2010 (from 7 per cent to 15 per cent), with more of that change occurring in the first half of the period. For women the increase was from 12 to 20 per cent, again predominantly in the first half of the period.

Turning now to methodology, it is important to stress that the difference between quantile regression (QR) and linear regression is that one focusses on conditional wage *distributions*, rather than conditional *means*. Consequently, model fitting is usually applied using a vector of quantiles, for example, various deciles or percentiles. As with the Blinder-Oaxaca approach to decompositions of the gender or racial wages gap, the core insight is that model coefficients can be interpreted as the effects of the wage structure (prices, or returns on characteristics) while the sample covariates can be interpreted as the effects of the workforce characteristics (quantities, or 'endowments'). This tradition also makes use of a kind of 'counterfactual by substitution' strategy, in which the substitution of one component in the decomposition by its opposite (for example, 'combining' male characteristics with female returns) allows one to assess the effect of each component on the size of the wages gap (see, for example, Blinder 1973; Oaxaca 1973; Watson 2010). This approach to the construction of the counterfactual is also the basis for the methodology in this paper, though the implementation is obviously different.

In the following exposition I make use of the terminology and presentation used by Machado and Mata (2005: 447:450) who show that the conditional wage quantiles of the distribution can be modelled by:

$$Q_\theta(w|z) = z\prime\beta(\theta) \tag{1}$$

where $Q_\theta(w|z)$ for $\theta \in (0,1)$ is the θth quantile of the log wage (w) conditional on a vector of covariates (z) while $\beta(\theta)$ is the vector of QR coefficients. These can be estimated by minimizing in β

$$n^{-1}\sum_{i=1}^{n}\rho_\theta(w_i - z_i\prime\beta)$$

with

$$\rho_\theta(u) = \begin{cases} \theta u & \text{for} \quad u \geq 0 \\ (\theta-1)u & \text{for} \quad u < 0 \end{cases}$$

The marginal density function of the wage distribution is constructed as follows. Let $W(t)$ stand for the QR coefficients for period t and $Z(t)$ stand for the sample covariates for period t. To construct the density 'implied by the model' the same t is used for both terms in the conditional wage function:

$$W^*(t) \equiv Z^*(t)\prime\hat{\beta}^t \tag{2}$$

To construct the counterfactual density, one alternates the period, t. Thus, if $f^*(W(0); Z(0))$ is the density implied by the model in the first period, then $f^*(W(0); Z(1))$ is the counterfactual for that period. Similarly, if $f^*(W(1); Z(1))$ is the density implied by the model in the second period, then $f^*(W(1); Z(0))$ is the counterfactual. For example, one can analyse the change in wage densities between 1982 and 1996 by comparing $f^*(W(1); Z(0))$ with $f^*(W(0); Z(0))$, which basically asks how the wage structure in 1996 applied to the workforce characteristics in 1982 changes the shape of the wages density. At the same time, a comparison of $f^*(W(1); Z(1))$ with $f^*(W(1); Z(0))$ provides an estimate of the contribution of the changes in the workforce to the changes in density. The top row in Figure 6 illustrates these two comparisons.[7]

As well as a visual inspection of the wages density it is also useful to construct various summary measures (see Tables 2 and 3). If $\alpha(\cdot)$ is such a measure (for example, a particular percentile) and $fW(t)$ is the *observed* wage density in period t, then the decomposition for changes in α is:

$$\begin{aligned} \alpha(f(W(1))) - \alpha(f(W(0))) = & + \underbrace{\alpha(f^*(W(1); Z(0)) - \alpha(f^*(W(0); Z(0)))}_{\text{coefficients}} \\ & + \underbrace{\alpha(f(W(1); Z(1)) - \alpha(f^*(W(1); Z(0)))}_{\text{covariates}} \\ & + \text{residual} \end{aligned} \tag{3}$$

As equation 3 shows, the $\alpha(f^*(W(1); Z(0))$ terms cancel out, leaving only the 'model implied' densities. This demonstrates that the only difference between the LHS and RHS of this equation is the residual, that is, the part not accounted for by the modelling.

Quantile regression results

Before looking at the decomposition results, I examine plots (Figures 4 and 5) of some of the key regressors for the quantile regression. These are shown as coefficient values (on the y-axis) plotted against the percentile (on the x-axis), and with grey dashed horizontal lines included to indicate an equivalent linear regression coefficient (which uses the same specification as the QR). Some plots also show grey solid horizontal lines at 0 for reference purposes. When there is a large difference between the quantile regression plots and the dashed horizontal line, it alerts us to the fact that the linear regression modelling is a poor representation of the heterogeneity in the population. Where the two plots coincide, this suggests that the linear regression results are comparable. It is worth keeping in mind that the use of deviation coding in the regression models makes all these coefficients a comparison with the group mean, not with the omitted category. Finally, for ease of expression I discuss the coefficients as percentage changes—since the wages are on the natural logarithmic scale—though a more precise figure for categorical variables can be calculated with the formula: $100(e^{\beta} - 1)$.

[7] One can also reverse this process to test for the robustness of the decomposition since the results can be sensitive to the order of the decomposition. I discuss this issue further in the results section.

Figure 4 Male quantile regression coefficents, 1982, 1996 and 2010

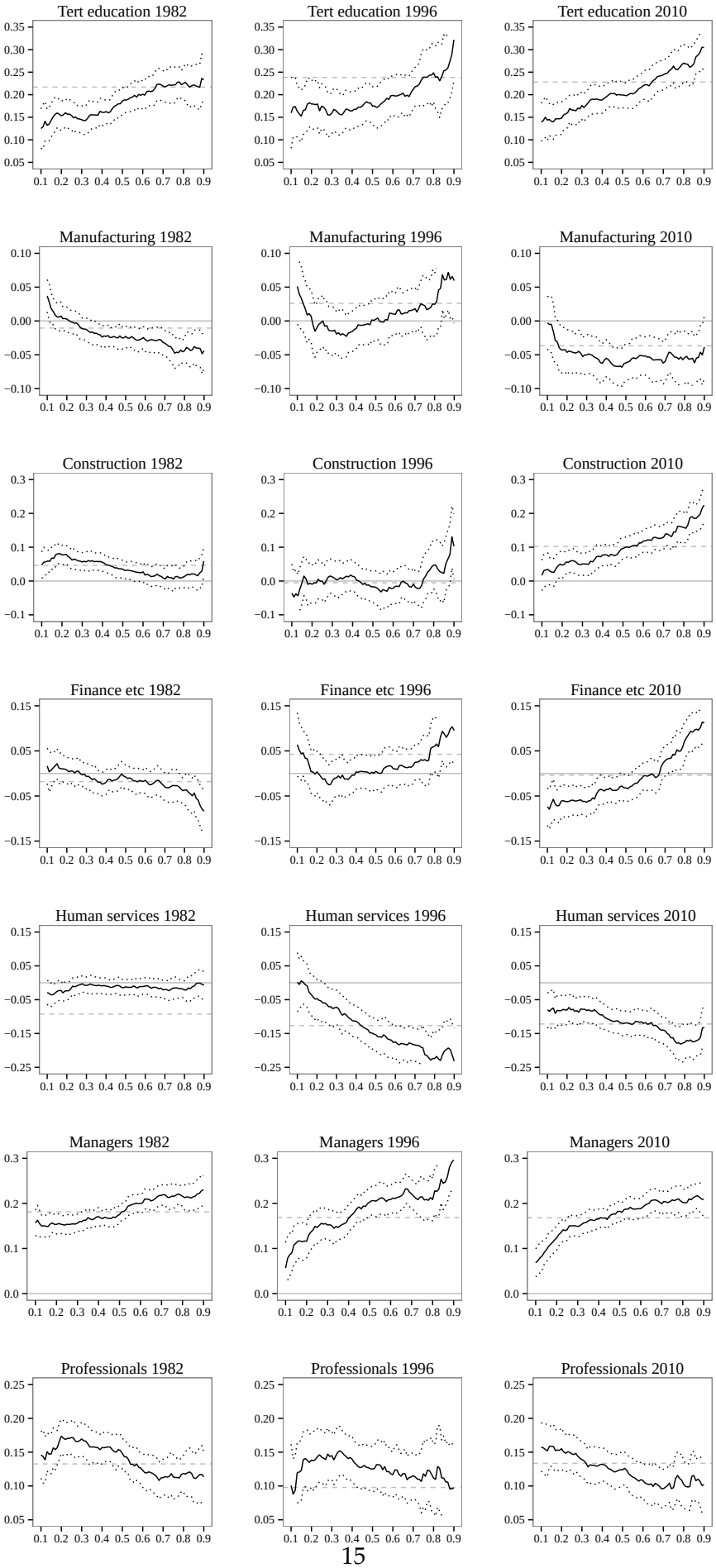
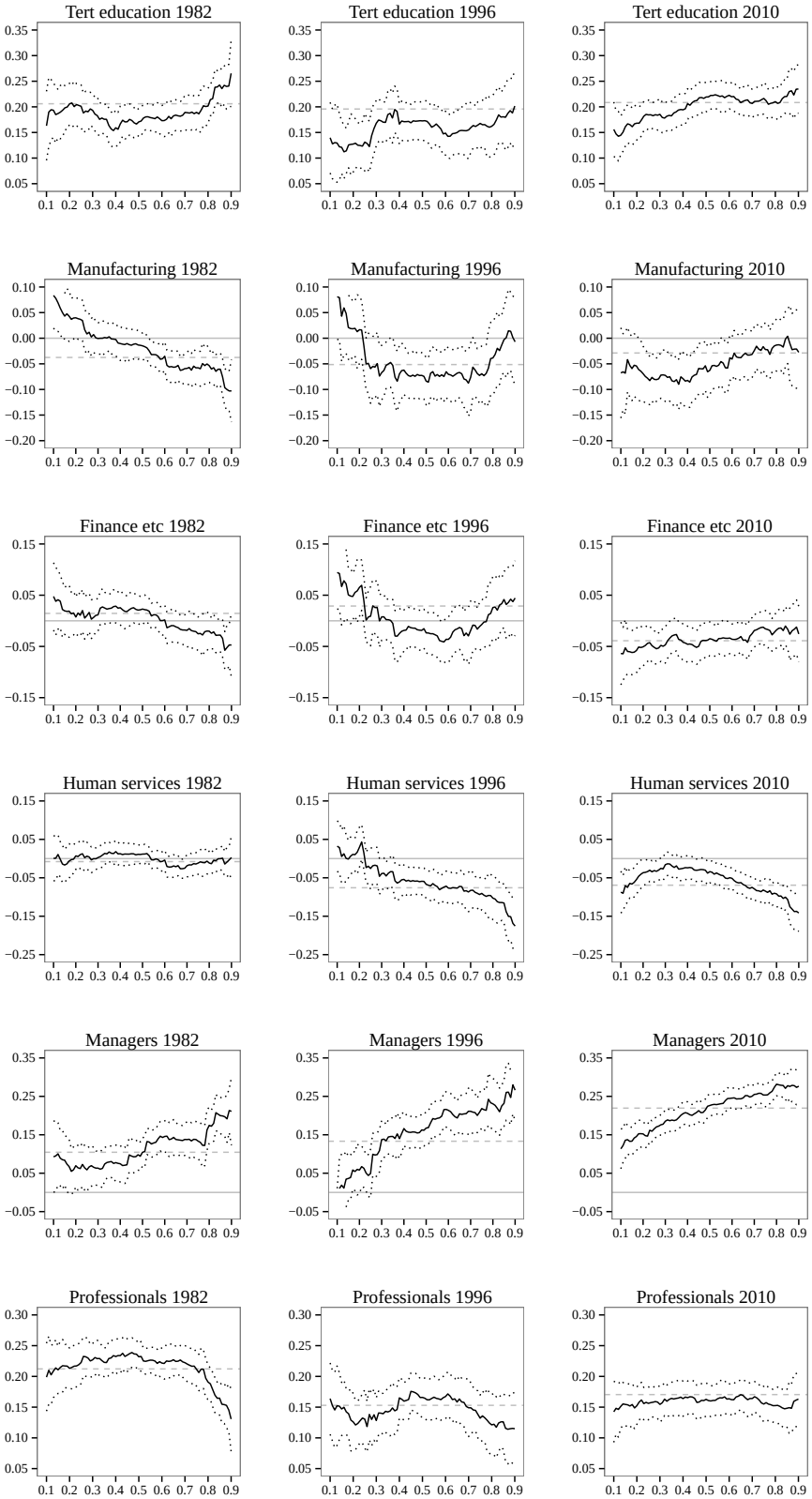


Figure 5 Female quantile regression coefficents, 1982, 1996 and 2010



These plots provide many insights into the factors driving inequality. Whether the end result is more or less inequality clearly hinges on the combination of these factors, their changes over time, and the changing composition of the workforce. The decomposition addresses this complex mix, but to appreciate the net effect of these factors, the coefficient plots are ideal. The link with inequality is as follows. The slope of the quantile regression line shows the effect of particular aspects of the wage structure—such as particular industries—on the wage distribution. Where the regression line is flat, the effect is largely neutral. If it slopes upwards to the right, it is *inequality-inducing*; if it slopes upwards to the left, it is *inequality-suppressing*.[8]

Looking first at male employees, it is clear that tertiary education was inequality-inducing, and this relationship strengthened over the period, particularly at the top of the distribution. In 1982, for example, the size of the tertiary education premium was about 15 per cent for the bottom half of the distribution, and this rose to about 22 per cent in the top three deciles. By contrast, in both 1996 and 2010, the bottom quintile was still stuck on about a 15 per cent premium, but the top quintile was experiencing premiums of between 25 and 30 per cent. In other words, for low wage workers, the modest gains from tertiary education had not changed over nearly 30 years, whilst among the high wage workforce, tertiary education was not only paying considerably more, but was increasingly doing so. These results contradict the conventional wisdom that the earnings premium for tertiary education in Australia has not changed—or has declined—over time.

While a full set of industry dummies were included in the models I comment mainly on those where the changes are most relevant to the later discussion. Looking first at manufacturing there has been an overall decline in the return—something also evident in the linear regression modelling—and a small boost given to inequality. Whereas in 1982 the bottom quintile of workers earned a small premium by working in manufacturing—something sustained during the mid 1990s—by 2010 this was gone. Another notable change in the period between 1996 and 2010 was the loss of the premium for manufacturing workers in the higher deciles. This premium had emerged in the 1990s but was gone by 2010. By 2010 manufacturing for men was a low wage industry across the board.

Construction and the finance omnibus provide two of the most dramatic pictures for this period. In 1982 these industries were actually inequality-suppressing, with the low paid workforce benefiting by working there and higher paid workers at a considerable relative disadvantage. By 2010 this picture had reversed and both these industries were decisively inequality-inducing. In the case of construction, workers in the bottom two quintiles had either gone backwards or stagnated, while workers in the top quintile had gone from average wages to a premium of between 15 and 20 per cent. In the case of finance etc, workers in the bottom two quintiles had gone from a premium of around 2 per cent to a penalty of 7 per cent. Mean-

[8] The full set of QR regressors are shown in appendix Table 4, where slopes for these QR coefficients have been calculated to provide a simple, albeit crude, summary of the overall effect of each regressor. These slopes have been constructed by regressing the QR coefficients against the tau values. Where these slopes are positive, this implies an *inequality-inducing* effect, where they are negative, this implies an *inequality-suppressing* effect.

while, workers in the top two quintiles had gone from a penalty of between 4 to 8 per cent to a premium of between 6 and 12 per cent. (A reminder that this language of 'workers moving' is really about changes in returns attached to *locations* in the wage structure.)

Human services stands out. On the one hand, workers in this industry lost out over time as they moved from being an industry that paid close to average wages to one that paid considerably below. These changes were, however, inequality-suppressing, particularly during the mid 1990s. While the situation worsened for the low paid workforce in this industry, it deteriorated more for the high paid workforce. By 2010 workers in the top quintile were losing out by as much as 15 per cent compared to their peers in other industries.

Occupation needs to be treated with caution because of the difficulties in achieving data consistency over time. The results for managers suggest a strong growth in a low-wage managerial sector—no doubt due to the proliferation of 'managerial' jobs in fast food and in other retail and hospitality areas. Interestingly, there was a strong boost in the top end of the managerial distribution during the mid 1990s, but this had evaporated by 2010. In the case of professionals, the changes were largely inequality-suppressing, except at the bottom of the distribution in the earlier period. There appears to have been little in the way of a large boost in premiums for higher paid professionals over time—something which goes against conventional wisdom—though the changes in the job composition of this occupational category warrant caution about drawing firm conclusions from these findings.

In the case of female employees, there are parallels as well as differences. Among the low paid workforce the premium for tertiary education declined while among middle wage earners it improved. In stark contrast to the men, among female high wage earners the premium actually declined. The impact on the growth in inequality overall was therefore somewhat ambiguous though its impact at the bottom of the labour market appears to have been negative.

In 1982 manufacturing provided low wage female employees with a reasonable premium—around 5 to 10 per cent—and this was sustained into the mid 1990s. However, by 2010 this had evaporated. Among middle wage earners in 1982 the industry paid average wages and among high wage earners it paid below average, as much as 5 to 10 per cent less. By 2010 the situation for middle wage earners had not changed much, but among higher wage earners manufacturing now paid closer to average wages. The net effect of these changes was to make manufacturing strongly inequality-inducing.

As with their male counterparts, wages for female employees in finance etc also moved from being inequality-suppressing to inequality-inducing but the changes were milder. As with the men, women in the bottom quintiles lost their modest premium, but unlike the men, women in the top quintiles did not benefit. Indeed, the profile of this industry by 2010 was virtually flat, with a small negative return attached to working here.If the finance sector had become the V8 motor for wage inequality among men, among women it was more like a bicycle.

Human services closely paralleled the male picture. This industry become more inequality-suppressing over time, largely at the expense of the high wage workforce. Unlike the situation with male employees, female employees in the bottom

quintile went considerably backwards, such that inequality actually grew at the bottom.

The managerial workforce among women became notably less equal during the mid 1990s. By 2010 this had moderated, largely as a result of improvements at the bottom of the distribution and a flattening at the top. This occupation remained, however, inequality-inducing. Among professionals there was a considerable deterioration in their earnings premium—by as much as 5 per cent—and this had a larger impact on women in the bottom three quartiles. In 1982 professionals had been in an occupation which was actually inequality-suppressing but by 2010 it was largely neutral.

Looking at these findings in general terms, it seems likely that some of these changes cancelled out others. While industries like finance etc and construction became strong promoters of inequality, other industries like mining and human services put the brakes on the growth of inequality. At the same time, the composition of the workforce was changing: particularly the growth in tertiary educated workers and the decline in the manufacturing workforce. In order to gauge the overall effect on inequality of these countervailing changes in the wage structure, as well as the considerable changes in the workforce composition, it is necessary to undertake a decomposition of the wage densities.

By way of concluding this section, it is salutary to observe just how striking are the differences between many of the QR coefficients and the linear regression coefficients and how much they inform this story of inequality. A simple comparison of the linear regression coefficients would suggest much greater stability over time: concealing more often than revealing. And yet linear regression models have been the mainstay of most labour market analysis over the last half century. Koenker is surely right to insist on the value of the 'deeper view' which quantile regression offers.

Decomposition results 1982, 1996 and 2010

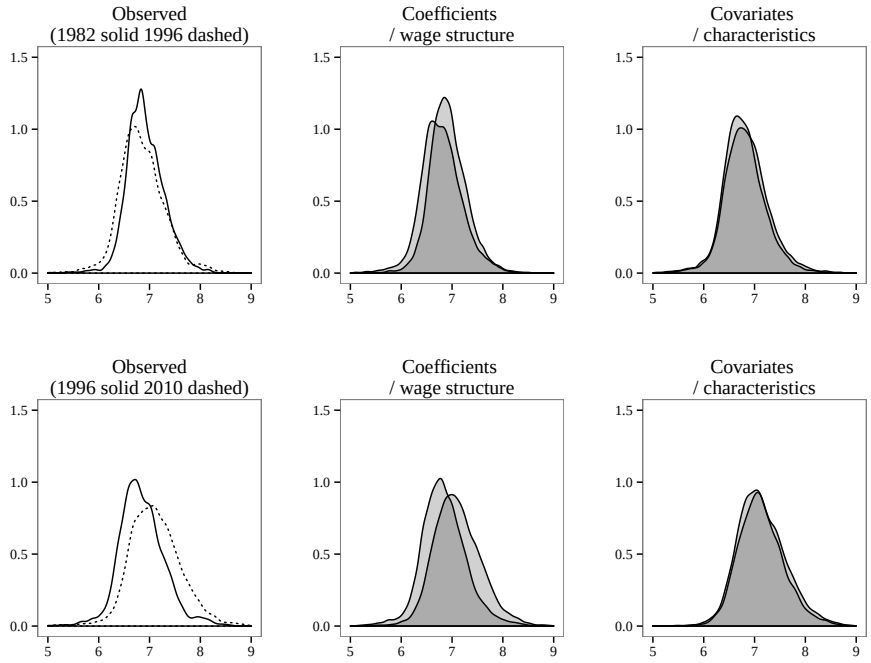
As outlined earlier, the difference between two observed wage densities can be decomposed into a component attributable to the model coefficients, that is, the wage structure, a component attributable to the sample covariates, that is, the workforce characteristics, and a residual. The latter is often interpreted as the 'return on unobservables' and has been an important part of the interpretation given to increased wage inequality (see, for example, Juhn, Murphy and Pierce 1993; Borland 1999). Figures 6 and 7 show this decomposition in a visual way (with the panel numbering which I refer to below moving left to right in each row). Tables 2 and 3 show the same information as summary measures. In the figures, these components can be visualised as comparisons between the density implied by the QR model, and the density implied by the counterfactual. Because the area under a density curve always equals 1, any change in the density over time (for example, the observed changes between 1982 and 1996 in panel 1) will show up as a 'displacement' in the area under the curve. This means that the areas of displacement (shown as lighter shading in panels 2 and 3) will equal the area of displacement for those changes (ignoring, for the moment, the residual). Consequently, one can visually compare panel 2 (the coefficients or wage structure) with panel 3 (the covariates or work-

force characteristics) and assess the relative importance of each component. The component with the larger area of lighter shading will have contributed more to the change in observed densities. This visual assessment can be augmented by examining the summary measures in Tables 2 and 3, where the proportions contributed by each component should correspond with the shaded areas in the figures. As will be evident from those tables, the residual is generally very small, and so can safely be ignored in most cases of visual comparison.[9] This can be supplemented by summary measures of the decomposition which quantify the size of the effect at different percentiles in the distributions (see Tables 2 and 3).

The difference in the observed densities of wages for male employees between 1982 and 1996 (Figure 6) shows an increase in inequality, largely driven by a reduction in real wages across the bottom of the labour market, and an increase in real wages at the very top (panel 1). These changes were overwhelmingly driven by changes in the wage structure, which consistently pushed wages backwards (panel 2). The changes in workforce characteristics, which were minor, were confined to the middle and top of the labour market. Only at the very top of the labour market did changes in workforce characteristics match changes in the wage structure (see the first panel of Table 2). In the second period, 1996 to 2010, inequality among male employees increased substantially, and again this was driven predominantly by the wage structure (Figure 6, panel 5, that is, middle panel, second row). This time, the changes in the wage structure drove wages forwards, but more at the top of the labour market than in the middle or the bottom. Again, workforce characteristics (panel 6) played only a minor role. This visual inspection is confirmed in the second panel of Table 2.

[9] These results can be influenced by the order of the decomposition (see Machado and Mata 2005: 450), so the analysis reported here was repeated in the reverse order. The results were essentially the same, or even more strongly in favour of the analysis provided here.

Figure 6 Conditional wage densities, male employees, 1982, 1996 and 2010



The lighter shaded areas reflect the part contributed by the component shown by the title. The x-axis shows the log weekly wage and the y-axis shows the densities.

Table 2 Decomposition of wage densities, male employees, sub-periods 1982 to 1996 and 1996 to 2010

	Log wages						Proportions		
				Decomposed into:			Decomposed into:		
Percentile			Change	Coef	Cov	Res	Coef	Cov	Res
	1982	*1996*							
10th	6.506	6.354	-0.152	-0.162	0.020	-0.010	1.064	-0.130	0.066
25th	6.673	6.577	-0.096	-0.142	0.027	0.019	1.479	-0.278	-0.201
50th	6.881	6.804	-0.077	-0.111	0.042	-0.007	1.451	-0.545	0.094
75th	7.138	7.107	-0.031	-0.091	0.057	0.002	2.926	-1.846	-0.080
90th	7.394	7.410	0.016	-0.064	0.066	0.014	-4.040	4.165	0.875
	1996	*2010*							
10th	6.354	6.551	0.198	0.169	0.016	0.012	0.855	0.083	0.063
25th	6.577	6.774	0.197	0.190	0.036	-0.029	0.965	0.184	-0.150
50th	6.804	7.090	0.286	0.215	0.054	0.017	0.753	0.190	0.058
75th	7.107	7.420	0.313	0.249	0.061	0.002	0.796	0.196	0.007
90th	7.410	7.753	0.344	0.280	0.074	-0.010	0.815	0.214	-0.029

Notes: Based on evaluating the conditional wage densities shown in Figure 6 at the quantiles shown. Coef = Coefficients; Cov = Covariates; Res = Residuals. The standard errors for these estimates can be found in the appendix (see Table 5.) *Source:* Empirical and counterfactual densities using QR model results for IDS data 1982, 1996 and 2010. *Population:* Male adult full-time employees.

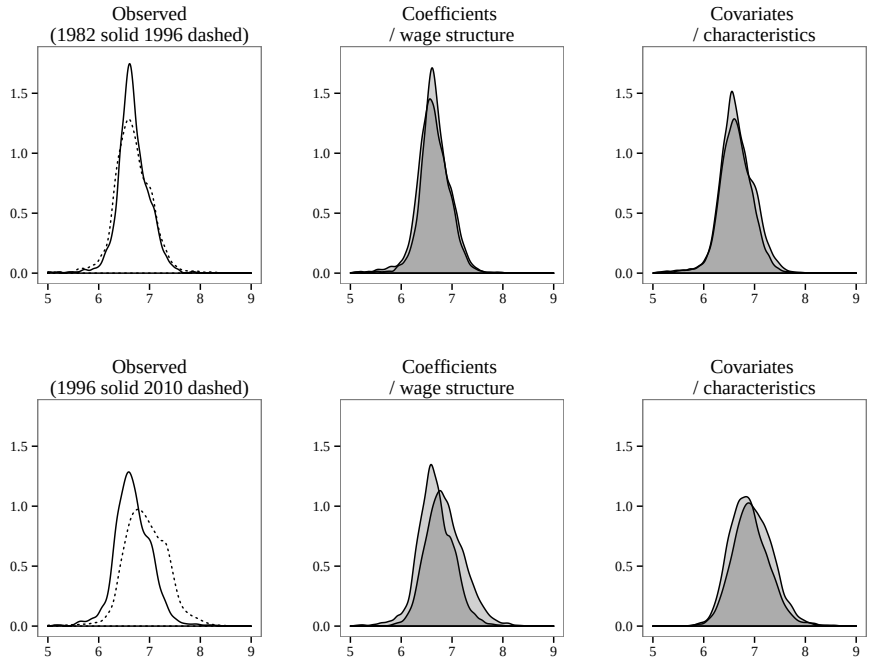
Among female employees (Figure 7) the period from 1982 to 1996 is almost static, with an increase in inequality mostly evident in wage reductions at the bottom of the labour market. The changes that did occur were largely driven by the wage structure moving backwards (panel 2) and by some changes in workforce characteristics in the top half of the distribution (panel 3). At the very top of the

distribution, characteristics counted much more than changes in the wage structure and in the middle of the distribution they were roughly equivalent (see Table 3).

By way of contrast, the second period, 1996 to 2010, saw a large increase in inequality among female employees, something evident in panel 4 of Figure 7. As with the male employees, this was driven by the wage structure moving forward for all employees (panel 5), though unlike the situation with male employees, workforce characteristics played a more important role in this period (panel 6). As Table 3 shows, changes in workforce characteristics were roughly equivalent to changes in the wage structure in the middle of the distribution, but not at the very bottom or the very top.

In summary, for male employees the changes in the wage structure contributed most of the growth in inequality in the 28 years following 1982. In the earlier years, the changing wage structure actually drove wages backwards at the bottom of the labour market, while in the latter years, the wage structure drove wages forwards, but disproportionately at the top of the labour market. Among female employees changing characteristics did indeed play an important role in the growth of inequality, but this was quite uneven and did not apply at the bottom of the wage distribution. These gender differences were most likely due to increases in women's labour force participation, and greater access to higher education, both of which are consistent with the impact being felt in the middle and top of the wage distribution. Finally, for both men and women the role of the residual within these decompositions was relatively minor, suggesting that much of the heterogeneity which linear regression fails to accommodate is well catered for in the quantile regression modelling. This makes the invocation of unobservables unnecessary in interpreting the decomposition results. The importance of the wage structure—particularly among the men—also suggests that the *net* quantile regression effects discussed earlier (and shown in Figures 4 and 5) were indeed the dominant influence on the wages outcomes which did emerge over this period.

Figure 7 Conditional wage densities, female employees, 1982, 1996 and 2010



The lighter shaded areas reflect the part contributed by the component shown by the title. The x-axis shows the log weekly wage and the y-axis shows the densities.

Table 3 Decomposition of wage densities, female employees, sub-periods 1982 to 1996 and 1996 to 2010

	Log wages						Proportions		
				Decomposed into:			Decomposed into:		
Percentile			Change	Coef	Cov	Res	Coef	Cov	Res
	1982	*1996*							
10th	6.356	6.289	-0.067	-0.066	-0.008	0.008	0.998	0.119	-0.117
25th	6.506	6.451	-0.055	-0.065	0.011	-0.001	1.188	-0.198	0.010
50th	6.646	6.654	0.008	-0.032	0.028	0.012	-4.027	3.462	1.565
75th	6.855	6.900	0.045	-0.010	0.049	0.006	-0.224	1.092	0.131
90th	7.078	7.107	0.029	-0.025	0.080	-0.027	-0.852	2.775	-0.922
	1996	*2010*							
10th	6.289	6.461	0.172	0.149	0.024	-0.001	0.866	0.138	-0.004
25th	6.451	6.647	0.196	0.153	0.058	-0.015	0.781	0.295	-0.075
50th	6.654	6.908	0.254	0.186	0.084	-0.015	0.730	0.329	-0.060
75th	6.900	7.215	0.315	0.197	0.110	0.008	0.625	0.349	0.026
90th	7.107	7.439	0.332	0.223	0.095	0.014	0.672	0.287	0.041

Notes: Based on evaluating the conditional wage densities shown in Figure 7 at the quantiles shown. Coef = Coefficients; Cov = Covariates; Res = Residuals. The standard errors for these estimates can be found in the appendix (see Table 6.) *Source:* Empirical and counterfactual densities using QR model results for IDS data 1982, 1996 and 2010. *Population:* Female adult full-time employees.

Conclusion

The two most salient features of wage inequality in Australia have been stagnation at the bottom of the wage distribution and substantial expansion at the top. The logic of the technical change argument, and its corrollary, stronger demand for a more highly skilled workforce, both offer explanations for why inequality might increase at the top of the labour market. However, the technical change argument relies largely on the return to unobservables and the employment change argument relies on static pay relativities alongside dramatic workforce compositional change. The decomposition results in this paper undermine both these explanations. The return on unobservables is minor within a quantile regression framework where the heterogeneity of the workforce is more fully encompassed. As for the identification of these unobservables with skill, this always relied on human capital assumptions rather than any explicit measure of skills.[10] Secondly, despite substantial changes in the composition of the workforce over the last thirty years, the results in this paper show that it has been changes in the wage structure which have overwhelmingly contributed to the growth of inequality among male full-time workers. Even within the female full-time workforce, where compositional change has been dramatic, changes in the wage structure have still been the most important factor.

As the earlier discussion suggested, the emphasis on managerial flexibility, the deregulation of the labour market, and the decline in trade union influence, were hallmarks of neoliberalism. The persistence of long-term unemployment and underemployment, alongside increased casualisation of work, has also been a striking feature of the last 30 years (Mitchell 2008; Mitchell 1999; Langmore and Quiggin 1994). As argued by Botwinick (1993) these developments ensure downward pressure on wages at the bottom of the labour market. They thus explain much of the stagnation in the growth of real earnings which has been evident over the last 30 years (Watson 2002). The growth of the reserve army of labour, particularly through various forms of immigration, such as 'backpackers' and 457 Visa holders, has also been central to this process (Watson 2011). Union density has been falling since the 1970s and union influence at the shop-floor level has also been in decline (Peetz 1998; ACIRRT 1999). The recession of the early 1990s accelerated both these trends and left the labour movement severely weakened. Once the Labor government abandoned the centralised wages system and moved decisively towards enterprise-based bargaining, the dispersion of wages began in earnest. Further labour market deregulation during the Howard years accelerated this process, something strongly evident in the time-series data shown earlier in this paper.

Explaining the expansion of wages at the top end of the labour market requires that we supplement this institutional perspective with an understanding of capital flows. A core element of neoliberalism has been financialisation. The deregulation of the financial sector in Australia during the 1980s saw large flows of capital into this sector, and via the massive expansion of credit, into property booms and resource sector booms. The industries which grew strongly as a result of these developments—finance and insurance, property and business services, construction and mining—can be regarded as a neoliberal core.

[10] It is worth noting that Borland's own discussion of unobservables canvassed other factors before endorsing the skills factor (Borland 1996: 193ff).

These flows of capital have had their impact in the labour market. The distribution of wages within the sectors which have boomed have all become dramatically more unequal, with one exception, mining. This industry has provided low wage workers with a substantial premium, well beyond their reach in any other industry. These wages have been one of the factors sustaining the fly-in-fly-out phenemenon across regional and remote Australia. In this respect, mining has been one neoliberal industry where inequality has been constrained, rather than accelerated. In all of the other industries, however, workers at the bottom have seen their wages stagnate or decline, while workers at the top have experienced dramatic increases.

By way of contrast, the neoliberal backwaters—such as manufacturing and human services—have not seen an expansion in inequality, largely because the workers at the top of the wage distribution have not enjoyed the gains which their colleagues in the neoliberal heartlands have enjoyed. In most cases, they have been dependent on public sector funds or have been located in sectors of low profitability. Human services has been particularly notable. It remains a backwater for neoliberalism because it remains an area of economic life which resists commodification and the possibility of high profits. Outside of the pharmaceutical industry, health, education and community services have all struggled to become more fully commodified, and public sector finances have remained integral to funding their wage structure.

The comparative literature has long suggested that those labour markets which more fully embraced market principles have also experienced higher levels of wage inequality. In Australia, the wage fixing system once operated to more widely spread the gains of the industrially strong, but with enterprise bargaining such gains became both *magnified* and at the same time *quarantined* to the most profitable sectors of the economy. Thus while the flows of capital created the impetus for the growth of wage inequality in Australia, it was political and institutional changes which provided the mechanism for its realisation.

Appendix

Table 4 Regression slopes for QR coefficients

	Male			Female		
	1982	1996	2010	1982	1996	2010
Age (in 10 years)	0.09	0.16	-0.03	0.09	0.16	-0.03
Age (quadratic)	-0.01	-0.01	0.01	-0.01	-0.01	0.01
Education	0.13	0.13	0.19	0.13	0.13	0.19
Agriculture	0.18	0.29	0.06	0.18	0.29	0.06
Mining	0.25	0.07	-0.05	0.25	0.07	-0.05
Manufacturing	-0.07	0.06	-0.03	-0.07	0.06	-0.03
Utilities	-0.04	-0.14	-0.01	-0.04	-0.14	-0.01
Construction	-0.08	0.06	0.21	-0.08	0.06	0.21
Transport	0.06	0.22	-0.01	0.06	0.22	-0.01
Communications	-0.08	-0.11	-0.05	-0.08	-0.11	-0.05
Finance etc	-0.08	0.08	0.22	-0.08	0.08	0.22
Government	-0.11	-0.27	-0.12	-0.11	-0.27	-0.12
Human services	0.01	-0.28	-0.13	0.01	-0.28	-0.13
Managers	0.11	0.20	0.15	0.11	0.20	0.15
Professionals	-0.08	-0.03	-0.08	-0.08	-0.03	-0.08
Tradesworkers	0.01	-0.06	-0.01	0.01	-0.06	-0.01
Clerical, sales etc	-0.02	-0.08	-0.03	-0.02	-0.08	-0.03
NSW	0.03	0.10	0.08	0.03	0.10	0.08
Victoria	0.01	0.00	-0.00	0.01	0.00	-0.00
Queensland	0.04	-0.02	-0.03	0.04	-0.02	-0.03
SA	-0.03	-0.09	-0.09	-0.03	-0.09	-0.09
WA	-0.03	0.11	0.11	-0.03	0.11	0.11
Tasmania	0.01	-0.08	-0.05	0.01	-0.08	-0.05

Notes: Based on regressing the quantile regression coefficients against the tau values. *Source:* QR model results for IDS data 1982 and 2010. *Population:* Male and female adult full-time employees.

Table 5 Standard errors for Table 2

	1982 to 1996				1996 to 2010			
	Change	Coef	Cov	Res	Change	Coef	Cov	Res
10th	0.005	0.013	0.008	0.009	0.005	0.013	0.006	0.011
25th	0.005	0.008	0.006	0.007	0.010	0.009	0.006	0.008
50th	0.013	0.008	0.007	0.007	0.014	0.009	0.007	0.008
75th	0.013	0.010	0.008	0.007	0.016	0.010	0.008	0.008
90th	0.019	0.014	0.010	0.011	0.021	0.015	0.009	0.013

Notes: Note that these are the standard errors for the log wage estimates, not the proportions. They are based on bootstrapping the estimates 1050 times. *Source:* Empirical and counterfactual densities using QR model results for IDS data 1982, 1996 and 2010. *Population:* Male adult full-time employees.

Table 6 Standard errors for Table 3

	1982 to 1996				1996 to 2010			
	Change	Coef	Cov	Res	Change	Coef	Cov	Res
10th	0.016	0.019	0.011	0.010	0.015	0.016	0.008	0.009
25th	0.013	0.011	0.009	0.007	0.015	0.011	0.008	0.007
50th	0.015	0.010	0.008	0.008	0.014	0.010	0.009	0.009
75th	0.017	0.014	0.013	0.008	0.017	0.012	0.011	0.009
90th	0.015	0.014	0.012	0.009	0.016	0.014	0.011	0.010

Notes: Note that these are the standard errors for the log wage estimates, not the proportions. They are based on bootstrapping the estimates 1050 times. *Source:* Empirical and counterfactual densities using QR model results for IDS data 1982, 1996 and 2010. *Population:* Female adult full-time employees.

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