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Income Inequality in New Zealand: Why Conventional Estimates are Misleading

by

John Creedy and Norman Gemmell*

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Abstract

Considerable attention is currently being paid to establishing the extent of inequality in New Zealand and whether it has risen in recent years. This paper offers some insights into the inequality measures and interpretations that commonly feature in those debates. These typically relate to *cross-sectional* inequality, such as annual Gini coefficients for various income definitions, or comparisons of income growth rates across income deciles. But failure to take into account the *longitudinal* dimension of inequality can lead to misinterpretations of inequality data and measures. The paper shows that examining longitudinal income data for *the same* individuals over time strongly contradicts cross-sectional inequality evidence. For example, some recent cross-sectional inequality measures suggest that the incomes of initially low-income households grew at slower rates than those with initially higher-incomes. This has been interpreted as the poorest earners being 'left behind'. But recent longitudinal data, at least for individuals, reveals evidence of much faster-than-average growth among initially lower, compared to higher, income earners. Thus, 'regression to the mean' is a dominant feature of the longitudinal data.

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1. Introduction

A great deal of attention is currently being paid to establishing the extent of inequality in New Zealand and whether it has risen in recent years. With the work of the recently elected Labour government's 2018 Tax Working Group well underway, and a proposed Welfare Working Group also to be established, the ability of tax and welfare policy to affect the inequality properties of the income distribution has also become a central political issue.

When summarising inequality, commentators generally recognise the need to specify the precise income measure, whether it is pre-tax or disposable income, or consumption expenditure. They also usually make the important distinction between individual and household or family incomes, where use of the latter recognises income sharing within households and differing needs of adults and children, along with possible economies of scale in consumption expenditure. Hence, results are often obtained where the 'household income per adult equivalent person' is treated as if it is obtained equally by each household member.[1]

However, considerably less attention is usually paid to the time period, or accounting period, over which income is measured, yet this has important implications not only for orders of magnitude but for attitudes to measured inequality. This is easily illustrated using the simplified case of just two individuals (A and B) and two time periods (1 and 2), where 100 income units are available in total in each period (and discounting is ignored). Suppose A receives 80 units in period 1 and 20 units in period 2, while B receives 20 units in period 1 and 80 units in period 2. The only difference between the individuals is that they have different time patterns of income.

When measured over a single period there is substantial inequality (in each year the richer person obtains four times the income of the poorer person), but over the two periods they have equal total incomes of 100 each. The attitude taken to inequality in this case is likely to differ substantially from a situation in which there is rigidity in the distribution and person A receives 80 units in each period. Of course, attitudes are also likely to depend significantly on the reasons for the relative income changes, and while some equalising mobility is likely to be regarded as 'good', reflecting opportunities for improvement, there could be 'excessive' mobility if this reflects considerable uncertainty. The choice of time period clearly depends, like that of the income and inequality measures used, on value judgements: there is no unambiguously 'correct' or 'objective' measure.[2]

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[1] A set of 'adult equivalent scales' is used by which each individual is assigned an 'adult equivalent size' (with a value of 1 for adult males). This assumption is not 'innocent', in that equal sharing is a strong assumption, made pragmatically in the face of a lack of information. Furthermore, the use of the individual as the 'income unit' in producing inequality measures can actually lead to a preference for inequality: that is, a transfer from a poor to a richer household may be preferred if the richer household is larger and has substantial economies of scale in consumption. For an introduction to the issues involved in the choice of income unit, see Creedy (2017).

[2] The choice also depends on the context. For example, weekly incomes display considerable variability compared with longer-period incomes, yet a case may be made for a redistributive transfer system based on weekly incomes. Broader judgements about income inequality and the desired progressivity of an income tax structure may continue

The relationship between short and long-period measures of inequality, while complex, clearly depends on the precise nature of relative income mobility. While the most common summary measures are reported for annual incomes, it is argued here that comparisons should be supplemented by information about such mobility. This requires the use of longitudinal data, whereby individuals can be tracked over a number of periods. Although such data are relatively scarce for New Zealand, failure to take into account the longitudinal and mobility dimension of inequality can lead to misinterpretations of reported inequality measures.

For example, most of the inequality measures quoted in recent New Zealand debates relate to *cross-sectional* inequality, such as Gini coefficients for various income definitions across a number of years. When considering income changes over time, comparisons of income growth rates of deciles of the annual income distributions are made, using only cross-sectional data. Hence, this does not identify how far *the same people* remain towards the bottom or top of the income distribution, or the extent to which movement within the distribution occurs over time.

This paper examines some longitudinal income data for individual New Zealand taxpayers and shows that, whereas inequality measures based on population cross-sections tend to suggest that the income of (initially) lower income groups grew at similar or slower rates than those with initially higher incomes, this is strongly contradicted by longitudinal data. Indeed, there is conclusive evidence of faster-than-average growth for those with initially lower incomes. The phenomenon of 'regression to the mean' seems to be a dominant feature of the longitudinal data.[3]

First, section 2 briefly summarises the evidence usually provided about cross-sectional (annual) income inequality in New Zealand, and about differential income growth rates. Section 3 demonstrates how longitudinal income data, to measure relative income changes of individuals (rather that changes in deciles of annual income), provide valuable additional information that has typically been ignored in popular debates. This section makes use of Inland Revenue Department (IRD) data which track a constant sample of individuals over a number of years. The data necessarily refer to individuals, which is the relevant unit used for income tax assessments. Hence, they cannot reflect the way these are combined into families or households, or the extent to which they may be shared. Brief conclusions are in section 4.

2. Cross-Sectional Inequality Evidence

Contributors to New Zealand policy debates on income inequality invoke a variety of inequality measures for alternative definitions of income. Two readily available indicators are the taxable income distributions from Inland Revenue and the numerous distributional measures reported in Ministry of Social Development (MSD, 2017 and previous annual editions). Two

to be based on the use of a longer accounting period. For example, students may be poor in annual terms but subsequently rich in terms of lifetime incomes.

[3] This phenomenon has also been observed to be strong in earlier studies for New Zealand: see, for example, Creedy (1996), Creedy et al. (2018).

examples are given below to illustrate the type of comparison given. Table 1 shows the percentage of taxpayers, taxable income and assessed tax paid by the top and bottom 10% (approximately) of the taxpaying population, and similar values for the top and bottom 50%.

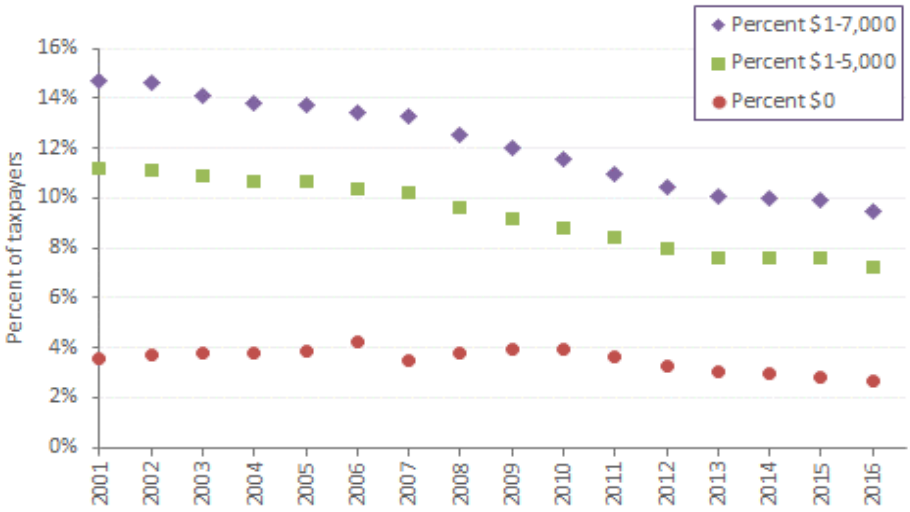
Table 1 2016 Percentage Shares (excluding zero taxable incomes)

Year: 2016	Taxpayers	Taxable Income	Assessed Tax	Income range ($)
Bottom	9.7	0.7	0.4	1 – 7,000
top	10.0	33.5	45.4	87,001 – 150,000+
Bottom	49.5	17.2	10.6	1 – 31,000
top	50.5	82.8	89.4	31,001 – 150,000+

Source: Inland Revenue data: http://www.ird.govt.nz/aboutir/external-stats/revenue-refunds/income-distrib-individual-customers/income-distrib-individ-customers.html

Table 1 reveals that the lowest 10% of taxpayers (earning $1 – $7,000 per year) received less than 1% of all taxable income, while the top 10% (earning over $87,000 in 2016) received around 34% of total taxable income. However, those low-income taxpayers are on *very* low incomes. By comparison, the annual gross-of-tax New Zealand Superannuation (pension) in 2016 was around $23,000 for a single person. Hence the lowest 10% of taxpayers are likely to be part-time earners, students, or children, who are all subject to large transitory income changes over time; see Creedy et al. (2010) for a detailed decomposition of the lowest income taxpayers by type. This serves to emphasise the limited value of focussing on the lowest income decile (or indeed the lowest two deciles, with incomes below $15,000 in 2016) since these are unlikely to provide a representative picture of individuals in income poverty.

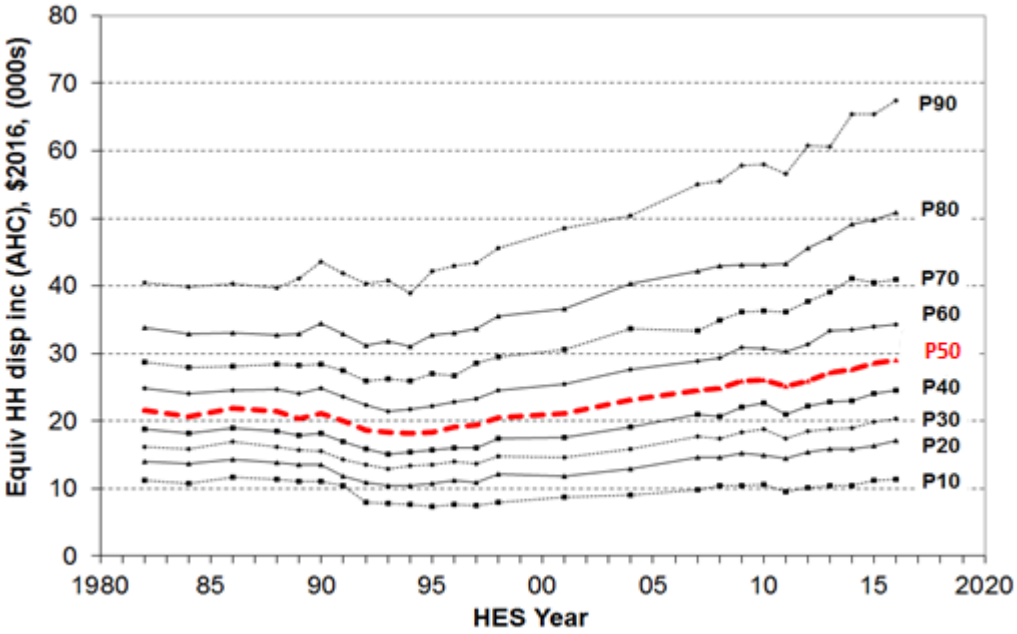
Figure 1 Percentage of All Income Taxpayers on Zero or Low Incomes, 2001-16



Based on the same data source, Figure 1 shows how the share of total taxpayers with incomes of $0, $1-5,000, and $1-7,000 changed over the 2001 to 2016 period for which comparable data are available. Figure 1 shows how the share of those on very low incomes has changed over the 2001-16 period. It can be seen that zero earners represent about 3-4% of all taxpayers, with a slight decline in recent years. The Figure also shows the share of taxpayers earning less than $5,000 and $7,000 per year. This reveals a steady decline in both groups which might be expected since these nominal income thresholds represent declining real incomes over the period. However, CPI data for the period shows that $5,000 in 2001 is approximately equal in real terms to $7,000 in 2016. Hence, in real terms, the 2016 value for "$1–7,000" can be compared with the 2001 value for "$1–5,000". This indicates that the share of taxpayers with those low real incomes fell from around 11.2% in 2001 to 9.4% in 2016. That is, the share in total taxpayers of the lowest (real) income taxpayers has fallen over the 15 years.

Of course, these data are highly selective, focusing on only small segments of the taxpaying population, and are based on a series of annual cross-sections of the income distribution. More comprehensive coverage of household incomes, rather than individual taxpayers, but still based on annual cross-sectional data, is provided by the Ministry of Social Development in their regular publication on household incomes in New Zealand; see, for example, MSD (2016, 2017). Since households differ by size and composition, as mentioned in section 1 above, MSD use total household income per adult equivalent person as their income measure, and use the individual as unit of analysis. Two of their examples are shown in Figures 2 and 3.

Figure 2 Real Equivalised Household Incomes (AHC) at Decile Boundaries, 1982-2016

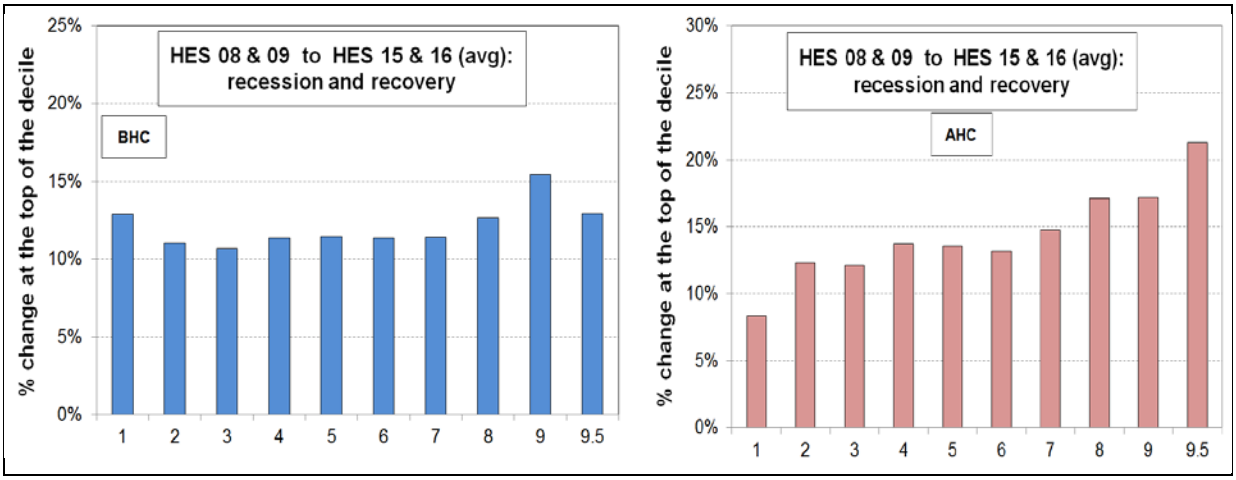


Source: MSD (2017, p.75, Fig. D6). *Note*: AHC = After Housing Costs

Figure 2 shows deciles of the distribution of annual household incomes (after housing costs) for 1982 to 2016 from MSD (2017).[4] Their commentary states: "from a longer-term perspective: in HES 2016, household incomes at the top of the bottom decile were no better than they were in the 1980s. This is the only decile for which this is the case, though for P20 the gain is small" MSD (2017, p.75).[5] More generally, these data are often incorrectly interpreted as evidence of the lower income deciles 'falling behind' the top deciles in real income growth, or even that real incomes are falling absolutely for lower income households.

These messages appear to be reinforced by evidence on the income growth rates by decile of the income distribution, such as those shown in Figure 3, from MSD (2017) for a 'post global financial crisis period' (2008-09 to 2015-16).

Figure 3 Real Equivalised Household Incomes: Changes at Each Deciles



Source: MSD (2017, p.65 & 76; Figs. D2 & D10). *Note*: BHC (AHC) = Before (After) Housing Costs.

Data in the left panel are for income *before* housing costs, and appear to show approximately similar income growth rates at most deciles, while the right panel, for income *after* housing costs, show distinctly larger income growth rates for those in initially higher income deciles

[4] Overall patterns look similar when based on incomes *before* housing costs (BHC), though there is more evidence of higher real incomes for the lowest deciles at the end of the period compared to the 1980s; see MSD (2017, p. 75).

[5] Interestingly, these interpretations can be quite sensitive to new annual data becoming available. For example, based on data for one less year, 1982-2015, MSD (2016, p.72) state, "In HES 2015, household incomes at the top of the bottom decile were lower in real terms than they were in the 1980s. This is the only decile for which this is the case, though for P20 the gain is very small".

compared to lower deciles.[6] Indeed, there is a fairly systematic pattern of higher growth associated with shifts from lower to higher deciles. That is, richer households seem to be moving away from poorer households in terms of their real income levels, over 2008/09 to 2015/16.

However, such an interpretation is based on a misunderstanding of the difference between 'income growth rates for *different individuals* with the same low initial incomes' and 'income growth for the *same individuals* with initially low incomes'. The former is observed from a series of cross-sectional 'snapshots' such as those above, whereas the latter requires longitudinal data for the same individuals over time. Longitudinal evidence for New Zealand is examined in the next section.[7]

2. Inequality Evidence from Longitudinal Data

To examine longitudinal income data comparable to the cross-sectional evidence for households presented in section 2, would involve tracking the same *households* over time. However, data to allow this for New Zealand are currently limited to the Survey of Family Income and Employment (SoFIE) data which is only available for the 2002-10 period, for a relatively small sample.[8] With the increasing scope and availability to researchers of matched household-level data in the Integrated Data Infrastructure (IDI) at Statistics New Zealand, such longitudinal household income analyses may soon be possible. However, it should be recognised that the use of households is considerably complicated by the fact that their size and composition changes over time, as a result of births, deaths, family division and formation, and so on. The use of individual data in this section avoids those complications.

With access to Inland Revenue's confidentialised longitudinal individual taxpayer data, Creedy and Gemmell (2017, 2018) examined the growth rates of taxpayer incomes across the individual (as opposed to household) income distribution for three five-year periods: 1998-2002, 2002-06 and 2006-10. This section reports on some of those longitudinal results and assesses them against directly comparable cross-sectional evidence.

The data used in this section are for a 2% random sample of individual New Zealand Inland Revenue personal income taxpayers. Using data for 2002, 2006 and 2010, results for two

[6] The growth rates here refer to income growth rates for the household at each decile: 1 (at the 10th percentile), 2 (at the 20th percentile), and so on, of the income distribution, not average growth rates for households between relevant deciles; for example, between the 10th and 20th percentiles.

[7] MSD (2016, p. 65) points out this distinction by stating that, "In interpreting the time series analysis that is based on the HES data (as above), it is important to understand that the HES provides repeat cross-sectional data with different people interviewed each survey. The HES does not follow the same individuals across time. Some individuals do stay in roughly the same income band for many years, some move up and some move down. The degree of income mobility in New Zealand is discussed in Section K using longitudinal data from Statistics New Zealand's Survey of Family, Income and Employment (SoFIE)." Unfortunately, SoFIE data cover only a limited number of years: 2001-09, and many commentators continue to ignore the above warning.

[8] See Carter and Gunasekara (2012) for some SoFIE-based mobility evidence. Individuals in all 7 waves of their SoFIE samples were around 18,000. Individuals in the IR data used in section 3 exceed 30,000.

separate panels are reported for 2002-06 and 2006-10, each (5-year) panel containing incomes for both years for the same taxpayers. This yielded usable samples of 31,355 and 32,970 individuals respectively.[9]

To identify longitudinal aspects, in each case individuals were ranked by their initial year incomes (2002 or 2006), with all of the diagrams below showing percentiles of the income distribution in the relevant initial year (2002 or 2006) on the horizontal axis. For cross-sectional comparisons, individuals were ranked in each of the two years, regardless of their rank in the previous or subsequent year. That is, they represent income distributions of different rankings of individuals that ignores their prior or subsequent status.

Figures 4 and 5, covering the periods 2002 to 2006 and 2006 to 2010 respectively, capture both longitudinal and cross-sectional aspects of inequality in the form of several Lorenz curves. In each panel two cross-sectional Lorenz curves are shown where individuals are ranked by their incomes in the initial and final year: 2002 and 2006 (in Figure 4) and 2006 and 2010 (Figure 5). In both panels the two Lorenz curves can be seen to be almost indistinguishable from each other, indicating little difference in a Gini-based cross-sectional measure of inequality for each year. For 2010, the Lorenz curve mostly lies slightly outside the 2006 equivalent, though some crossing of the two curves can also be seen.

Two important messages arise from those charts. Firstly, it is known that increasing the length of the accounting period tends to reduce inequality measures such as the Gini coefficient, for example as incomes are measured over 1, 2, 5, 10 years etc.[10] This aspect is evident in Figure 4 where, in each panel incomes in both years for each individual are added (and the average ranked by initial year incomes). While this does not include incomes for *all* years over the two five-year periods, it does demonstrate the effect of extending the accounting period. It can be seen that this Lorenz curve for *two years* of income data lies wholly inside the two equivalent curves for 2002 and 2006 (Figure 4) or 2006 or 2010 (Figure 5). That is, longer-term incomes display noticeably less inequality than either of the annual cross-sections. These curves confirm that substantial reductions in inequality as the income period is lengthened are consistent with the relatively unchanged cross-sectional patterns that are also observed in Figures 4 and 5.

[9] To avoid the exercise being contaminated by taxpayers with very low incomes (such as small part-time earnings of children, or small capital incomes of non-earners), individuals with annual incomes less than $1,000 were omitted from the sample.

[10] See, for example, Laws (2014) and Creedy et al. (2018) for New Zealand evidence.

Figure 4 Lorenz Curves: 2002-2006

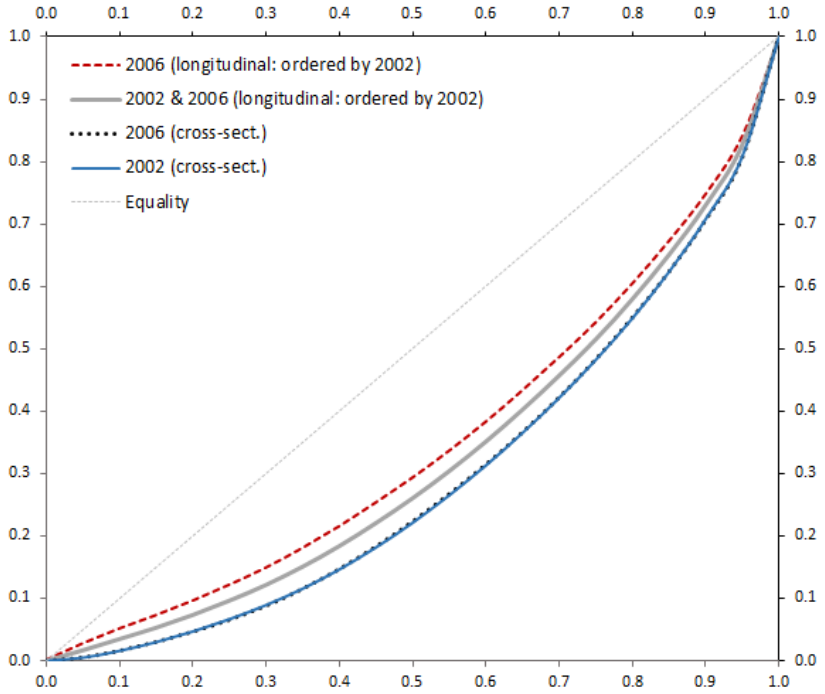
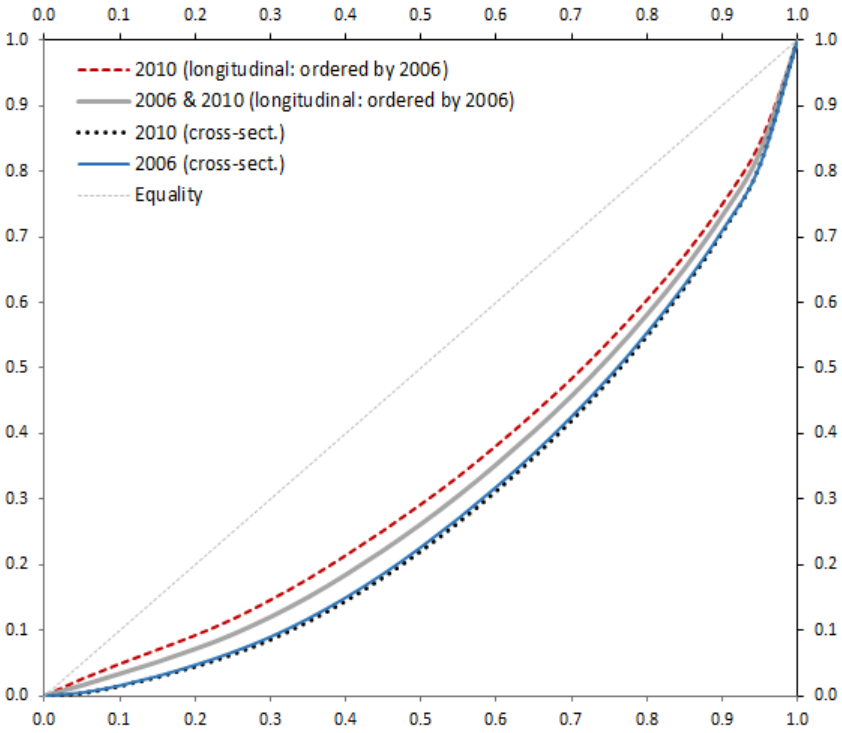


Figure 5 Lorenz Curves: 2006-2010



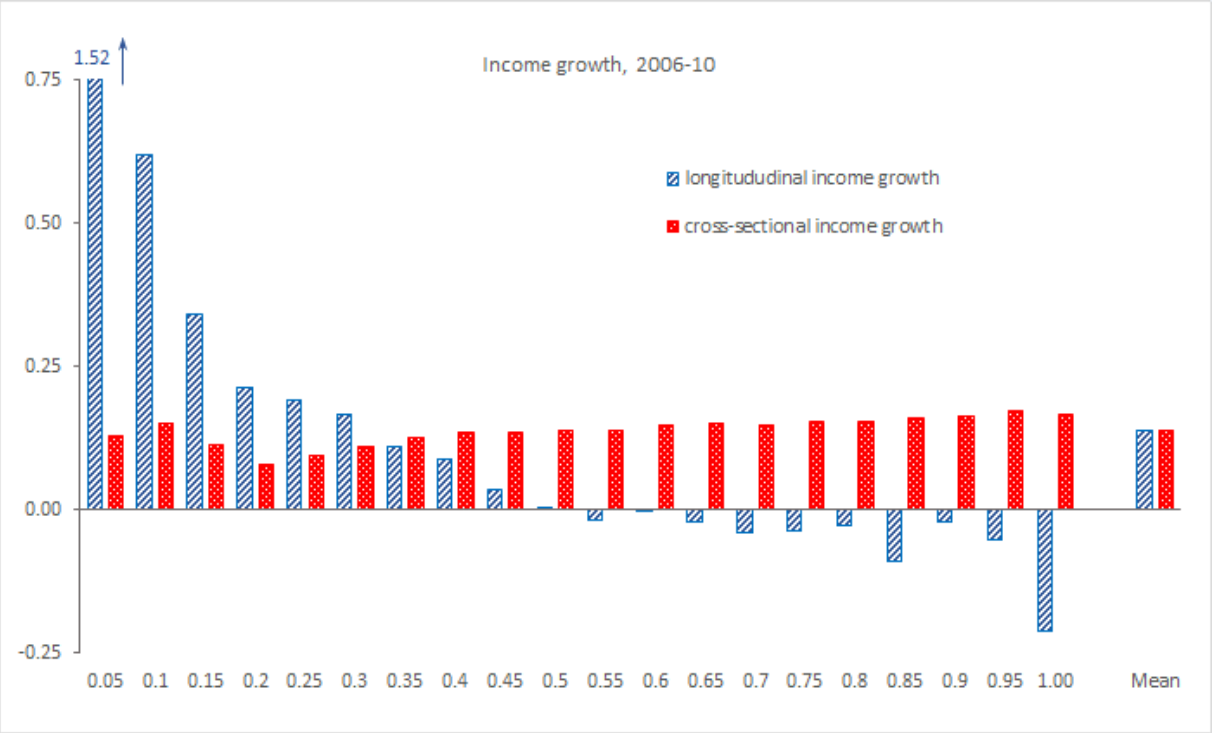
Secondly, in Figure 5, when longitudinal dimensions are introduced explicitly by ordering income in both 2006 and 2010 for each individual by their 2006 incomes, a further distinct reduction in inequality is apparent. That is, the "2010 longitudinal (ranked by 2006)" curve lies everywhere closer to the line of equality than any of the other curves in the chart. Similar patterns can be observed in Figure 4 for 2002 to 2006. The Gini coefficient is the area between the Lorenz curve and the line of equality, expressed as a fraction of the total area below the line of equality. Hence, it follows that for both these periods the 'longitudinal based Gini' must be smaller than the cross-sectional based Ginis.

An alternative, and in some ways more insightful, means of comparing the different inequality outcomes captured by cross-sectional and longitudinal dimensions of the data, is to examine growth rates over the two periods, 2002 to 2006 and 2006 to 2010, by different groups within the (initial) income distribution.

These are shown by ventiles (twenty equal sized divisions) of the income distribution in Figures 6 and 7, for 2002 to 2006 and 2006 to 2012 respectively, which allow for a more fine-grained comparison than income deciles.

Figure 6 Income Growth Rates: 2002 to 2006

Figure 7 Income Growth Rates: 2006 to 2010



The cross-sectional growth rates by ventile are obtained by ranking individual incomes from lowest to highest separately for each year. Growth rates are then estimated for the incomes of the lowest to the highest individual, who will generally *not* be the same person in both years. These growth rates are then averaged within ventiles; with over 30,000 individuals in total there are in excess of 1,500 in each ventile. These are shown by the red bars in Figures 6 and 7, with values on the horizontal axis representing the ventile, 0.5, 0.10 … 0.95, 1.0. Longitudinal growth rates, on the other hand, relate to the income growth of the same individual with ventiles based on the initial income ranks (2002 or 2006).

It can be seen in Figure 6, for 2002 to 2006, that growth rates based on cross-sectional data are similar across ventiles, with most generally close to the mean for the whole sample, and there is no obvious pattern towards systematically higher or lower growth rates across the ventiles. By contrast the (blue, hatched) longitudinal-based growth rates demonstrate that income growth over the five years was systematically higher for low, compared to high, income ventiles, with clear evidence of substantial regression towards the mean across the ventiles.

For example, on average individuals who were initially in the lowest 5% of incomes in 2002, experienced much faster income growth over 2002-06 than individuals in the highest ventiles. Indeed, for those in above-median ventiles income growth was negative on average, especially for the top 5% of taxpayers. A similar pattern is observed in Figure 7, for 2006-10, but here the cross-sectional income growth rates demonstrate some tendency for higher ventiles to

experience faster growth than lower ventiles (at least for those from around 0.2 upwards). Longitudinal-based ventiles however continue to reveal that when the same individuals are observed, the initially lowest income taxpayers experienced the fastest subsequent income growth.

Thus, if inequality of income growth experience is assessed by reference to income growth rates across ventiles or deciles (as in Figure 2), this leads to the impression that the poorest have been 'left behind', as those on initially higher incomes experience faster growth. However, this obscures the evidence that if income growth rates for the initially poorest are considered, this conclusion is not supported. Rather, some higher-income individuals move down the income distribution over time, and vice versa, such that when comparing the incomes of the 'old lowest' to the 'new lowest', observed income growth rates are similar.

3. Conclusions

The clear conclusion from this examination is that a great deal of care is required when interpreting evidence on inequality based on income growth rates across deciles (or other divisions) of the income distribution. Since contributors to inequality and poverty debates often begin by asking how increases in incomes or welfare of the initially poorest compare with those initially better off, the relevant evidence is longitudinal, not cross-sectional. On the other hand, if concern is with the poorest in any or all periods for which data are being examined, then care needs to be taken to recognise the extent to which people move between income bands over time. In this case, estimating inequality using Gini or similar indices that are measured over several years provides a clearer picture of longer-term inequality as distinct from that which is observed from annual data which include a mixture of persistent and transitory components.

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