An Analysis of Changes in the Australian Income Distribution, 2001 – 2009

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Abstract

This paper considers the evolution of the Australian Income Distribution over the period 2001–2009. Through cross-sectional analysis on the Household, Income and Labour Dynamics in Australia survey we examine changes to the income distribution and potential drivers. I find evidence that Australia's 21st century expansionary phase resulted in strong income growth across the distribution and reduced income inequality. Income growth below the median appears to have been driven mainly by strong effective employment growth, partially offset by falling wages. Higher returns to observables, realised as wage growth, completely explained income gains to the top half of the distribution. Thus whilst the income distribution portrays increased equality over the focus period there is growing disparity in the observed wage distribution.

1. Introduction

Understanding changes in the income and earnings distributions, as well as the associated degree of inequality and the extent to which changes in macroeconomic activity translates into changes across a distribution, is a central focus of modern labour economics. A large body of international work has examined the determinants of changes in the income or earnings distributions, as well as the relationship between the cyclicality of income inequality. This includes the early work of Smith (1904), extending to Kuznets (1955), and the more recent work of Beach (1976, 1977), Blank (1989) and Borland (1999). The recent arrival of a large Australian panel dataset is encouraging the further development of this country-specific literature, such as the work of OECD (2008), Barrett (2009) and Rohde, Tang and Rao (2010).

This paper will consider the impact of the longest recorded period of economic growth in Australia on the income and earnings distributions, with a view to identifying the relative winners and losers, and determining factors. This will facilitate an examination of whether the disparity in earnings growth rates and the associated systematic increases in income and earnings inequality identified in Borland (1999) persisted into the 21st century. To do so, the paper follows the methodology of Hyslop and Yahanpath (2006), which investigates changes in the income and labour market earnings distributions for New Zealand over the period 1998-2004. The period of focus in Hyslop and Yahanpath (2006) is comparable to that of this paper due to a degree of overlap, whilst both country-specific periods are characterised by sustained output growth, falling unemployment rates and increasing labour force participation. However, the principal appeal of the study lies in the robust analytical approach that is employed; the paper involves descriptive analysis, two separate examinations of the distributions at a broad level and three distinct decompositions of the changes. The authors find that this period of economic growth translated into strong income growth across the distribution, with average income growth of 12% for the total period. Further, this growth in income was well dispersed across the distribution, resulting in reduced inequality in both the income and earnings distributions. The income growth was predominantly driven by effective employment growth in low to mid percentiles, whilst the majority of income growth at higher percentiles came through higher hourly wages.

The analysis utilizes data from the Household, Labour and Income Dynamics in Australia (HILDA) survey, focusing on the changes in financial year gross income and employment earnings amongst individuals who report non-zero income and are of working age. Given the strong economic performance, one would believe that distributional changes will be largely determined by various labour market outcomes. This drives the choice of variables for analysis as well as sub-sample selection. There are three components to the analysis of this paper. First, this paper will describe the broad changes in real income, real earnings and inequality over the focus period. This consists of trend analysis in the aforementioned variables evaluated at the mean and focal percentiles, as well as a comparison of kernel density estimates of the 2001 and 2009 distributions of real income and earnings. Second, we graphically decompose the income growth into changes in labour market outcomes, which descriptive statistics suggests are the main drivers of income growth over the expansionary period. Observations are grouped in percentiles according to their income in each year and then we describe the relative changes in income for each percentile before proceeding to estimate the relative contribution of earnings to income, as well as the relative contributions of employment, hours worked and the real hourly wage to the relative changes in income for each percentile. Finally, to formalise the determinants of income changes this paper will draw upon the analytical decomposition developed by Juhn, Murphy and Pierce (1993). This allows one to quantify the relative contribution to changes in income from changes in socio-economic characteristics, employment outcomes, the returns to such characteristics and employment outcomes interpreted as wages, and unobserved factors.

The rest of the paper is set out as follows. Section 2 presents a review of the literature on changes in the income distribution and the cyclicality of inequality and provides the Australian macroeconomic background to the post-1978 Australian literature. Section 3 describes the HILDA survey, as well as the relevant variables and sub-samples used for the analysis more completely. Section 4 uses the trends in real annual income and earnings summary measures as a guide to distributional changes over the period, followed by a deeper look into the income and earnings distributions through examination of kernel density estimates. Section 5 uses three alternative decompositions of the changes in income and earnings. Firstly, we use the ratio of earnings to income as a key descriptive and then consider the relative growth in earnings and income for each percentile of the income distribution. Secondly, I decompose the change in earnings for each percentile of the income distribution into changes in the average employment rate, hours worked per week and the hourly wage rate. Finally, I utilise the decomposition set out in Juhn, Murphy and Pierce (1993) to report the relative contributions associated with changes in the level of observed characteristics, changes in their returns and changes in unobserved effects, at various points in the 2001 and 2009 distributions.

2. Literature Review and Background

Before the analysis begins, consider the evolution of the related literature and the macroeconomic background against which this paper is set. A large body of modern international literature has examined the changes in the income distribution as well as the associated inequality and their determinants. Such work originated with the study of the determinants of earnings differential in Adam Smith (1904), the formalisation of inequality in Dalton (1925) and the relationship between business cycles and inequality in Kuznets (1955).

In an attempt to capture the distributional effects of macroeconomic activity and improve the efficiency of policy formulation, Beach (1976) presented a general framework for analysing the cyclicality of earnings inequality within the distribution. Beach (1976) concludes that income inequality is noticeably sensitive to the cyclical fluctuations in the participation and unemployment rates. This is consistent with the observation of Phelps (1972), whereby unemployment is an economic burden that is borne unequally across the population, whilst confirming the work of Johnson (1966) which argues that low-unemployment policies are important because of the cyclicality effect on the distribution of income. Specifically, Beach (1976) identifies a strong negative relationship between movements in the participation or employment rates and income inequality for the working-age male sub-population.

Blank and Blinder (1985) characterise the link between macroeconomic activity and the income distribution, with a specific focus on the bottom of the distribution. Using data from the 1950's through to the 1970's, Blank and Blinder (1985) show that the income share of the lowest 20% of the distribution and the poverty count move substantially with the business cycle. The authors estimate that a 1 percentage point reduction in the unemployment rate reduces the poverty rate by 1 percentage point. Further, the authors find evidence that 'a rising tide floats all boats', suggesting that economic growth increases the income of all agents. In fact those at the bottom of the distribution enjoy greater relative income growth than those in the middle to top during an economic expansion which serves to reduce inequality within the income distribution. However, later studies fail to find such a tight relationship between Macroeconomic performance and labour market outcomes or welfare. Blank and Card (1993) show that the expansionary phase from 1983-1987 was associated with a 4% reduction in the unemployment rate, but only a modest fall in aggregate poverty and falling incomes shares to the lower 60% of the income distribution, with an increased share for the top 20%. Given the counter-cyclicality of inequality over this period the authors investigate if the relationship between macroeconomic performance and the income distribution is still relevant. Drawing on Blank (1993) and Cutler and Katz (1991) the authors acknowledge that this period was associated with increased dispersion in the wage distribution, as wages to the less-skilled labour experienced below-average growth, but attempt to explain the growing inequality through alternative means. The authors show that whilst the economic expansion of the 1980's was a similar magnitude to that of the 1960's, the former was associated with increased employment whilst the latter was facilitated with increased productivity per worker. Thus it may be that increased productivity is the channel through which the macroeconomic growth affects the income distribution.

Juhn, Murphy and Pierce (1993) evaluated changes in income over the US 1963-1989 period. The authors find that the real average weekly earnings for a working male rose by 20%, however this period was also characterised by a large increase in inequality. Specifically, real wages at the 10th percentile fell over this long period by 5%, whilst the real wage at the 90th percentile rose by more about 40%. When the authors restrict their focus to the period 1970-1989 the inequality becomes more pronounced; the authors find evidence of 15% growth in the real average weekly wage for working males, whilst the real weekly earnings at the 10th percentile fell by 25%. This divergence in outcomes has led to a large increase in inequality. Such divergence is explained through a rising return to skills, as a result of higher demand for skilled labour, and is independent of changes in the composition of the labour force and the patterns of employment across industries that were well documented over this period.

A growing body of literature has considered the changes in the Australian income distribution and inequality. One of the earliest such studies was Norris (1986). Whilst the author was primarily concerned with the comparative dispersion in Australia and Britain, Norris (1986) estimates dynamic changes at a decade interval. Dispersion was narrower in 1981 than 1971, however wider than 1961 and 1960. Driving factors appear to be stronger advances in gender wage equality in Australia during the 1970's, whilst managerial wages were relatively low, generating a more compressed wage structure. Borland and Kennedy (1998) focus on Australian income inequality changes using the Australian Bureau of Statistics (ABS) Income Distribution Survey (IDS) between 1982 and 1995. The authors find that increased inequality is driven by growing disparities within groups defined by demographic characteristics, as opposed to between groups. Notably, the authors find that income inequality is substantially greater in the 25-59 age bracket than for those in the wider 15-64 working-age age bracket. The promoted explanation is a changing of the age composition of the labour force due to increased school retention rates.

Borland (1999) examined earnings growth and inequality over the period 1976-1997, a period characterised by volatility in the Australian macro-economy. This is captured in Figure 1, which portrays Australia's aggregate performance for the period February 1978 - January 2011, featuring the monthly unemployment rate and quarterly Gross Domestic Product (GDP) growth obtained from ABS Labour Force and National Accounts series. One can see that this period encompassed three recessions, an unemployment rate that was often above 10% and significant fluctuations in the GDP growth rate that often extended below -1% and above 2%. For the analysis Borland (1999) draws upon data from the ABS Labour Force Survey (LFS), ABS Survey of Employee Earnings and Hours (SEEH) and the ABS IDS. Borland (1999) shows that this period involved increases in earnings inequality in the full-time employed population in almost every year, inferred from stronger growth at high percentiles and low or even negative growth in the low to mid percentiles. Borland (1999) also contains a useful summary of Australian growth and inequality literature over the same period which supports the author's deductions.

Several other papers confirm the conclusion of growing in inequality in Australia over the 1980's and 1990's as identified in Borland (1999). Borland, Gregory and Sheehan (2001) examine the trend in the Australian earnings distribution between 1975 and 1999. Evaluating relative earnings attributable to the main job amongst the full-time employed at each 5 year interval, the authors find that the earnings of individuals at the 10th and 25th percentile have systematically decreased relative to the median. Conversely, the relative earnings for males and females at the 75th and 90th percentiles regularly rose over each 5 year interval. As a result, a large increase in earnings inequality is documented. Barrett et al (2000) examined the evolution of income and expenditure inequality over the period 1975-1994 using the ABS Household Expenditure Survey (HES). The authors find a substantial increase in the inequality of market income, with a smaller increase evident with disposable income highlighting the equalising effects of government transfers and taxation. Barrett et al (2000) finds evidence that the rising inequality of disposable income between 1975 and 1994 was a result of rising real incomes for those at the top of the income distribution, whilst real income growth was flat in the middle of the distribution and negative at the bottom, particularly between the 10th and 25th percentiles, suggesting a growing working-poor population. This provides support for the conclusion of growing income inequality in Borland (1999), which is further confirmed by Blacklow and Ray (2000) and Harding and Greenwell (2001) which use the same dataset. In an attempt to identify the factors driving increased inequality, Pappas (2001) finds that over this period there was a substantial increase in the contribution of wages to income, whilst investment represented a smaller proportion of income, suggesting that there may be growing inequality in the wage distribution.

Johnson and Wilkins (2003) examine the income and earnings distributions in Australia for the period 1982-1998 using a balance of nonparametric kernel density estimates and summary measures. The authors show that there was a considerable increase in aggregate market income inequality over this period confirming the results of previous studies, although the inequality increase was somewhat mitigated by government transfers in gross income as well as taxation in disposable income. Using the semi-parametric methodology of DiNardo, Fortin and Lemieux (1996) the authors conclude that changes in the distribution of employment or labour force status across alternative household type's accounts for half of the increased inequality, such as the relative increase in both two-person and no-person earner families. Changes in the family-type composition off the population resulted in a much smaller rise in inequality, which was largely offset by the reduction in inequality associated with changes in demographic characteristics over this period. A substantial proportion of the increase in inequality not attributed to observables was due to an increase of the returns to these observed factors. This is consistent with changes in wages, specifically large wage growth for those at the top of the wage distribution. Given these findings, the study suggests that policy should focus on the distribution of employment across the distribution in an attempt to equalise the income distribution.

A small number of studies have used the Household, Income and Labour Dynamics in Australia (HILDA) survey to examine how the Australian income distribution has evolved since 2000. The economic performance of Australia between July 2000 and June 2009, which represents the focus period of this paper, is displayed in the un-shaded region of Figure 1. We see that this period was characterised by sustained growth in real GDP, coinciding with falling unemployment rates and rising participation rates. In fact, the 31 quarters December 2008 represents the longest period of sustained quarterly GDP growth since the relevant ABS series begin. This is in direct contrast to the Australian experience before 2000. One should also observe the relative stability of GDP over this period when compared to the focus period of Borland (1999), a feature often attributed to increased efficiency in monetary policy. Figure 1 also highlights a fall in the unemployment rate from 11.9% in December 1992 to 3.9% May 2008. The decline in unemployment was also accompanied by a rise in the Labour Force participation rate of 3.6 percentage points. This makes the employment growth abundantly clear, but also motivates the question of how the benefits of Australia's economic performance were dispersed across the income distribution.

Using HILDA waves 1-4, which corresponds to the years 2001-2004, OECD (2008) found that inequality, as measured by the Gini coefficient, had fallen by 2 percentage points to 2004. This reduction in inequality has resulted in the Australian measure sitting below the OECD average for the first time since the Australian series began in the 1990's. However, the study also suggests that poverty has continued to rise over the period which suggests that there may be greater disparity between the extremes in the income distribution. Barrett (2009) examines the evolution of income inequality in Australia using waves 1-5 of the HILDA survey. Using the concepts of stochastic and Lorenz dominance, Barrett (2009) finds no discernable change in relative inequality over the focus period, however there was significant fluctuations in inequality between adjacent periods. Over the same period social welfare, defined through expenditure, and poverty fell but the reductions were concentrated between 2003 and 2005. Such findings appear to be at odds with those of OECD (2008). Rohde, Tang and Rao (2010) explore the links between income inequality and mobility, using waves 1-6 of the HILDA survey. Using the Gini coefficient, the authors find a small but steady reduction in the Gini coefficient, totalling a 2 percentage point decrease over the 6 year period, consistent with OECD (2008). Using the half squared coefficient of variation as an alternative measure of cross-sectional inequality, the authors find the reduction in inequality is largely consistent across measures, although the reduction in the half squared coefficient of variation is less systematic, identifying increasing inequality for the years 2004 and 2005. The consideration of these three papers suggests that the trend in inequality is dependent upon the statistic employed. The papers propose the greater targeting of government transfers to the very poorest of the population, economic growth and a lower tax burden on the low-income earners as possible drivers of falling inequality. Further, OECD (2008) suggests that the rising age of the Australian population and the increased level of single-parent families and smaller households may have offset a greater reduction in inequality.

This paper will apply the methodology of Hyslop and Yahanpath (2006) to the Australian context. We will consider the distributional impact of a prolonged period of economic growth, examine the dispersion of the benefits of economic growth, and investiage if the disparity in growth rates and associated increases in earnings or income inequality identified by Borland (1999) persisted into the 21st century.

3. Data Description

For the empirical analysis of this paper I utilise the data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. The period of analysis is the years 2001 -2009; this is partially motivated by the sustained growth in macroeconomic activity in Australia over this period which was highlighted in the previous section, and also because at the time of submission the available dataset extends to the 2009 interview period, thus all available information is utilised. Through Australian Government funding, the HILDA survey commenced in 2001 identifying 7,682 households and 19,914 individuals. However, many interviews could not proceed for a variety of reasons, for example, only those aged 15 and over complete a personal questionnaire which details labour market information. This reduces the Wave 1 data set to 13,969 individuals. Designed as a household-based panel study for the purposes of inferring national parameters, interviewees are followed through subsequent interviews. The structure of HILDA, derived from its longitudinal formation, is that the unit of analysis is an individual-year specific observation. That is, there is a unique entry in the dataset for each time observation for all interviewees. Weights are derived from the probability of selecting households, and individuals into the survey sample. Weights are then adjusted so that weighted household and person-level estimates match several external benchmarks. Thus, it is weighted analysis that provides for estimation and inference that is representative of Australia. For this reason, all analysis conducted in this paper is weighted prior to estimation.

Whilst HILDA is a panel set by nature, the majority of the analysis reported in this paper is one of repeated cross–sections. This allows me to consider percentile specific changes in the income or earnings distributions for the years 2001 and 2009, whilst abstracting from individual specific changes. In setting up the analysis one should also note that imputed observations for the key variables of analysis are ignored. Such a decision was merely a simplification and the inclusion of imputed values should not change the results from independent cross-sectional analysis which ignores the correlation of outcomes that possibly include an imputation over time.

As suggested, the analysis of this paper focuses on two key variables. Firstly, gross financial year income denoted as *Totinc,* defined as the sum of employment earnings, public and private transfer income and investment income, where the Australian financial year runs from July 1st to June 30th. This allows one to disregard possible variations in marginal tax rates within the focus period. Secondly, I concentrate on financial year employment earnings, defined as the sum of wage and salary earnings and unincorporated business income, which I denote *Empearns*. Both of these variables, as well as their components, are reported 2010 December Quarter dollars. In theory, one should be able to disaggregate employment earnings into the product of a binary employment variable, annual hours worked and the hourly wage. An employment rate is generated for the annual period, defining an individual as employed if non-zero employment earnings are reported for that financial year. Unfortunately, the HILDA survey does not collect an individual's annual hours worked; this is a clear limitation. I proceed by defining the real hourly wage as the total usual weekly earnings, adjusted for inflation, divided by the total usual weekly hours worked. This will give the real hourly wage relevant at the survey time. Finally, annual hours are derived by dividing the total real employment earnings by the implied real hourly wage rate.

Household income or individual expenditure may be a better predictor of welfare than the two measures described above for individuals at the bottom of the income distribution, however we are more likely to be able to identify causation over the business cycle through labour market earnings. Further, employment earnings account for a significant proportion of income. Using waves 1-9 of HILDA, the ratio of total real employment earnings to total real gross income is almost 81%.[1] This implies the income distribution can be used as both a proxy for social welfare and a consequence of business cycles.

A component of interest in *Totinc* is that of Australian Government transfers (denoted *TransInc*). Such a partition allows one to examine whether economic growth reduces the incidence of government transfers through increased employment as well as conditional earnings, and the resulting effects on the income distribution. *TransInc* itself can be broken down into income support payments (*IncSupport*) that includes government pensions, parenting payments, the Newstart Allowance (also known as the unemployment benefit) and various targeted allowances; non-income support payments (*NIncSupport*) which comprises family payments and non-income focused allowances such as mobility and carer allowances, as well as a catchall category for all other transfers (*OtherBenInc*).

[1] This ratio is calculated using the values provided in column 1 of Tables 1 and 2. Specifically, one divides the product of the non-zero gross income dummy (TotincD) and the gross income conditional on receiving income (CondTotInc) by the product of the employment dummy (EmpDummy) and employment earnings conditional on being employed (CondEmpEarns).

In an attempt to curtail the impact of the looming Global Financial Crisis the Kevin Rudd-led Federal Government engaged in fiscal stimulus targeted at the Australian public to boost confidence and consumer spending. In December 2008 the first stimulus package provided $10.4 billion in one-off financial assistance to the Australian public, targeted at those that were receiving government transfers already. The premise was these individuals face binding budget constraints and thus additional income would be subject to higher marginal propensities to consume. Most of this initial package went to pensioners, carers and war veterans, or those receiving a family tax benefit.

As we saw in Figure 1, the first stimulus package coincided with negative output growth in the last quarter of 2008. In response to this contraction as well as increased uncertainty in the international environment, the Rudd Government announced a second fiscal stimulus package in February 2009 valued at $42 billion which included $26 billion in infrastructure expenditure, $2.7 billion in tax breaks, and facilitated a one-off payment to every tax-declaring Australian earning less than $100,000 per year which totalled $12.7 billion. This one-off payment provided $950 to those earnings less than $80,000, $650 for individuals with income greater than $80,000 but less than $90,000, and $300 for individuals with income greater than $90,000 but less than $100,000. The combination of one-off payments from the two stimulus packages appears in a derived variable (*Bonus*).

Because of this "helicopter" bonus payment this paper will analyse two 2009 cross-sections; the first will include the *Bonus* component in *Totinc*, whilst the second abstracts from these one-off receipts. We are most interested in the growth of income or earnings summary values between 2001 and 2009 that was not determined by the Bonus payments. This is because the income growth excluding bonus payments will be driven by mostly observable labour market outcomes, allowing us to describe the contributing factors. Additional analysis will compare both 2009 cross-sections to infer the effectiveness of the fiscal stimulus on positive labour market outcomes and inequality.

All analysis restricts observations to individuals of usual working-age, defined here as greater than or equal to 15 but less than 65. Table 1 uses various sub-samples to consider the data at a deeper level, portraying the relevant characteristics and basic income statistics, as well as their standard errors in parentheses. These sub-samples are all observations pooled; a comparison of observations that report zero gross income in any year with their non-zero counterparts; a comparison of the 2009 observations that did not receive any bonus payment under the two fiscal stimulus packages with those that did receive a one-off payment; and a comparison of the 2001 and 2009 cross-sections.

The upper partition describes the average age and number of children, conditional on having children, whilst all other values report the fraction of observations for which that variable is relevant. The lower partition reports some broad income statistics. Specifically, I include the fraction of observations that received non-zero income, non-zero employment earnings and non-zero transfer income, as well as the average income received conditional on receiving some over the financial year.

The statistics that appear in the first column of Table 1 are attributable to a pooled sample of the almost 90,000 observations from all 9 years. In terms of characteristics we see the entire sample consists of an almost equal proportion of men and women, with an average age around 40 years, two thirds of all observations were married at the time of interview, 73% were born in Australia and almost one third held a bachelors degree or higher whilst more than one quarter had not completed high school. Further, slightly more than one third of observations had children, with an average of 1.8 children over these observations. In terms of income, almost 98% of observations report non-zero income in a given year whilst these observations received an average real income of $49,223. Further, just less than 75% of the population reported employment earnings in a given year and almost 50% reported receiving transfer income in a given year.

Columns 2 and 3 of Table 1 reproduce the descriptive summary above for those that do not receive any income in a financial year, and those that receive some, respectively. To compare the significance of the difference between summary values across sub-samples or within sub-sample changes over time I compute a standard error for this difference, which is reported in parentheses under descriptive statistic.[2] Less than two percent of working-age year-specific observations report no income, where these individuals are more likely to be female, born outside Australia, possess a lower level of education, and less likely to have children. In fact the two groups are very distinct with the only insignificant differences between group characteristics occurring in the marriage rate and the fraction of individuals who obtained a vocational focused certificate. Interestingly, Column 3 reveals 2.5% of this no-income group report receiving earnings from employment. Further investigation reveals such earnings were completely offset through investment losses.

Columns 4 and 5 of Tables 1 recreate the analysis for the 2009 observations that did not and did receive a Government bonus transfers, respectively. This suggests more than 82% of individuals received some form of this aggregated bonus. We find evidence that those who received a bonus payment were significantly more likely to be married, females, born in Australia, with a relatively high level of education, and considerably more likely to have children. Much of this is unsurprising as families were an important target group for assistance. Interestingly, whilst 99.6% of the population who received bonus payments reported receiving some income in 2009, 99.2% of this population reported income from sources other than the bonus transfer, although this latter statistic is not reported in Table 1. This implies some individuals received a bonus payment which was offset by

[2] This would be traditionally calculated according to equation (1) below.

$$SE(b-a) = \sqrt{SE(b) + SE(a) - 2Cov(a,b)} \quad (1)$$

For this purpose, and throughout the analysis, I will treat the cross-sections as independent random samples. This implies that the covariance between summary measures will be zero. Given that HILDA is a panel survey this simplification will be incorrect, however, the unbalanced nature of the panel of the analytical sample over time complicates the calculation of the covariance term. Further, the approach adopted will be more conservative as the covariance of individual-specific observations over time is likely to be large and positive, thus we obtain a larger standard error and reduced significance.

investment losses, but more importantly almost all individuals that received a bonus would have otherwise reported non-zero income for the financial year. This was a key determinant of the stimulus package; many of the bonus receipts were conditional on filing a tax return for the financial year ending June 2008. Those that did not receive a bonus were less likely to report any income, although those that did receive a bonus and reported income had a significantly higher annual income, perhaps reflecting observations with annual incomes in excess of $100,000. Further, individuals that did not receive a bonus were significantly less likely to be employed or receive any form of Government transfer.

Finally, columns 6 and 7 of Table 1 repeat the descriptive analysis for the years 2001 and 2009, whilst column 8 illustrates the percentage change between these years relative to the 2001 value. These two sub-populations comprise the year-specific observations that will be focused upon in the cross-sectional analysis that follows in this paper. These columns reveal some ageing over this period however the change is small relative to the time between surveys, this gives one confidence in HILDA's ability to provide and maintain representative cross-sectional samples and facilitates the approach of repeated cross-sectional analysis. We see evidence that over this 9 year period the proportion of Australian-born individuals in the population increased by 4%, however this was particularly pronounced for indigenous Australian's whose proportion of the population rose by 42.3% to 2.3% of the 2009 population. The increases in the proportion of Australians coincided with a fall in the proportion of individuals born in an English speaking country excluding Australia, which fell by 21.3% to 8.6% of the 2009 population. This reflects a changing composition of the Australian population, but not the story one would expect given the large volume of immigration into Australia over the 21st century.

The descriptive analysis of Table 1 also suggests that the period of sustained economic growth was coupled with a higher level of education. I find evidence that there was a significant degree of "up-skilling" in the economy; over the nine year period the proportion of individuals whose highest qualification was a bachelor's degree or higher increased by 13.10%, those with a trade certificate as their highest qualification rose by 17.31%, individuals whose highest qualification obtained during Year 12 rose by 9.31%, whilst the proportion of individuals who did not complete high school in the population fell by 28.75% to 22.9% of the population. This clear evidence of up-skilling will be pleasing to Australian officials and may even drive future prosperity.

The lower partition of Table 1 suggests that more than 97% of observations report positive annual income in 2001 as well as 2009. This proportion of observations is both high and stable in the two main cross-sections. For this reason, as well as the corresponding figure from column 1, I will condition on receiving annual income for the analysis that follows in later sections. Further, the lower partition tells us that over this period of sustained growth average real income, amongst those who receive income, rose by 21%. This average income growth is remarkable, especially when we recall that this represents growth in incomes over and above inflation and when we contrast this to the experience of New Zealand over a comparable time period and phase of the business cycle. Hyslop and Yahanpath (2006) estimate income growth of 11.8% in New Zealand for the 1998-2004 expansionary phase. This translates into a geometric average of the annual real income growth rate of 1.61%, whilst the analogue for this paper is 2.14%. Thus we have identified very strong growth in income over the expansionary phase between 2001 and 2009, which is promising at a first glance however it is the dispersion of income growth that determines inequality changes.

The strong growth in income was driven by, amongst other factors, an increase in the fraction of the sample defined as employed from 70.1% to 76.4% over the period. This employment growth represents another key descriptive result of this paper. This is intuitive as increased output requires increased demand for the factors of production. We see that economic growth can drive employment growth, which has the potential to reduce inequality as individuals can move above the minimum level of subsistence provided by government transfers. As with income growth, such inference will be dependent on how the employment growth is dispersed across the distribution. This observed employment growth is consistent with the macroeconomic characterisation of the focus period as set out in Section 1. The lower partition of Table 1 also suggests that a contributing factor to the income growth was due to the inclusion of the 2009 bonus payment, which we saw from Table 1 affected 82.2% of 2009 population, with the fraction receiving transfers increasing by 81.2% to 84.0% of the 2009 population.

Table 2 presents descriptive statistics related to the components of income for the same sub-samples. The upper partition of Table 2 contains information pertaining to the employment component of income, including the average financial year employment earnings, the fraction of individuals that work full-time and part-time, as well as the averages for annual hours worked and the hourly wage rate, all conditional on receiving some employment earnings. The central partition describes the components of transfer income, containing the conditional mean for total transfer income, as well as the mean of its four components conditional on receiving a transfer in any form over the financial year. The lower partition describes the components of transfer income more fully. For each component of transfer income, the lower partition reports the fraction in each sample receiving that transfer, and then the specific transfer average conditional on receipt.

Column 1 of Table 2 sets out the described statistics for all observations across the entire focus period. We see that of those who reported annual employment earnings in a given year earned on average $52,143 in 2010Q4 dollars, 68% were classified as being in full-time employment whilst 24% were classified as in part-time employment[3], they work 1961 hours over the year on average at $26.78 per

[3] Due to a mismatch between the observation periods relevant to annual earnings and labour force status and outcomes, the fraction of observations that work full-time or part time, conditional on receiving non-zero annual employment earnings is less than one; employment earnings refer to earnings over the financial year, July 1st to June 30th, whilst labour force status is determined by one's status at the time of the personal questionnaire, which

hour in real terms. The central partition shows that those that received any transfer income over the financial year received on average a combined $7609 from all sources; of this, 54% was in the form of income support, 41% was in the form of non-income support, 4% was due to the fiscal stimulus bonus payments, whilst the contribution from the catch-all was trivial. The lower partition of Table 3 describes the fraction of all annual income observations that reported receiving a specific component of transfer income as well its conditional mean.

Columns 2 and 3 highlight the differences in income components between the sub-populations that report zero and non-zero income in a given year. Conditional on being employed the two groups have little difference in the proportions working full-time and part-time, whilst unsurprisingly those without income report receiving significantly less employment earnings and working significantly less hours. Conversely, the conditional means for transfer income, as well as most of its components and all of their fractions were quite different between the two groups even with the large standard errors.

Columns 4 and 5 summarises the differences between the 2009 sub-populations who did not and did receive a bonus payment under either fiscal stimulus package. Table 2 suggests that the two groups were very different in the comparison of their income sources. In particular, those that received a bonus and were employed reported much lower employment earnings, were more likely to work full-time and less likely to work part-time, which is also reflected in the annual hours worked, and for a lower hourly wage rate. As discussed in reference to the lower partition of Table 1, this is likely to be due to the inclusion of individuals whose annual income exceeded the threshold in the no-bonus sub-population and their implied hourly wage. Conditional on receiving any transfer, total transfer income and income support payments were much lower amongst those who receive a transfer, whilst non-income support measures were higher, the lower conditional means can be explained by a dilution of these components due to a large increase in individuals who only receive the bonus payment. For those that did receive a bonus transfer, on average this totalled $1682 in 2010Q4 dollars. The lower partition shows the difference in transfer components without the effects of such a dilution. In fact the conditional mean for income support transfers was much higher, as was the proportion receiving a non-income support measure, allowance or pension.

Columns 6 and 7 of Table 2 describe the differences in the components of income between the years 2001 and 2009. Whilst we saw earlier that the 21.0% growth in real income was driven by increased employment, the upper partition of Table 2 displays two further headline descriptive results. We see real average conditional earnings rose by 10.7% over this period, largely coming through an 8.06% growth in real hourly wages. Together, the 8.86% growth in the employment rate and this 10.71% growth in conditional earnings almost completely explain the growth in income over the focus period. Such rising real wages suggests the purchasing power of the returns to one hour of labour supplied

is conducted at any time between August following the end of the financial year and March in the subsequent year.

have increased by 0.87% year on year through a geometric average. Whilst impressive, these growth statistics are slightly lower than the estimates of New Zealand between 1998-2004 as set out in Hyslop and Yahanpath (2006). In that paper the authors estimate an increase in real conditional earnings of 15.7% whilst the inferred average real wage rate growth was on the order of 8-9%.

Other employment-conditional factors displayed relative stability at the mean over this period, the increased proportion of individuals in part-time employment suggests there was marginally more growth in part-time employment over the period, however this difference as well as that of the full-time proportion and annual hours worked are not significant. The average value for each component of Government transfers, conditional on receiving some form of transfer, falls due to the aforementioned dilution effect. One should also note that apart from the bonus payment and pension components, the fraction of individuals that report receiving a specific transfer falls, although some specifi transfer conditional averages rise. The economic growth and falling unemployment leads to an impressive 26.3% and a 7.3% reduction in the number of individuals claiming income support and non-income support assistance, respectively. The reduction in income support claims was mainly driven by the large relative fall in allowance receipts, of which is mostly the Newstart Allowance, which fell by 31.1% to 6.9% of the population. Whilst these numbers are impressive, they are consistent with an economic expansion driving higher incomes, higher employment and lower Government dependency. The other changes were in the components of transfer income were more modest in absolute terms.

This income growth and employment gains, coupled with comparable cross-sections at the boundary, motivate this paper's focus; given Australia's strong economic performance over the last decade, who were the relative winners and losers?

For the analysis that follows we will restrict our attention to the sub-sample of individuals that contribute towards column 3 of Tables 1 and 2. That is, we focus on the labour market outcomes of working age individuals with non-zero annual income. Table 2 shows that the proportion of working-age individuals not reporting any income in 2001 and 2009 is both low and stable, justifying their exclusion throughout the analysis.

4. Trends and Changes in the Income Distribution

The empirical analysis begins with a look at the evolution of the income distribution as a whole in Section 4.1, using various summary measures for both income and earnings. Specifically I report the relative movements in the mean, median, Gini coefficient, as well as the relative movements for five focal percentiles. One can find the motivation of these summary statistics, or the calculation of the Gini coefficient, in sub-section A.1 of the Technical Appendix at the end of the paper.

Section 4.2 applies the kernel density estimation approach with graphical representation. Kernel density estimation is a non-parametric method of estimating the probability density function of a random variable. This method provides a more complete picture of how the distribution changed, with the ability to examine the relative movements at different levels of income. Greater discussion of the methodology and implementation can be found in sub-section A.2 of the Technical Appendix.

4.1 Trends In Summary Statistics

Figure 2 portrays the trends in real earnings and real income for each year between 2001-2009 using the above mentioned summary statistics. This analysis selects on the observations reporting non-zero income in each year, as set out in the discussion of Table 1. Sub-plot (a) depicts the relative performance of the mean, median and Gini coefficient for gross financial year income. I begin with income which represents this paper's main 'outcome' of interest, whilst the analysis for earnings, which are an important explanatory component of income, is detailed below. I introduce a dotted line to represent the change in a descriptive statistic that would have been realised if we abstract from an individual's bonus income, other factors constant. From an initial value of $45,176, the average income of our focus population displayed little growth to 2003, thereafter quickly rising to 21.0% growth over the period 2001-2009. The median of income displayed a nearly identical relative performance to that of the mean over all 9 years, although the median began from the lower initial value of $37,000 and ended up with total growth of 20.4% over the entire period if we include bonus payments. This captures the dynamic process in average real income that lead to the strong income growth highlighted in Section 3, but also suggests that the median enjoyed a similar degree of impressive real growth. However, if we ignore the bonus payments the final change in the mean and median would have been 3 and 4.5 percentage points lower, respectively. A similar relative performance in the mean and median suggests a symmetric distribution of gains, which would have an effect of reducing on inequality across distribution. This is confirmed in the relative performance of the Gini coefficient. From an initial measure of inequality of 0.437, the Gini coefficient falls by 3.5% to 2006, thereafter experiencing some volatility around this point and ending the period 3.3%, or 1.5 percentage points, lower. This is a finding consistent with the inequality literature that used the HILDA dataset to study inequality and the income distribution which was set out it Section 2. An interesting facet of the data is that this measure of inequality would barely have changed over the interest period had the bonus payments not been issued. This highlights the effectiveness of the fiscal stimulus in mitigating a rise in inequality, as well as the dependence of outcomes to individuals below the median on macroeconomic fluctuations.

Sub-plot (b) shows the trend movements in income evaluated at the 10^{th}, 25^{th}, 50th, 75^{th} and 90^{th} percentiles. The percentiles below the mean enjoy growth in excess of 30% , with 33.1% growth at the 10^{th} percentile and 36.0% income growth at the 25^{th} percentile, whilst the mid to upper percentiles enjoyed income growth on the order of 20%, specifically 20.4%, 19.6% and 18.2% income growth attributable to the 50th, 75th and 90th percentiles respectively. It is also clear that that the lower percentiles, particularly the 10th percentile, are more volatile in their growth performance. This demonstrates instability in income at this percentile and possibly their vulnerability to fluctuations in the macroeconomic environment. Abstracting from bonus payments, the 25 percentile would have enjoyed growth of 26.2% with all others on the order of 16-19%. This demonstrates the disproportionate success of the lower to mid percentiles and the strong equalising effect that the period of sustained economic growth had on the income distribution.

The analysis is repeated in sub-plots (c) and (d) for employment earnings. Sub-plot (c) considers the mean, median and Gini coefficient for unconditional earnings over the period 2001-2009, that is including those that have zero annual earnings. The mean, from an initial value of $35,907, experiences steady growth of 19.7% between 2001 and 2007, followed by a 2% point gain in 2008 and a 1% point fall during 2009 associated with the looming Global Financial Crisis. Meanwhile the median, from an initial value of $29,155, enjoys stable growth of 30.5% from 2001 to 2008 only to be followed by a more pronounced 4.6% point fall in 2009. The median's outperformance of the mean, suggests that earnings growth may have been concentrated in the middle of the distribution. This also suggests a reduction in inequality over the period. This is confirmed in the performance of the Gini coefficient, which displays a trend similar to, but more pronounced than that under income. From an initial value of 0.564, we estimate a 9.2% fall in the Gini coefficient to 2008, however the quarter of negative growth increases inequality in 2009 such that inequality has fallen by 8.9%, or 4.4 percentage points, over the entire period. The considerably larger initial value of the Gini for earnings is due to the inclusion of a significant number of observations with zero earnings with unconditional earnings.

Sub-plot (d) illustrates the relative performance of earnings at the focal percentiles. Recall from Table 2 that we have 30% non-employment in the 2001 cross-section, whilst this falls to 24% in 2009. This would effectively rule out 2 key percentiles and so we proceed with conditional earnings. It is clear that the gains to 2008 are concentrated in the lower to middle of the distribution, but these percentiles are also more volatile and all suffer reductions in 2009, both of which occur markedly at the 10th percentile. In contrast, the 75th and 90th percentiles enjoy modest gains in 2009 and overall it is the higher percentiles that perform better over the entire period suggesting increased inequality in the conditional earnings distribution over the entire period,

4.2 Distributional Changes

Figure 3 compares the annualised conditional income and earnings distributions at 2001 and 2009 using the kernel density method set out in the introduction to this section and explained in the appendix. Treating the 2009 fiscal stimulus bonus as an exogenous helicopter drop, i.e. assuming the bonus payment is independent of characteristics and income components which I acknowledge is not true for all observations but does hold for the 2009 observations earnings less than $80,000 and not receiving any other form of benefit, suggests the examination of inter- and intra-temporal changes in income. Specifically, I shall consider the changes in income between 2001 and 2009 excluding bonus payments to examine the broad effects of economic growth over this period, and then separately consider the changes in 2009 income due to the inclusion of the bonus payment to examine their specific effects. Because there is no such complication in earnings I can compare the 2001-2009 changes in annual employment earnings directly. Sub-plot (a) compares the income distribution of 2001 and 2009, excluding bonus payments. In 2001 there was a significant proportion of the population receiving $10,000-16,000. Such an income is consistent with receipt of a non-income or income support transfer from the Government. Table 1 suggested the number receiving such transfers fell over this period, a result also portrayed in Figure 3 (a), perhaps due to employment growth. The graph also implies a rightward shift in probability mass, with the proportion of individuals with income at all levels above $52,000 increasing. Sub-plot (b) indicates there would not be a considerable change in the 2009 distribution whether we allow for bonus payments or not. There would be fewer individuals reporting income below $16,000, including at the censoring point, with the only noticeable gains near $24,000 or between $55,000 and $128,000.

Consider now the analogous analysis of earnings in sub-plot (c). This suggests a pattern largely consistent with income. There appears to be a rightward shift in probability mass; the number of individuals earning between $14,000 and $24,000, approximately, and $32,000 and $55,000, approximately, is significantly reduced whilst the number of workers earnings more than $64,000 rose dramatically. A consistent story could be that the almost 9% growth in employment mitigates the changes in the lower to middle with new entrants, whilst the top of the distribution enjoys strong wage growth and largely fixed hours and employment rates.

5. Decomposition Analyses of Changes

Having considered the broad changes occurring across the distribution, the focus now turns to decomposing the changes between 2001 and 2009. The first process will consider the contributions from direct labour market outcomes, specifically earnings as a whole, and then employment, hours worked and the hourly wage. Secondly, I will decompose the relative change in income into changes associated with observed demographic and employment changes, changes in the returns to these components, and the change associated with unobserved determinants.

5.1 Changes across the Income Distribution

The analysis begins by considering income changes across the distribution. The attention then turns to the contributions to these changes of, first, changes in employment earnings and secondly, changes in employment, hours and wages. This analysis requires ordering the working age-positive income sample by real income and splitting individuals into 100 percentiles for years 2001 and 2009 independently. Because the focus is on changes in the income distribution over time, percentile analysis provides a natural grouping for comparison, especially given I select on the more than 97% of the population with income in each year. For each percentile I calculate the average income, employment earnings, employment rate, hours worked, hourly wage, as well as their changes between 2001 and 2009.

Figure 4 (a) plots both the average income level and the average ratio of earnings to income centred at each percentile for the 2001 and 2009 without bonus receipts cross-sections. To smooth some of the percentile specific variation I include observations from adjacent percentiles and depict the three percentile moving average at its central percentile. Consider first the two lower series, which plots the average real income for each percentile. 8 years of economic growth has a visible impact on the income level for percentiles above the 15^{th}; the absolute gap between 2001 and 2009 income appears to be increasing in the percentile above this point. One should also note the slope of the income curves above and below the 90^{th} percentile. This appears to be a turning point, after which the moderate and stable income level relative to the previous percentile resembles an exponential function.

The two upper series of Figure 4 (a) highlights the patterns in employment earnings relative to income. Relative earnings appear to be correlated with the percentile across all cross-sections; the ratio is falling below the 15^{th} percentile after which the ratio steadily increases up to the 50^{th} percentile with an apparent plateau at 95%thereafter. This dip around the 15^{th} percentile coincides with the annual level of the Newstart unemployment benefit, currently set at $456 per fortnight or just under $12,000 over the financial year. Those with income below this level are likely to be the self employed and part-time workers that have considerable employment earnings relative to income but a low income base. In 2001, the decrease in the ratio of earnings to income was from above 1 at the lowest percentile to less than 0.65. A ratio above 1 indicates that earnings exceeded income and possibly an anomaly in the data. However, this was because a small number of individuals in the first two percentiles during 2001 suffered significant investment losses, perhaps representing the self-employed in new businesses or asset losses associated with the deflation of the dot-com bubble. This drove total income below employment earnings, and the ratio of earnings to income above 100%. Earnings as a fraction fell noticeably for individuals below the 15^{th} percentile in 2009 when we exclude the bonus receipts where one can see that the bottom now falls below 0.6. The converse was true for those above the 15^{th} but below the 50^{th}; there were strong relative employment earnings gains, particularly around the 25^{th} and 35^{th} percentiles.

Figure 4 (b) replicates the previous graph, this time comparing the two 2009 cross-sections, excluding and including bonus payments. Again, consider the two lower series which plot the average real income for each percentile first. We notice that the income levels when we include or exclude bonus payments are indistinguishable on a scale of thousands of 2010 December Quarter Australian dollars. This similarity leads one to conclude that the effects of the bonus payments on the income level were marginal. Such an observation is consistent with the average values of income and bonus receipts in Table 2 which suggested that the average bonus payment across the population represented 3% of average income for our restricted sample, however there are certainly larger effects in the lower income errors which are not easily identified in the series. Now consider the two upper series which plots the ratio of earnings to income for each percentile. The inclusion of bonus payments has little effect other than by lowering the relative earnings ratio locus by 2.5 percentage points on average, as employment earnings are discounted by a strictly larger income level under inclusion. However the biggest difference between the series evident in the lowest 40 percentiles, whilst convergence of the series is achieved around the 95th percentile. This suggests the diminishing contribution of bonus payments to higher incomes.

In Figure 4 (c) I show the growth in employment earnings and total income in 2009, relative to the income level in 2001. Instead of graphing the percentage growth for each series, the 2001 income level is used as the base to characterise the growth in income that is driven by employment factors. This figure suggests that most of the distribution enjoyed income growth independent of bonus payments on the order of 20%. However, stronger growth was evident, with those between the 15th and 40th percentiles enjoying growth up to 30% and those in the top 5 percent enjoying growth close to 25%. Weaker growth was also experienced, with those between the 10th and 15th percentiles enjoying income growth of approximately 15%, and less than 15% and even negative growth recorded for the lowest 5 percent of the distribution. The inclusion of bonus payments increases income growth by as much as 20 percentage points at some of the lower percentiles, with this increase diminishing up to no discernable difference for the top decile. This reflects a combination of the targeting aspect inherent in the bonus payments and the fixed absolute level. This clearly illustrates the reason for the large reduction in inequality over the period 2001-2009 that was estimated by the Gini coefficient in Figure 2 (a) when bonus payments were included, as well as why the reduction in the Gini coefficient was much smaller under exclusion.

Evidence suggests that as with income growth, average earnings growth across the distribution over the focus period was also on the order of 20%. This growth was stronger but more volatile for much of the lower 40 percentiles; growth was particularly pronounced near the 25th percentile, however the growth near the percentiles associated with the Newstart unemployment benefit was marginal at just 4%. At higher percentiles earnings growth is more stable, ranging from 15%-22%. The combination of the income and earnings growth series allows one to view the driver of changes in the earnings to income ratios, as witnessed in Figures 4 (a) and (b). The combination of all three sub-plots allows one to conclude that there was strong income growth across the distribution, with substantial increases in employment earnings between the 15th and 50th percentiles.

Figure 5 concentrates the focus on earnings growth, and specifically the changes in the components of earnings. In Figure 5 (a) I plot the 2001 percentile averages for the employment rate, as well as the percentile averages for weekly hours worked and the hourly wage, conditional on employment. Again observations within 1 percentile either side of the evaluation percentile are included. Note that conditional hours and the hourly wage were censored at the top and bottom 1% to reduce the effect of outliers, such as an average conditional wage in excess of $100 at the 13th percentile, solely driven by a single observation in excess of $2000.

The employment rate at the bottom of the distribution is around 20% and is increasing up to the 10th percentile, perhaps driven by part-time employment and the self-employed. However the employment rate declines as we near the 15th percentile, where one could receive the equivalent income without working from the unemployment benefit. From the 15th to the 50th percentiles there is a sharp rise in employment after which the employment rate levels off above 90%. This is intuitive; most individuals placed near the top of the distribution must fund their high level of income through some form of employment. Conditional hours worked increases steadily with the percentile, such that hours worked appears as a linear function. This is an incredible observation, where income and labour market effort are closely linked, perhaps through some underlying motivational factor. One should note that a spike in hours at the 100th percentile is reduced through censoring. The effective wage per hour across the lower 75 percentiles largely appears flat around $20. Due to the censoring set out in previous paragraph the average conditional wage at the 13th percentile falls in line with that of the surrounding percentiles. Divergence in the average wage rate is only apparent above the 75th percentile from which the wage appears as a convex function of the percentile, with particularly strong wages for the top 5% of individuals. This is intuitive given the physical limits on the employment rate and hours worked; there exists some maximum effective hours worked, perhaps full-time employment, such that for employed individuals working that amount of hours there is only scope for wage growth.

Figure 5 (b) displays the percentage growth between 2001 and 2009 in each of our labour market factors across the distribution. Note that the growth is more volatile than the levels, so this sub-plot displays a 5 percentile moving average. The employment rate displays impressive growth in the lower 40 percentiles, particularly near the 15th percentile where the employment rate more than doubles over this 9 year window. Such growth is constrained at higher percentiles due to the almost full-employment at higher percentiles in 2001, as observed in Figure 5 (a). Conditional hours worked broadly displays the same growth pattern as the employment rate, although somewhat muted near the 15th percentile. Then we witness strong growth along both the intensive margin where those already in employment increase their hours worked, as well as along the extensive margin with an increase in the proportion employed. Such an increase in effective labour supplied appears to flow through to falling wages in the lower 40% of the distribution, a story consistent with the supply and demand theories of Stage 1 Economics. However, those above the median enjoy a remarkable average increase in real hourly wages on the order of 20% across the 9 year period. Thus, whilst we have seen reduced inequality in the income distribution there appears to be increasing inequality in the observed wage distribution. This observation has important consequences; whilst effective employment growth has mitigated the increased inequality in the wage distribution, if individuals in the lower to mid levels of the income distribution cannot continue to supply more effective labour then the trend in the wage distribution may outweigh other factors and we could see a strong rising trend in income inequality. This is all the more realistic as the witnessed growth in effective employment in the lower tail is unsustainable in the long-run.

Whilst it appears as though wages fell over the period for individuals in much of the lower half of the distribution one should be careful to make such inference due to compositional effects. For example, there may have been a degree of reordering of the individuals in the lower half of the income distribution according to wage growth, and we do not have 2001 wage information for observations that comprised the 6 percentage points of employment growth over the period. As a result, one would want to estimate the underlying period growth of the latent wage distribution for all individuals, not just those that are employed. This may be a fruitful line of research and one that would deliver greater confidence in the inference of wage growth.

5.2 Contributions to Changes in Income

Our attention now turns to quantifying the effects from the contributing factors. Juhn, Murphy and Pierce (1993) developed a method for quantitatively analysing the determinants of changes in income. For the analysis I draw upon this method which represented an extension to the decomposition of Oaxaca (1973) and Blinder (1973), allowing for the evaluation point to differ from the mean. Essentially this method separates the changes in the log of the hourly wage into changes in the level of observable characteristics, their returns and the unobservable factors.

One can understand the motivation of the analysis by considering the classic example of the effect of education on income in a simple linear regression context. An individual's income can rise between two periods due to an increase in their education level between periods; one might receive a higher annual salary reflecting increased knowledge or specialisation, as opposed to a salary consistent with no formal education or training. Alternatively, returns to a specific level of education can increase over time due to increased demand for this type of labour, increasing an individual's income whilst holding their education level constant. In the simple regression context this would be realised as a higher coefficient on the education level. Examples include an increased hourly wage for individuals with post-school trade qualifications during a property boom reflecting increased demand for this skill-set, or perhaps a higher wage for a specific sub-population that reflects their increased productivity with technological advancements. Of course, there are many other factors that affect income other than education, such as experience or tenure; responsibility and remuneration tends to increase the longer one works in an industry or firm. Thus, income can also rise due to a change in some unobserved or omitted factors. The Juhn-Murphy-Pierce method estimates the relative contribution from a change in the three components to the total change in outcome. For a formal discussion of the analytical method see sub-section A.3 of the Technical Appendix at the end of this paper.

The demographic characteristics employed in the regressions are a quadratic in age, the individuals total number of children and dummy variables for gender, marital status and the highest qualification obtained (bachelor degree or higher, certificate or diploma, year 12, or did not complete high school). The employment variables include dummy variables for full time and part time employment status, as well as a quadratic in annual hours worked. In testing the equivalence of the coefficients for both the hours and hours squared terms across employment status one rejects the null hypothesis of equivalence, regardless of year of regression or whether bonus transfers are included; all regression tests yield a probability value of observing a test statistic at least as extreme, if in fact the coefficients were equal across employment status, equal to zero at four decimal places. The conclusion of different returns to hours across status promotes the inclusion of both sets of hourly covariates in the regression analysis. However, in a less statistical and more economic sense, there does not appear to be a great absolute difference between these coefficients, and the increased variation in income that is explained through the division of hours across employment status is minor, thus for tractability I proceed without interacting hours or hours squared with part-time and full-time employment dummy variables.

Table 3 displays the relative contributions from our analysis. In the first row we consider the relative contributions to the change of the natural logarithm of income, evaluated at the mean. Over this period there was an increase in mean log income of 0.211, which is approximately a 24% increase in income levels. This value differs from the earlier descriptive analysis due to the skew of the income distribution and the non-linear weighting of high values in the log function. This increase was predominantly attributed to changes in the returns to observable effects at more than 70%, with the remaining change due to the changes in observable characteristics whilst changes in unobservable quantities and their prices had a trivial effect. The changes in observables are sectioned into those changes that are associated with changes in employment or demographic characteristic changes. Of the change attributable to changes in observable characteristics almost 90% is attributed to changes in the employment features. Evaluation at the mean will produce results consistent with the Oaxaca-Blinder decomposition. With an intercept the expectation of a residual is zero, so it is unsurprising that the contribution from unobserved factors is near-zero when evaluated at the mean.

The next 5 rows of table 3 reports the results of decomposition at the 5 focal percentiles; 10th, 25th, 50th or Median, 75th and 90th. There are five key points to consider. First, notice income growth was strongest in the low to mid percentiles, this is a point made throughout this paper. Whilst incomes appear to have grown around 20% for the three upper focal percentiles over the 9 year period, the growth was closer to 30% at both the 10th and 25th percentiles. Second, the previously outlined effective employment growth at the middle to lower end of the distribution shows through as a significant driver of income growth for those individuals but as suspected, has little impact on incomes at the upper focal percentiles. Rather, the income growth at the top of the distribution was solely explained by changes in the returns to characteristics, which we interpret as higher wages. This is a picture consistent with Figure 5 (b); there was strong effective employment growth in the lower half of the distribution, whilst there was solely growth in wages at the top half. Third, the effect of demographic changes on income changes is negligible across all key percentiles, with a maximum attributable effect of just 11% at the median. This is not surprising as the explanatory variables tend to be relatively constant over time. Fourth, the impact of changes in the returns to the characteristics is relatively increasing in the percentile. Changes in the coefficients explains 41-52% of log income changes at the 10th and 25th percentiles, 70% at the 50th percentile, and 98-116% at the 75th and 90th percentiles. Fifth, the effect of changes in unobservable quantities or prices on the changes of log income is modest but volatile. The contribution of unobserved effects ranges from negative to positive 16%. This final point promoted the replication of the above analysis whilst removing bonus receipts, which may be a significant source of unexplained changes in income.

Through removing the exogenous increase from the Second Fiscal Stimulus Package the unexplained effect should be reduced and underlying indicators should be improved. However, this requires removing all components of bonus income, such as those targeted towards the included demographic covariates, so we are not guaranteed to reduce the size of contributions associated with unobserved effects. This output appears in Table 4. The facets highlighted above still broadly apply, including stronger income growth at the lower end. The abstraction from bonus payments reduces the total change for individuals at the lower end by considerably more than individuals at the top because we know some components of the *bonus* variable were targeted. The absolute effect of unexplained factors actually increases at the 10th and 25th percentiles, whilst falling at the upper three focal percentiles. This flows through to increased explanatory power in employment factors in the lower end of the distribution, whilst the contributions from returns are reduced, whereas there is little change at the top of the distribution where the entire change is explained by changes in the returns to characteristics.

Table 5 reports the average level of key descriptive statistics associated with the above JMP decomposition, evaluated at each of the focal percentiles. This allows for a comparison of characteristics at different points in the income distribution. In accordance with theory, the fraction of individuals that are employed (specifically employed full-time) and male, as well as an individual's highest qualification highest qualification, is increasing in the percentile. The table also allows one to examine the change and growth in the level of characteristics between 2001 and 2009 for a particular percentile. Evidence confirms earlier inference; whilst real income growth was impressive across all percentiles, growth was greater at the 10th and 25th percentiles. The JMP analysis suggested that observed characteristics could only explain about 25% of the change in income at the 10th percentile. This is highlighted in Table 5. Whilst there was a large improvement in the education level, driven by a decrease in the number of individuals who do not finish high school and increase in those attaining a vocational based Certificate qualification, and an increase in the fraction of males within individuals at this percentile, the increase in the employment rate was insignificant at the 5% level. These changes were accompanied by a large relative fall in the fractions of individuals that are married and have children. This is consistent with the monopsony theory of the labour market which suggests that such changes would put downward pressure on average incomes.

The picture is clearer at the 25th percentile where we could explain almost all of the changes through the JMP decomposition, 50% of which came from observed characteristics. Strong income growth was driven by a phenomenal increase in the employment rate of 11.9 percentage points. Further, there was a significant increase in the average education level, again driven by a reduction in individuals who do not complete high school, at the 25th percentile.

We have a very hard time explaining the growth at the higher focal percentiles. This was a feature of the JMP analysis. There is no significant change in the employment rate at any higher percentile, but we alluded to this in the discussion accompanying Figure 5 (b). Table 5 also suggests that the realisation of "up-skilling" was particularly concentrated at the 75th percentile. The proportion of individuals at this point on the income distribution who held a tertiary qualification rose by 23.9% to 44.1%. This coincided with a large but insignificant increase in the proportion that held a trade certificate as their highest qualification and a significant 47.8% fall in the proportion who had not completed school to 14%. There was some transition of labour from part-time employment to full-time at the median, as well as rising education at all three higher focal percentiles, but there were few other significant changes.

Conclusion

The period of strong economic and employment growth in Australia between 2001 and 2009 has resulted in broad gains to working-age individuals, suggesting the benefits of economic growth have been shared widely across the income distribution. Recent literature found inequality increasing steadily to 1999, with the pattern reversing since 2000. The results of this paper confirm the latter conclusion. Average income grew 21% in real terms over this period, of which 3% was driven by the 2009 Fiscal Stimulus bonus payments, whilst there was a 6 percentage point growth in employment and employment earnings grew at 11%, also in real terms. Further, the number of individual's receiving all non-bonus forms of government assistance fell.

The income growth between 2001 and 2009 was particularly pronounced in the lower half of the distribution, where we witness increases of up to 40%. However, the inclusion of the bonus payments makes up to 15 percentage points of such growth. Above the median, income growth was relatively flat around 20%.

Multiple forms of decomposition analysis suggested that the income growth over the focus period in the lower half was driven by mainly employment growth, whilst the income growth for the top half was almost exclusively explained by wage growth. In a highlight of this paper, employment gains in the lower half were accompanied with falling hourly wages. There may be compositional effects at play here, for example if the newly employed join the income distribution at the very bottom, and assuming no wage growth otherwise, then we would witness negative growth. Further research could investigate the latent and true wage growth and provide greater inference for underlying wage inequality.

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A. Technical Appendix

This section attempts to flesh out the details regarding some the technical analysis found in this paper, to provide understanding to the reader without interrupting the flow of the paper itself. In the sub-sections that follow I discuss some of the details of the Gini coefficient, Kernel density estimation and the Juhn-Murphy-Pierce Decomposition.

A. 1 Key descriptive statistics: Mean, Percentiles and the Gini Coefficient

The mean is used as the key central tendency, and provides an accurate estimate of the population average given the sample sizes. However the arithmetic mean is also sensitive to outliers, thus the median (or 50th percentile) may be a more robust description of central tendency. This is the income or earnings value for which 50 percent of all observations are below. Analogous descriptions hold for the other percentiles. The difference between the mean and median can also suggest the degree of skew in a distribution, whilst the relative trends in the mean and median can indicate the broad dispersion of changes. For example, if the mean and median increase at the same rate one could infer that changes were spread evenly across the distribution. In contrast, when the median increases quicker than the mean one might infer that growth in the middle of the distribution exceeds the growth at either the top or the bottom of the distribution.

I use the Gini coefficient as a measure of the dispersion of income or earnings through the distribution. Whilst it is generally accepted that there is no perfect summary measure of inequality, the Gini coefficient is commonly reported as it is easily interpretable and comparable across distributions or over time. Further, the Gini coefficient is consistent Pigou-Dalton transfer principle as set out in Dalton (1925), whereby a transfer of wealth from a rich individual to a poor individual, of magnitude such that the transfer does not reverse the order of the individuals, would result in a more equal distribution. The simplest way to understand how the Gini coefficient describes inequality is through the graphical definition: the Gini coefficient is calculated as the ratio of the area between a 45° line and the Lorenz curve, divided by the total area under the 45° line, where the Lorenz curve plots the cumulative income or earnings earned at each share of the population. A value of zero would indicate perfect equality; every individual enjoys the same income or earnings, thus cumulative income and the Lorenz curve overlays the 45° line. Alternatively, a value of 1 suggests perfect inequality; all income is enjoyed by just one individual. This makes it clear that higher values of the Gini coefficient are associated with greater inequality.

Whilst the Gini coefficient can be defined with the Lorenz curve, it is often calculated directly with sample data. Deaton (1997, p.139) provides the Gini coefficient expression and notation that follows. Let income or earnings of individual i be denoted as x_i. After ordering all individuals according to their value of x we assign a rank to each individual, p_i, where $p_i = 1$ signifies the individual with the highest level of income in the distribution, whilst $p_i = N$ will be the rank of the individual with the lowest level of income in the distribution. Further, let μ denote the average level of x_i. The expression for the Gini coefficient is then defined as:

$$G = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu}\sum_{i=1}^{N} p_i x_i$$

If one individual receives all income then $\sum_{i=1}^{N} p_i x_i = p_1(N\mu) + \sum_{i=2}^{N} p_i \times 0 = N\mu$, in which case the $G = 1$, as asserted above. Alternatively, if $x_i = \mu$ for all individuals, then $\sum_{i=1}^{N} p_i x_i = \mu \sum_{i=1}^{N} p_i = \mu N(N+1)/2$, in which case $G = 0$, also as asserted above.

A. 2 Kernel Density Estimation

Before I proceed with any estimation of the distribution of income or earnings, some manipulation of the data is required. First, I log transform both income and earnings. A log scale is used to scale down higher values more heavily, and thus reduces the skew typically seen in income or earnings distributions, which tend to be closer to log-normal than normal. Second, I censor both log-distributions below 7 (approximately $1100 over the financial year) and above 12.5 (approximately $268000), so as to reduce the graphical range without manipulating the densities between these points. These points refer to round log numbers and represent the 2nd and 98th percentiles in both 2001 and 2009.

Now consider the estimation methodology. First, I estimate the kernel density at 500 equally spaced points between 7 and 12.5 on each log distribution. A kernel is essentially a weighting function, which gives greater weight to observations closest to the evaluation point, which is the centre of the kernel. At a given point x, the estimated density is calculated with the following expression,

$$\hat{f}(x,h) = \frac{1}{Nh}\sum_{i=1}^{N} K\left(\frac{x - X_i}{h}\right)$$

where N is the number of observations in the sample, h is the bandwidth and $K(.)$ is the kernel function.

This expression states the density at a given point is a function of the deviation between that point on the distribution and observation, X_i, relative to a bandwidth, h. The normalised value is then used in a kernel function, and the kernel density is the average over all observations and scaled by the bandwidth. The specific kernel I have employed in this estimation is of the following Epanechnikov form,

$$K(u) = \frac{3}{4}(1 - u^2)1\{|u| < 1\}.$$

Where $1\{.\}$ is an indicator function, which takes the value one if the expression inside the braces is true and zero otherwise. Thus all observations within a bandwidth of the evaluation point contribute to the construction of the estimated density at that point.

The bandwidth is a free parameter which governs the range around a point that contributes towards the density; however higher bandwidths scale down larger deviations to allow a wider range of observations to satisfy the indicator function. However, it should be clear that the kernel integrates to one on the $[-1,1]$ interval in u space, where the range is determined by the indicator function, thus a wider bandwidth will also flatten out the kernel. Therefore some observations close to the evaluation point will contribute less to the density at the relevant evaluation point after an increase in the bandwidth, ceteris paribus. As a result, a wider bandwidth will increase the smoothing between points. I follow the approach in Hyslop and Yahanpath (2006) and employ a bandwidth of 0.05; this value is less than the suggested 'optimal' value of 0.13 which minimises the Mean Integrated Squared Error under some restrictive assumptions, in order to allow for more localised variation. The qualification for such an approach is that it is easier to smooth a distribution visually than it is to understand the true, but unobserved, localised variation in a smooth distribution.

A. 3 Juhn-Murphy-Pierce Decomposition

To illustrate the Juhn-Murphy-Pierce decomposition method consider a linear wage regression. The log of the hourly wage rate for individual i at time t, y_{it}, can be expressed as a linear function of the individuals characteristics at the same time, X_{it}, where the parameters, β_t, reflect the returns to these characteristics in the time period, plus some unobservable traits and their associated returns captured by the error term u_{it}.

$$y_{it} = X_{it}^{'}\beta_t + u_{it} \tag{2}$$

Let $F_t(.)$ denote the cumulative residual distribution in year t. That is, the percentile of an individual residual, given characteristics, in the cumulative residual distribution can be denoted by $\theta_{it} = F_t(u_{it}|X_{it}^{'})$. This allows us to express the residuals as a function of their percentile in the residual distribution, $u_{it} = F_t^{-1}(\theta_{it}|X_{it}^{'})$, and thus construct a residual in the counterfactual cases that follow.

The regression equation (2) is run unconstrained for both the 2001 and 2009 years. This allows one to construct the counterfactuals that follow. First, consider holding the parameters and the distribution of the unobserved effects constant, but allowing the observed covariates to change. This is constructed as:

$$y_{it}^{X} = X_{it}^{'}\beta_{01} + F_{01}^{-1}(\theta_{it}|X_{it}^{'}) \tag{3}$$

It should be clear from equation (3) that $y_{i01}^{X} = y_{i01}$, whereas y_{i09}^{X} is obtained by using the 2009 observed characteristics weighted by the 2001 parameters, along with the individuals 2009 residual percentile in the 2001 residual distribution. The absolute change attributable to changes in the observed characteristics is estimated as in equation (4) below. Note that the difference is not simply the difference between the observed characteristics, weighted by the 2001 parameters, but also includes a non-zero change in the unobserved effects due to a change in observed characteristics.

$$y_{i09}^{X} - y_{i01} = (X_{i09}^{'} - X_{i01}^{'})\beta_{01} + \left(F_{01}^{-1}(\theta_{i09}|X_{i09}^{'}) - u_{i01}\right) \tag{4}$$

The second stage allows both the covariates and their returns to vary, whilst holding the distribution of the unobserved factors fixed, as in the following expression.

$$y_{it}^{X\beta} = X_{it}^{'}\beta_{t} + F_{01}^{-1}(\theta_{it}|X_{it}^{'}) \tag{5}$$

The only difference between equations (3) and (5) is that we now introduce the 2009 parameters. Again it should be clear from equation (5) that $y_{i01}^{X\beta} = y_{i01}$, however $y_{i09}^{X\beta}$ maintains the 2001 residual distribution alongside the 2009 observables, parameters and residual distribution percentile. Then the absolute change attributed to a change in the returns to observable characteristics only is the difference driven by allowing both the characteristics and returns to vary, less the previously noted change attributed to a change in characteristics, however this reduces down to the difference between the 2009 income counterfactuals with and without varying parameters, i.e.

$$\begin{aligned} y_{i09}^{X\beta} - y_{i09}^{X} &= \left(X_{i09}^{'}\beta_{09} + F_{01}^{-1}(\theta_{i09}|X_{i09}^{'})\right) - \left(X_{i09}^{'}\beta_{01} + F_{01}^{-1}(\theta_{i09}|X_{i09}^{'})\right) \\ &= X_{i09}^{'}(\beta_{09} - \beta_{01}) \end{aligned} \tag{6}$$

Finally, consider the change attributed to a change in unobserved effects by allowing the residual distribution to vary across periods. The contribution from unobserved effects is equal to the change in income that is unexplained by the above factors. Therefore we estimate this effect as the difference between the change in income across all years, less the change estimated by allowing both the observables and their returns to vary, which is simply the difference between 2009 income and the 2009 counterfactual with the 2009 covariates and parameters but the 2001 residual distribution.

$$\begin{aligned} y_{i09} - y_{i09}^{X\beta} &= (X_{i09}^{'}\beta_{09} + u_{i09}) - \left(X_{i09}^{'}\beta_{09} + F_{01}^{-1}(\theta_{i09}|X_{i09}^{'})\right) \\ &= u_{i09} - F_{01}^{-1}(\theta_{i09}|X_{i09}^{'}) \end{aligned} \tag{7}$$

Thus we have the following expression of the decomposition of change into the respective contributions.

$$y_{i09} - y_{i01} = \Big(\big(X'_{i09} - X'_{i01}\big)\beta_{01} + \big(F_{01}^{-1}\big(\theta_{i09}\big|X'_{i09}\big) - u_{i01}\big)\Big)$$
$$+X'_{i09}(\beta_{09} - \beta_{01}) + \Big(u_{i09} - F_{01}^{-1}\big(\theta_{i09}\big|X'_{i09}\big)\Big) \qquad (8)$$

Dividing through by the total change that appears on the left hand side of equation (8) delivers an expression for the relative contributions from our alternative sources. These are the figures reported in Tables 4 and 5.

Table 1: Characteristics and Labour Market Outcomes for various samples, 2001 – 2009

	All	Income		2009 by Bonus Status		Year Specific Obs		2001-'09
		Zero	Non-Zero	No	Yes	2001	2009	%Change
NumObs	89613	1760	87853	1801	8318	10950	10119	
Age	40.46	41.99	40.42*	40.38	40.71	40.04	40.64*	1.50
	(0.127)	(0.655)	(0.127)	(0.500)	(0.177)	(0.132)	(0.173)	
Female	0.502	0.604	0.500*	0.474	0.508*	0.503	0.501	-0.42
	(0.005)	(0.022)	(0.005)	(0.016)	(0.007)	(0.005)	(0.007)	
Married	0.657	0.684	0.657	0.518	0.686*	0.661	0.654	-1.12
	(0.005)	(0.020)	(0.005)	(0.017)	(0.007)	(0.005)	(0.007)	
OZBorn	0.727	0.573	0.731*	0.690	0.755*	0.711	0.743*	4.44
	(0.005)	(0.023)	(0.005)	(0.017)	(0.007)	(0.005)	(0.006)	
Atsi	0.019	0.010	0.019*	0.018	0.024*	0.016	0.023*	42.30
	(0.001)	(0.004)	(0.001)	(0.005)	(0.002)	(0.001)	(0.002)	
EngBorn	0.097	0.072	0.098*	0.084	0.086*	0.109	0.086*	-21.34
	(0.003)	(0.009)	(0.003)	(0.008)	(0.004)	(0.003)	(0.003)	
University	0.326	0.214	0.328*	0.322	0.350*	0.304	0.344*	13.10
	(0.005)	(0.017)	(0.005)	(0.015)	(0.007)	(0.005)	(0.006)	
Certificate	0.223	0.196	0.223	0.185	0.253*	0.204	0.240*	17.31
	(0.004)	(0.019)	(0.004)	(0.013)	(0.006)	(0.004)	(0.005)	
Year12	0.177	0.239	0.176*	0.267	0.166*	0.169	0.185*	9.31
	(0.004)	(0.020)	(0.004)	(0.015)	(0.005)	(0.004)	(0.005)	
DNFSchool	0.274	0.351	0.272*	0.227	0.230	0.322	0.229*	-28.75
	(0.005)	(0.021)	(0.005)	(0.014)	(0.006)	(0.005)	(0.006)	
KidsD	0.354	0.124	0.360*	0.135	0.390*	0.366	0.341*	-6.79
	(0.004)	(0.012)	(0.004)	(0.010)	(0.007)	(0.005)	(0.006)	
CondTotKids	1.82	1.55	1.83*	1.66	1.85*	1.82	1.84	1.21
	(0.012)	(0.060)	(0.013)	(0.054)	(0.021)	(0.014)	(0.020)	
TotincD	0.976	0.000	1.000*	0.870	0.996*	0.973	0.971	-0.15
	(0.001)	(0.000)	(0.000)	(0.013)	(0.001)	(0.002)	(0.003)	
CondTotInc	49223	0	49223*	60392	53482*	45176	54676*	21.03
	(421.1)	(0.000)	(421.1)	(2371)	(700.1)	(470.5)	(707.4)	
EmpDummy	0.743	0.025	0.761*	0.629	0.796*	0.701	0.764*	8.86
	(0.004)	(0.007)	(0.004)	(0.016)	(0.006)	(0.005)	(0.006)	
TransferD	0.498	0.117	0.507*	0.172	1.000*	0.464	0.840*	81.16
	(0.004)	(0.011)	(0.004)	(0.013)	(0.000)	(0.005)	(0.005)	

Note: One asterisk (*) denotes significance of change over adjacent column at the 5% level, abstracting from the covariance between terms.

Upper Partition: NumObs – Number of observations within defined sample; Age – Average age of observations; Female - Fraction of observations who define themselves as female; Married - Fraction of observations who were married at the time of the relevant interview; OZBorn – Fraction of observations born in Australia; Atsi – Fraction of observations that describe themselves as an Aborigine or Torres Strait Islander; EngBorn - Fraction of observations born in an English speaking country excluding Australia; University - Fraction of observations whose highest qualification is a bachelors degree or higher; Certificate - Fraction of observations whose highest qualification is a vocational certificate; Year 12 – Fraction of observations whose highest qualification is from Year 12; DNFSchool - Fraction of observations whose highest qualification relates to Year 11 or below; KidsD - Fraction of observations who report having children; CondTotKids – The average number of children of those that report having non-zero children.

Lower Partition: TotincD - Fraction of observations who report income over the financial year; CondTotInc – Average financial year income reported by those who report non-zero income; EmpDummy – The fraction of observations who report non-zero employment earnings over the relevant financial year; TransferD - Fraction of observations who report non-zero transfer income over the relevant financial year.

Table 2: Income, Earnings and Transfers for various samples, 2001 – 2009

	All	Income		2009 by Bonus Status		Year Specific Obs		2001-'09
		Zero	Non-Zero	No	Yes	2001	2009	Non-Zero
CondEmpEarns	52143	21302	52167*	65143	53298*	49841	55180*	10.71
	(410.9)	(6529)	(411.0)	(2563)	(534.8)	(551.0)	(605.1)	
CondFT	0.677	0.652	0.677	0.586	0.690*	0.672	0.674	0.23
	(0.004)	(0.120)	(0.004)	(0.019)	(0.007)	(0.006)	(0.007)	
CondPT	0.240	0.238	0.240	0.290	0.232*	0.234	0.241	3.26
	(0.004)	(0.105)	(0.004)	(0.017)	(0.006)	(0.005)	(0.006)	
CondHours	1961	1045	1962*	1687	1994*	1964	1949	-0.77
	(8.480)	(194.5)	(8.477)	(45.58)	(14.48)	(13.78)	(14.23)	
CondHrWage	26.78	27.63	26.78	33.80	27.32*	26.17	28.27*	8.06
	(0.155)	(2.693)	(0.156)	(1.275)	(0.221)	(0.417)	(0.268)	
CondTransInc	7609	5398	7621*	7101	5526*	7458	5588*	-25.07
	(88.51)	(356.1)	(88.85)	(386.4)	(110.5)	(99.76)	(107.4)	
CondIncSupp	4127	859	4145*	6839	1796*	4614	1995*	-56.75
	(76.45)	(169.1)	(76.73)	(392.8)	(75.20)	(88.33)	(75.79)	
CondNIncSupp	3134	4157	3129*	234	2047*	2824	1976*	-30.04
	(50.64)	(308.2)	(50.83)	(77.41)	(53.42)	(48.54)	(51.73)	
CondOtherBen	21	65	21	28	1	21	2*	-90.69
	(2.388)	(64.77)	(2.375)	(22.98)	(0.589)	(6.175)	(1.066)	
CondBonus	327	317	327	0	1682*	0	1615*	.
	(4.137)	(62.49)	(4.155)	(0.000)	(18.91)	(0.000)	(18.90)	
IncSupportD	0.212	0.019	0.216*	0.164	0.172	0.232	0.171*	-26.31
	(0.004)	(0.004)	(0.004)	(0.013)	(0.006)	(0.004)	(0.005)	
CondIncSupport	9709	5316	9719*	7149	10428*	9235	9819*	6.32
	(94.25)	(711.8)	(94.32)	(398.7)	(246.8)	(115.7)	(219.2)	
NIncSupportD	0.310	0.097	0.315*	0.009	0.364*	0.319	0.296*	-7.29
	(0.004)	(0.010)	(0.004)	(0.002)	(0.007)	(0.005)	(0.006)	
CondNIncSupp	5039	4995	5040	4657	5617	4104	5611*	36.72
	(63.16)	(315.7)	(63.49)	(1010)	(103.1)	(57.95)	(102.7)	
OtherBenD	0.002	0.000	0.002*	0.001	0.000	0.001	0.000*	-68.43
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
CondOBenInc	5247	22006	5179*	6034	2788	7529	4021	-46.60
	(452.4)	(0.000)	(448.2)	(3469)	(2021)	(1293)	(1935)	
BonusD	0.097	0.011	0.087*	0.000	1.000*	0.000	0.807*	.
	(0.001)	(0.003)	(0.002)	(0.000)	(0.000)	(0.000)	(0.006)	
CondBonus	1682	6382	7068	0	1682*	0	1682*	.
	(18.91)	(600.2)	(97.12)	(0.000)	(18.91)	(0.000)	(18.91)	
AllowanceD	0.085	0.005	0.090*	0.169	0.045*	0.100	0.069*	-31.07
	(0.002)	(0.002)	(0.003)	(0.013)	(0.003)	(0.003)	(0.004)	
CondAllowInc	7066	4440	11597*	6967	5805*	6984	6357*	-8.98
	(96.88)	(1834)	(166.5)	(388.1)	(358.4)	(145.2)	(262.1)	
PensionD	0.088	0.018	0.099*	0.001	0.098*	0.082	0.080	-2.70
	(0.003)	(0.004)	(0.001)	(0.000)	(0.005)	(0.003)	(0.004)	
CondPensInc	11588	2082	1680	12752	12229	11062	12230*	10.56
	(166.7)	(277.5)	(18.95)	(1019)	(361.7)	(180.1)	(361.1)	

Note: One asterisk (*) denotes significance of change over adjacent column at the 5% level, abstracting from the covariance between terms.

Upper Partition: CondEmpEarns – Average employment annual earnings amongst non-zero observations; CondFT – Proportion of the employed population that work in a full-time capacity; CondPT– Proportion of the employed population that work in a part-time capacity; CondHours – Average annual hours worked by those defined as employed; CondHrWage – Avergae hourly wage amongst those defined as employed.

Central Partition: CondTransInc – Average total transfer income received amongst those that receive non-zero transfer income; CondIncSupp – Average income support assistance received amongst those that receive non-zero transfer income; CondNIncSupp – Average non-income support assistance received amongst those that receive non-zero transfer income; CondOtherBen – Average level of other benefit income received amongst those that receive non-zero transfer income; CondBonus – Average bonus payment received amongst those that receive non-zero transfer income.

Lower partition : IncSupportD – Proportion of the population that received income support assistance; CondIncSupport – Average level of income support assistance amongst those who received a non-zero amount; NIncSupportD – Proportion of the population that received income support assistance; CondNIncSupp – Average level of non-income support assistance amongst those who received a non-zero amount; OtherBenD – Proportion of the population that received non-income support assistance; CondOBenInc – Average level of other benefits amongst those who received a non-zero amount; BonusD – Proportion of the population that received another form of benefit; CondBonus – Average bonus payment amongst those who received a non-zero amount; AllowanceD – Proportion of the population that received Government Allowance; CondAllowInc – Average allowance paymenty amongst those who received a non-zero amount; PensionD – Proportion of the population that received a pension; CondPensInc – Average pension payment amongst those who received a non-zero amount.

Table 3: JMP Decomposition of Changes in Income Summary Statistics

	2001-2009 Change	Observed Characteristics (%)			Returns to Characteristics (%)	Unobserved Effects (%)
		Total	Employment	Demographics		
Mean	0.211	30.16	26.85	3.31	70.55	-0.71
10th	0.250	32.17	33.77	-1.60	51.83	16.00
25th	0.309	61.98	52.90	9.08	40.63	-2.61
Median	0.183	29.29	25.42	3.87	69.73	0.98
75th	0.165	15.61	4.34	11.27	97.78	-13.40
90th	0.163	-0.84	6.39	-7.23	115.87	-15.03

Table 4: JMP Decomposition of Changes in Income Summary Statistics, abstracting from Bonus Transfers

	2001-2009 Change	Observed Characteristics (%)			Returns to Characteristics (%)	Unobserved Effects (%)
		Total	Employment	Demographics		
Mean	0.167	39.23	34.93	4.29	61.75	-0.98
10th	0.160	63.34	67.82	-4.48	16.70	19.96
25th	0.242	82.41	77.25	5.15	24.38	-6.78
Median	0.147	29.94	31.40	-1.47	69.61	0.45
75th	0.141	11.59	-6.19	17.78	98.07	-9.66
90th	0.148	-10.12	-7.36	-2.76	115.12	-5.00

Table 5: Working-Age Individuals Characteristics at Key Percentiles

	10th		25th		50th		75th		90th	
	2001	2009	2001	2009	2001	2009	2001	2009	2001	2009
NumObs	330	284	344	274	311	253	316	309	324	288
TotIncome	8517	11379*	16284	22261*	36445	44280*	59328	70604*	85158	100611*
	(39.07)	(52.88)	(35.44)	(55.23)	(45.11)	(58.16)	(60.32)	(100.1)	(143.4)	(200.5)
Age	39.796	37.819	40.086	37.915	38.687	39.975	39.052	40.356	41.412	43.538*
	(0.938)	(1.065)	(0.822)	(1.271)	(0.788)	(0.956)	(0.626)	(0.795)	(0.569)	(0.731)
OZBorn	0.683	0.695	0.699	0.756	0.749	0.728	0.756	0.750	0.715	0.809*
	(0.030)	(0.036)	(0.028)	(0.040)	(0.028)	(0.040)	(0.027)	(0.037)	(0.028)	(0.027)
Atsi	0.019	0.036	0.029	0.036	0.012	0.019	0.022	0.021	0.012	0.013
	(0.008)	(0.012)	(0.009)	(0.023)	(0.005)	(0.008)	(0.009)	(0.010)	(0.006)	(0.008)
Female	0.722	0.636*	0.615	0.572	0.566	0.547	0.368	0.373	0.260	0.265
	(0.028)	(0.038)	(0.029)	(0.046)	(0.031)	(0.040)	(0.029)	(0.035)	(0.026)	(0.030)
Married	0.729	0.574*	0.611	0.607	0.583	0.612	0.700	0.712	0.727	0.781
	(0.029)	(0.038)	(0.029)	(0.045)	(0.031)	(0.039)	(0.028)	(0.031)	(0.028)	(0.031)
KidsD	0.421	0.343*	0.387	0.441	0.366	0.296	0.412	0.390	0.441	0.440
	(0.030)	(0.036)	(0.028)	(0.044)	(0.029)	(0.037)	(0.030)	(0.036)	(0.030)	(0.034)
CondTKids	2.043	1.883	1.824	1.935	1.964	1.519*	1.806	1.925	1.881	1.781
	(0.076)	(0.072)	(0.063)	(0.122)	(0.094)	(0.085)	(0.079)	(0.093)	(0.074)	(0.083)
University	0.215	0.227	0.191	0.209	0.231	0.258	0.356	0.441*	0.520	0.535
	(0.026)	(0.029)	(0.023)	(0.031)	(0.026)	(0.038)	(0.029)	(0.036)	(0.030)	(0.035)
Certificate	0.141	0.235*	0.201	0.232	0.239	0.319*	0.242	0.289	0.238	0.236
	(0.021)	(0.035)	(0.023)	(0.033)	(0.026)	(0.037)	(0.025)	(0.033)	(0.025)	(0.028)
Year12	0.182	0.233	0.209	0.233	0.202	0.188	0.134	0.130	0.081	0.153*
	(0.024)	(0.033)	(0.025)	(0.046)	(0.026)	(0.029)	(0.022)	(0.023)	(0.017)	(0.031)
DNFSchool	0.462	0.305*	0.399	0.326*	0.327	0.235*	0.268	0.140*	0.161	0.076*
	(0.030)	(0.033)	(0.028)	(0.041)	(0.029)	(0.030)	(0.027)	(0.024)	(0.022)	(0.017)
Employment	0.396	0.410	0.517	0.636*	0.818	0.865	0.917	0.934	0.930	0.972
	(0.030)	(0.037)	(0.029)	(0.043)	(0.025)	(0.026)	(0.017)	(0.018)	(0.015)	(0.010)
FT	0.160	0.135	0.187	0.221	0.575	0.691*	0.858	0.808	0.857	0.889
	(0.022)	(0.023)	(0.024)	(0.044)	(0.030)	(0.035)	(0.020)	(0.028)	(0.021)	(0.020)
PT	0.245	0.243	0.296	0.349	0.228	0.194	0.091	0.088	0.071	0.063
	(0.026)	(0.030)	(0.026)	(0.039)	(0.024)	(0.028)	(0.016)	(0.019)	(0.014)	(0.015)
Hours	495	554	788	1035*	1994	1948	2343	2330	2682	2539
	(38.87)	(93.58)	(53.48)	(59.06)	(131.9)	(36.86)	(53.63)	(42.26)	(75.89)	(49.79)

Note: One asterisk (*) denotes significance of change over corresponding 2001 percentile at the 5% level, abstracting from covariance between terms. The results represent a 3 percentile moving average whose central percentile is that indicated at the top of each column.

Upper Partition: NumObs – Number of observations; TotIncome – Average income at evaluation percentile amongst those reporting income; Age - Average age at evaluation percentile; OZBorn – Fraction of evaluation percentile born in Australia; Atsi - Fraction of evaluation percentile defined as Aboriginal or Torres Strait Islanders; Female - Fraction of evaluation percentile identified as female; Married - Fraction of evaluation percentile married at each point in time; KidsD - Fraction of evaluation percentile with children; CondTKids – Average number of children amongst those with children at the evaluation percentile; University - Fraction of evaluation percentile with a university degree; Certificate - Fraction of evaluation percentile whose highest qualification is a trade certificate; Year12 - Fraction of evaluation percentile whose highest qualification is Year 12; DNFSchool - Fraction of evaluation percentile who did not complete high school.

Lower Partition: Employment - Fraction of evaluation percentile defined as employed; FT - Fraction of evaluation percentile defined as in full-time employment; PT - Fraction of evaluation percentile defined as in part-time employment; Hours – Annual hours worked amongst those employed in evaluation percentile;

Figure 1: Unemployment and GDP Growth, Feb 1978 – Jan 2011

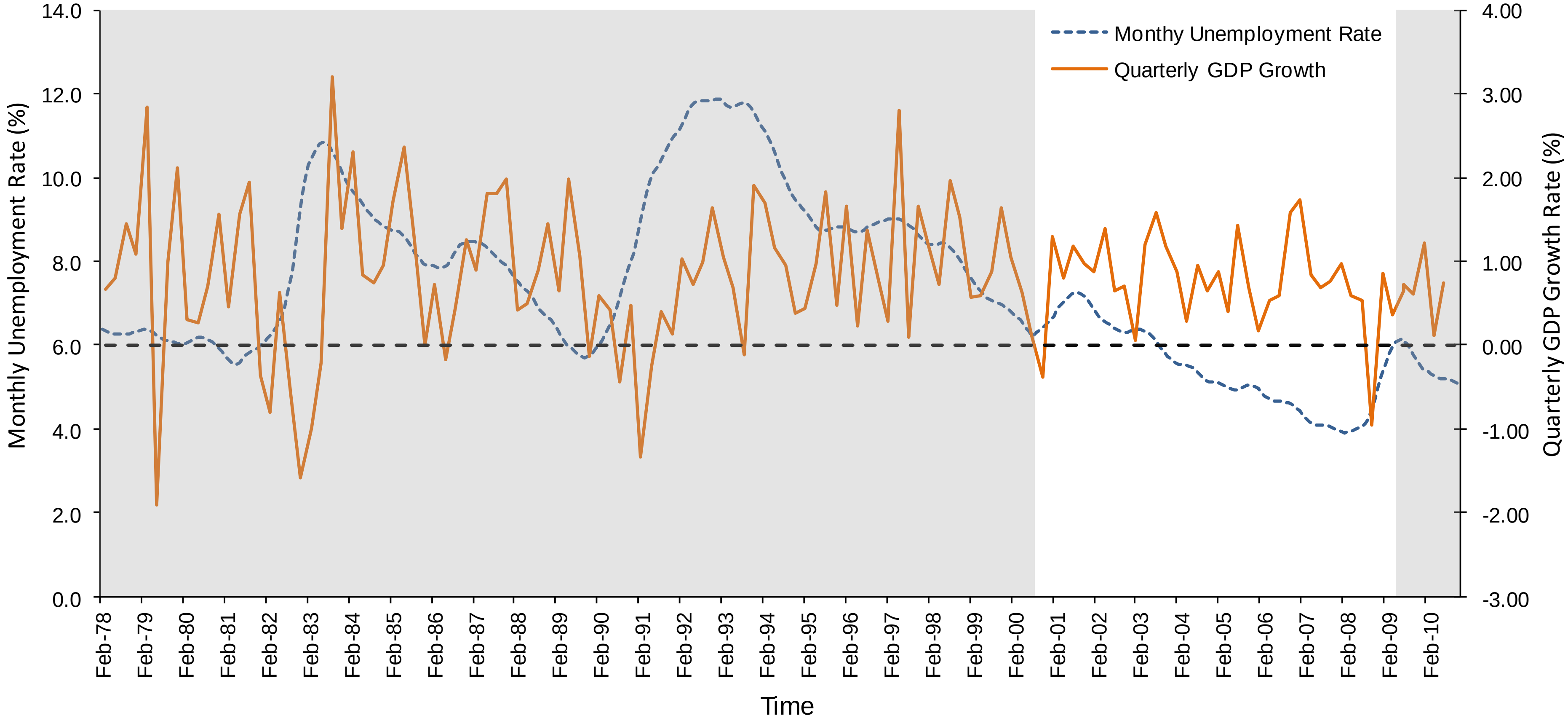
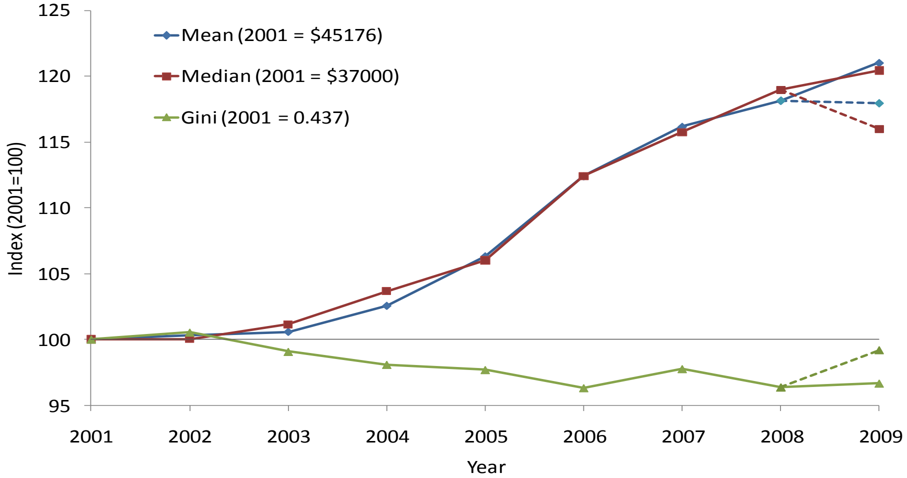
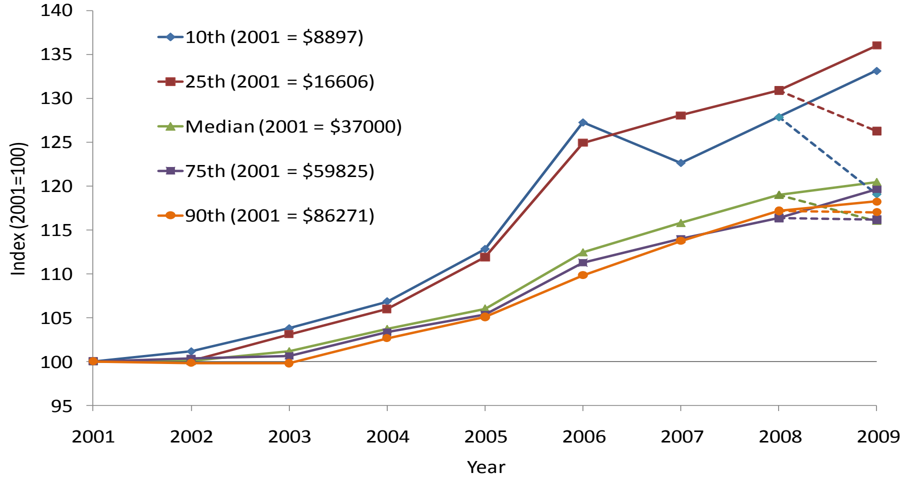


Figure 2: Income and Earnings Trends, 2001 - 2009

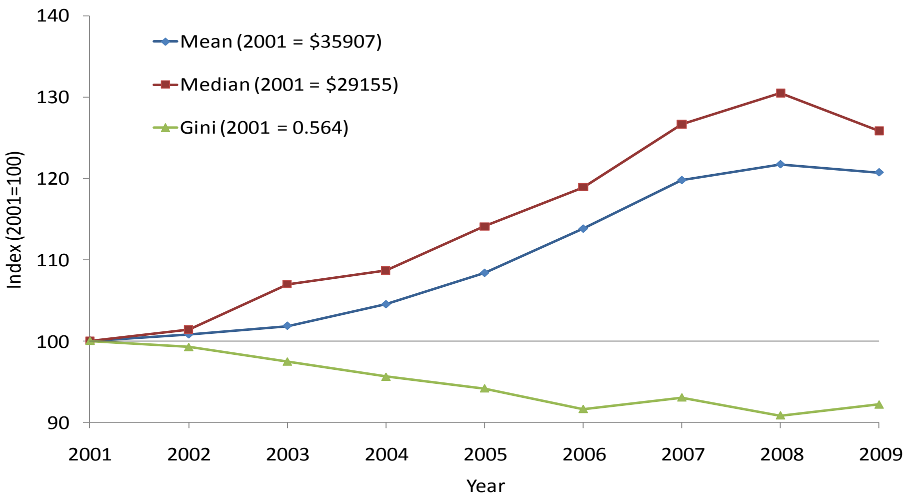
(a) Real Annual Income



(b) Real Income Percentiles, Relative to 2001



(c) Real Annual Unconditional Employment Earnings,



(d) Real Conditional Earnings Percentiles, Relative to 2001

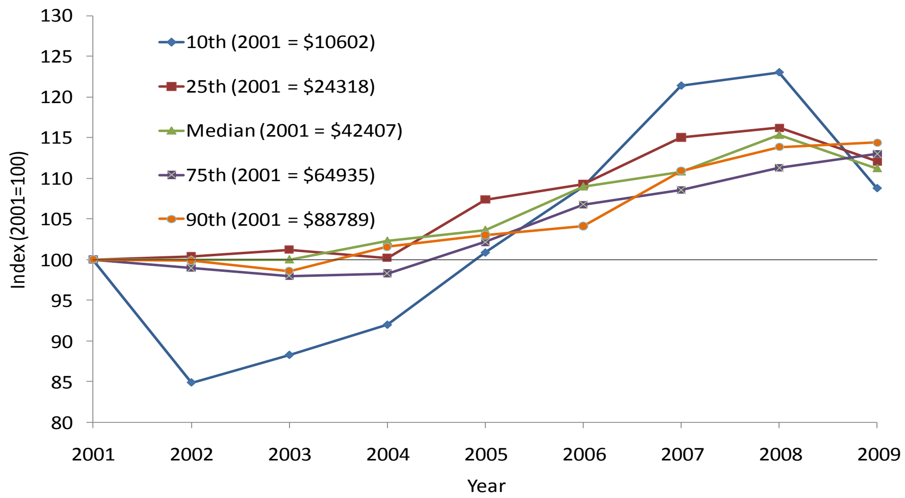
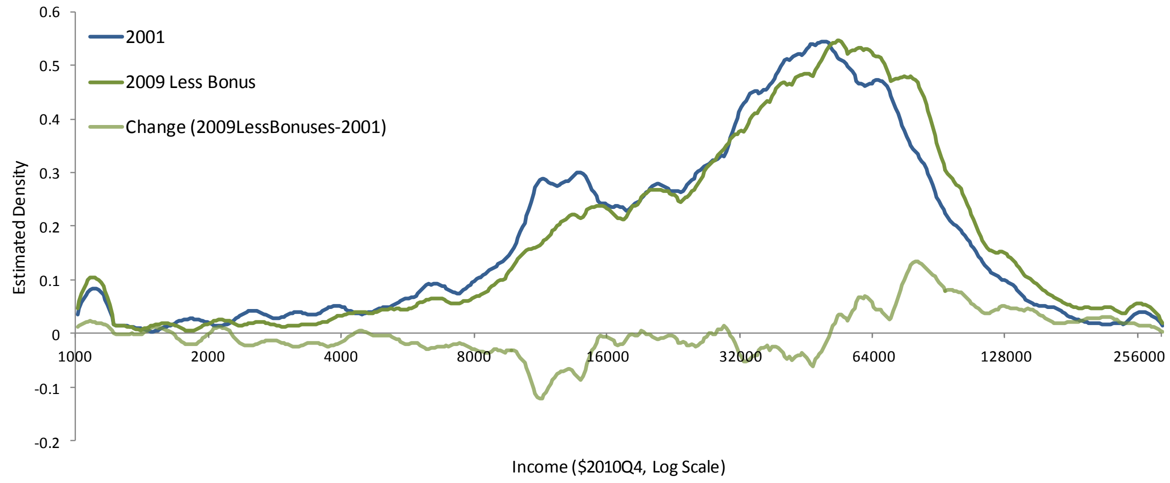
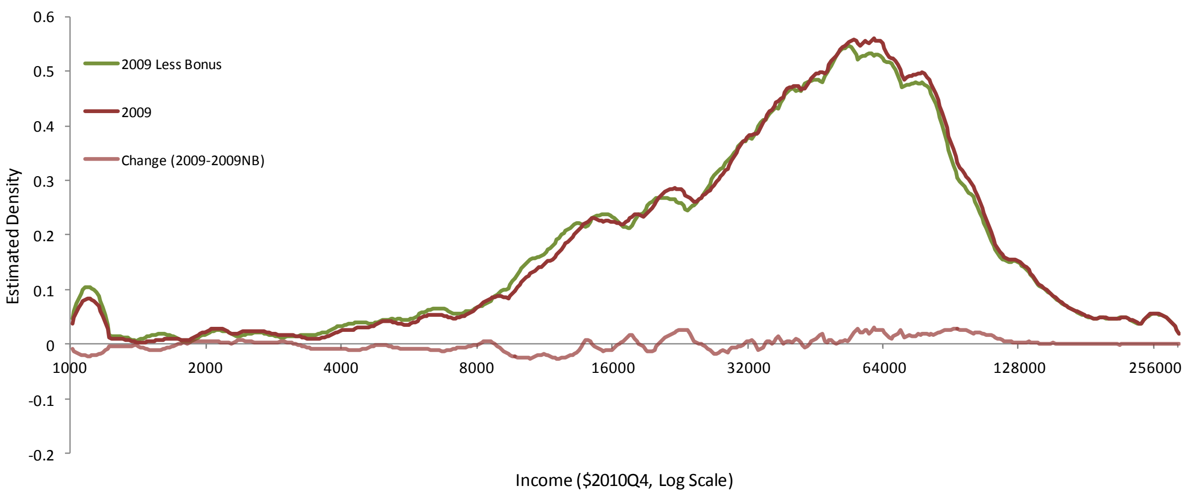


Figure 3: Individual Earnings and Income Distributions, 2001 and 2009

(a) Annual Income Distribution, 2001 – 2009 without Bonus



(b) Annual Income Distribution, 2009 without Bonus – 2009 with Bonus



(c) Annual Earnings Distribution, 2001 – 2009

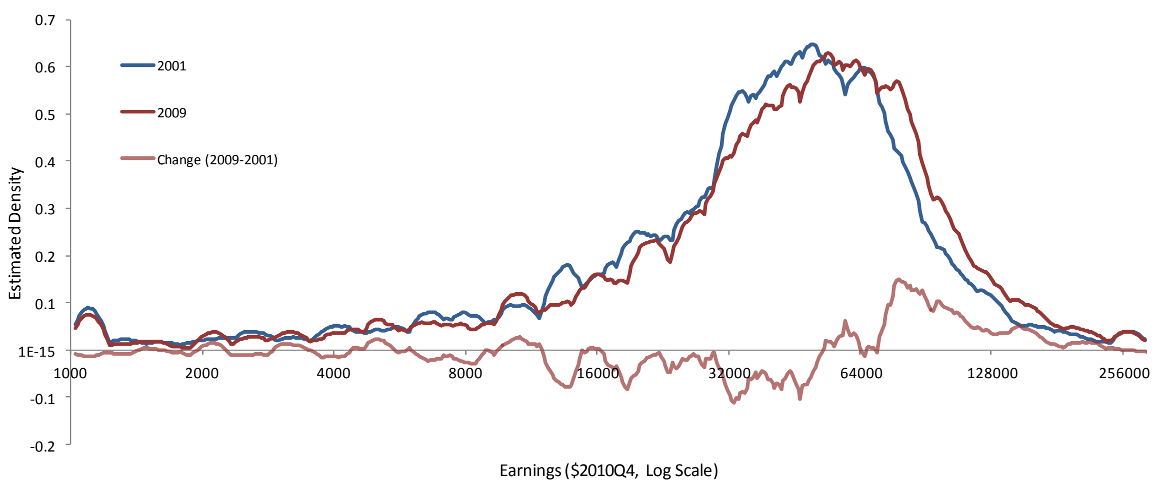
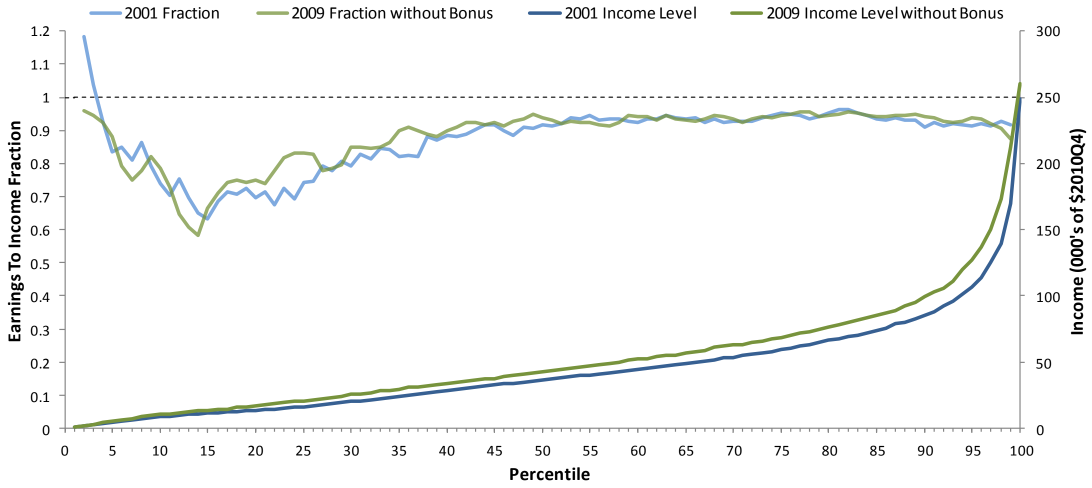
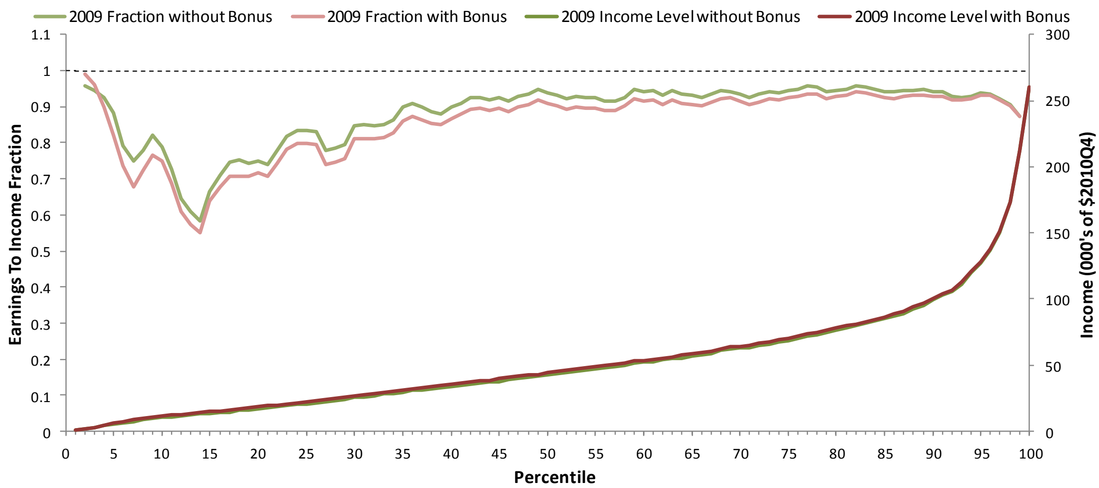


Figure 4: Contributions to Individual's Income Levels and Changes, 2001 – 2009

(a) Income Levels and Earnings Contributions, 2001 and 2009 without Bonus Payments



(b) Income Levels and Earnings Contributions, 2009 with and without Bonus Payments



(b) Change in Income and Earnings, relative to 2001

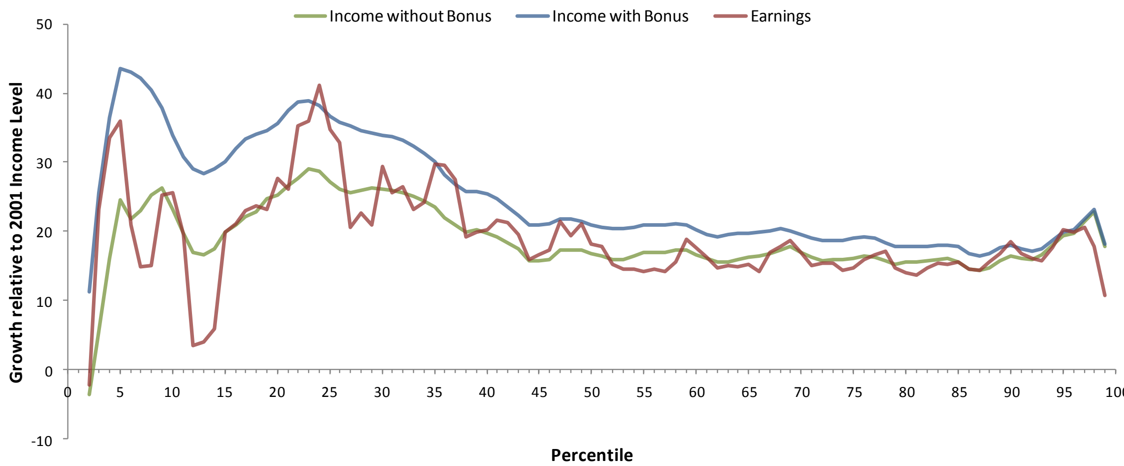
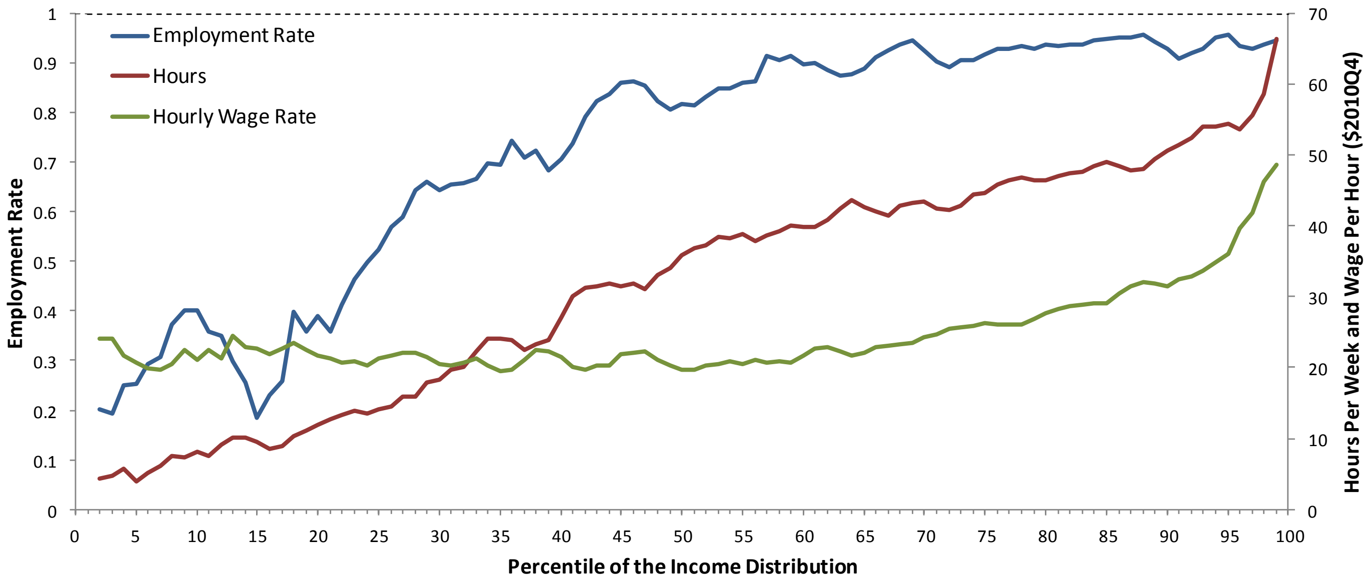


Figure 5: Individuals Employment, Hours Worked and Hourly Wage

(a) Averages, 2001



(b) Changes, 2001 - 2009