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Issues in the analysis of inequality

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Conceptual and measurement issues

Inequality exists within a range of forms. There is aggregate inequality within a population which might be measured with an indicator like the Gini coefficient, the Theil index, one of the family of Atkinson measures, or a decile ratio or related measure. The choice of indicator is not innocent: levels and trends tend to vary with the measure used. There is also inequality between population subgroups: for example, wage differences between women and men, immigrants and the native-born, young and old, and visible minorities and non visible minorities. Trends in the differences between population subgroups in income are likely to influence trends in aggregate inequality, but are interesting in their own right.

The levels and trends in aggregate inequality found in research are not only influenced by the inequality measure used but also by the data source and a variety of data processing decisions. Atkinson’s (2008) compendium of earnings data for OECD countries for example, contains one series that suggests that the difference between earnings at the 90th percentile and the median in Canada is smaller than it is in the United States and another suggesting that it is larger (Figure 1).

The differences in magnitudes are not small. Frenette, Green and Picot’s (2006) study of inequality in the incomes of families turns up appreciable differences in the levels and trends of Gini Coefficients depending on whether survey or tax data are used (Figure 2).

![Figure 1: Earnings at 90th percentile relative to median: Canada (two series) and US](image-url)
Using US data, Lerman (1997) shows that between 1986 and 1995 earnings inequality rose by a lot, by a little, or not at all, depending on whether the sample is confined to women, men, or includes both (Figure 3). (Wolfson and Murphy, 2001, show something similar for Canada.)
MacPhail (2000) examined the effects on earnings inequality of top coding levels (assignment of cases above a particular level to a single, maximum, value to protect confidentiality), data cleaning exclusions at the top and bottom of the earnings distributions, decisions to include or exclude the self-employed, use of hourly, weekly, or annual earnings, gender choices of the sort examined by Lerman, and data set choices. Her results reveal substantial differences across a range of inequality measures in both levels and changes (Figures 4 and 5).

**Figure 4: Changes in Gini coefficient for earnings: Canada 1981-1989**
(SCF unless otherwise indicated)

Source: MacPhail, Applied Economics, 2000

**Figure 5: Gini coefficients for earnings, Canada, 1989**
(SCF unless otherwise indicated)

Source: MacPhail, Applied Economics, 2000
None of these methodological difficulties challenge the conclusion that earnings inequality has risen in Canada, the US, and elsewhere or that the rise has been substantially driven by very large increases at the top of the distribution. However, because the sort of choices examined by MacPhail clearly influence estimates of the magnitude and timing of trends it is very likely that they also affect estimates of associations between inequality and other outcomes of interest. There is a considerable body of research on the association between inequality and the business cycle, trade exposure, economic growth, and policy changes, among other things. It is likely that the results of those studies were sensitive to the data source and measurement issues discussed above. Moreover, when the sample of countries is broadened and some summary source is used - like the World Bank’s compendium of inequality indicators - problems of data quality and comparability become even more acute. Atkinson and Brandolini (2009) have discussed the methodological problems of cross-national research on inequality in some detail.

The causes of rising inequality

There is an ‘orthodox’ and there is a revisionist account of rising inequality, both developed primarily using US data. The orthodox account (e.g., Autor, Katz, and Kearney, 2008) starts from the observation that there have been several decades of innovation in information and communication technologies (ICT). The productivity of more skilled employees tends to be increased more by these technologies than does that of less skilled employees. This technological change has been, then, skill-biased and its effect has been to increase the demand for the more skilled relative to the less skilled. Unless the supply of skilled employees rises to match the increase in demand their pay will rise and, because the more skilled are paid more to start with, the difference between their pay and that of the less skilled - that is, inequality - will rise. In the United States the growth in the supply of people with a college education slowed from the 1980s. The result of all this was rising earnings differentials associated with two indicators of skill: education and work experience.

This account has evolved to come to grips with the fact that so much of the rise in inequality has been caused by very large rises in earnings at the top of the distribution (the 95th percentile and above). ICT innovations, the argument goes, have little effect on the demand for a range of manual and service workers whose jobs cannot be replaced. Examples of these jobs are “health aides, security guards, orderlies, cleaners, and servers” (Autor, Katz, and Kearney, 2008: 318). The innovations do, however, replace lots of mid level jobs - both white collar (e.g., claims processors) and blue collar (e.g., operatives). Some of the white collar jobs affected have been occupied by college graduates. It is this mid level group which experiences falling earnings. It is those in jobs requiring the exercise of a great deal of discretion, often requiring post graduate qualification, whose productivity has been most enhanced by ICT; investment bankers, for instance. Earnings inequality has risen at the top of the distribution, then, because the productivity of a relatively small number of very highly skilled jobs has been increased enormously by ICT while the pay of a set of mid level jobs replaced by the technology has stagnated or fallen. Pay at the very bottom of the earnings distribution has not declined. ICT cannot replace most of those jobs.

Early writings on skill-biased technological change (SBTC) identified a number of
problems with the account. First, pay differences had not only increased between skill levels; there had been an almost equal increase in inequality within skill levels. If it were the productivity enhancement provided by ICT to more skilled employees, why the increase in inequality among employees with, ostensibly, the same level of skills? Second, in the aggregate studies, at least, the technological changes driving rising inequality are entirely unmeasured. Moreover, the ICT revolution has gone through various stages: mainframes in the 1960s and 1970s, personal computers in the 1980s, then networked computers and web-based applications from the 1990s. It is reasonable to ask, how exactly, did each of these waves of innovation change the demand for different kinds of skilled employees? It is unlikely that they had identical effects. Third, and related to the previous point, occupations whose pay has increased the most - doctors and lawyers - are not obviously those most associated with the ICT revolution - systems analysts, electrical engineers, for example (Pryor and Schaffer, 1999). Finally (assuming that the available data are comparable and reliable) there has been substantial variation in the trend in earnings inequality across countries. It seems not to have risen at all in France. The increases in countries like the Netherlands or Austria have been rather small. But ICT has been adopted in all rich countries. International differences in outcomes suggest that institutions have played a role in where inequality has risen the most.

None of these issues is fatal to the SBTC account. Both education and experience are imperfect measures of skill. ICT may have caused the pay of the more talented within those skill groups to rise the most. Because it takes a while to figure out how to use them, general purpose technologies like ICT often take some time to produce the productivity improvements they promise, which makes it very difficult to associate any phase of innovation with any particular shift in earnings inequality. The occupational categories across which earnings increases have been compared are internally heterogeneous and comparisons of earnings outcomes are complicated by changes in supply. The failure of earnings inequality to rise (very much) in some countries may have come at an aggregate economic cost. These sorts of points are more persuasive in the absence of a plausible competing account.

But a competing account has been developed. It is heterodox because it proposes a number of distinct explanations of increases in earnings inequality as well as raising some questions about the data upon which conclusions about trends rest (Lemieux, 2006, 2007). First and foremost in this account, there is a set of institutional changes. In the 1980s earnings inequality rose in part through declines at the bottom of the distribution caused by federal freezing of the minimum wage in nominal terms, which had a spillover effect on minimum wage rates in many states. A large number of low paid jobs was created, particularly for women. Second, the rate of unionization fell and this affected inequality in two ways. In the lower part of the distribution fewer jobs commanded a union wage premium. In the upper part of the distribution, unions no longer force caps on pay, allowing more earnings differentiation among erstwhile members. Third, and related to the previous point, there has been a spread of performance-related pay that seems to be closely associated with the rapid growth of earnings at the top of the earnings distribution. For example, bonuses seem to have contributed mightily to the growth in bankers’ pay over the last couple of decades. Smith (2012: 174) gives some sense of the magnitudes involved for a quite junior Goldman Sachs employee in 2009. The effects of these bonuses certainly show up in the rising share of earnings in the 95th percentile and above.
Evidently, these institutional explanations are consistent with the variability in growth in earnings inequality across countries. Unions have not fared as badly in most countries as in the US. If there are cases of falls in the real value of the minimum wage over close to a decade in other countries I am not aware of them. And it is surely plausible to think that the extent and aggressiveness of use of performance related pay varies across countries - probably with the proportion of jobs in the financial sector.

Lemieux adds two extra considerations. One is the effect of the accumulation of more educated and experienced employees in the work force. Pay differences tend to increase with education and experience. That is, the variability in pay among college graduates is much larger than it is among high school graduates. Similarly, the variability among employees with twenty-five years of work experience is much greater than it is among those with five years. This can be readily understood. Educated and experienced employees tend to hold jobs that require the exercise of discretion. Exercising discretion provides demonstrable differences in performance that may be rewarded with different wage rates. Because earnings variability increases with education and experience a rising proportion of employees with more education and experience is likely to increase inequality. The proportion of more educated and experienced employees in the US did indeed rise over the period during which inequality increased.

Finally, how reliable are the data used to document the increases in earnings inequality that require explanation? Most US studies have used data from supplements to the Current Population Survey (CPS). The one used by the protagonists of SBTC is a March supplement. The ones favoured by Lemieux are the May and Outgoing Rotation Group (ORG) supplements. The main difference between the March and the May/ORG supplements is that the former does not contain a direct measure of the hourly wage rate. That has to be computed by dividing total annual earnings by hours of work. Lemieux argues that there is more measurement error associated with reported total earnings and hours of work than with reported hourly pay for workers paid by the hour. More random measurement error is likely to cause more variability in wages. Moreover, the proportion of US employees paid an hourly rate has increased over time so the size of that variability is likely to have increased too. Part of the increase in inequality, then, may be measurement error.

There are, then, two substantially different accounts of rising earnings inequality. Each side concedes some ground to the other, but not all that much. Neither appears ready to lay down arms.

**Population composition and inequality: Two examples**

1. Cohort size and relative earnings

A series of publications has explored the effects of cohort size on relative cohort earnings in the US (Easterlin, 1968, 1987; Macunovich, 2002). The argument assumes that the labour market can be approximately divided into jobs likely to be filled by young persons and jobs filled by older persons. The latter are most common in professional and managerial jobs for which experience is likely to be important. The number of young persons entering the labour market in any particular period is substantially determined by an earlier fertility rate. A consequence of the Great Depression was that fertility fell, which reduced the size of the cohort entering the labour
market in the late 1940s and 1950s. A smaller cohort competing for entry level jobs pushed up entry level wages which encouraged early marriage and increased fertility; it caused the baby boom. But the baby boom meant a larger cohort entering the labour market in the 1960s and early 1970s which pushed down entry level wages. This fall in earnings of young males in turn strengthened the incentive for their spouses to remain in, or to enter, the labour market; female labour force participation increased to protect family incomes against the effect of stagnant male wages.

Macunovich (2002) provides quite good evidence in support of aspects of this interpretation. For the 1965-1995 period cohort size 20 years earlier predicts the ratio of the earnings of young to prime age males, the male hourly wage rate, the college wage premium as well as residual wage variance (variance after controlling for state, education, and experience). These processes, it should be clear, are likely to have a number of consequences for inequality. Most immediately, they affect the relative pay of the old and the young. They are also likely to affect overall inequality. A large cohort of younger workers means a larger proportion of workers with lower pay. Insofar as the process led females to enter the labour market that also increases the proportion of lower paid employees.

Foot (1996) addresses some of these issues using Canadian data. But, overall, his treatment is casual. I find this lack of attention to this population composition issue a bit surprising, not least because we know that the relative pay of young Canadian workers declined appreciably for lengthy parts of the 1980s and 1990s (Picot, 1998).

2. Immigration

A significant proportion of US immigrants is poorly educated. Have they depressed the earnings of native-born citizens with poor education? In a stream of publications George Borjas has provided evidence that they do. By how much is less clear. The issue has usually been addressed by examining the association between immigrant proportions in metropolitan areas and the wages of the less skilled. There are problems with this method. First, immigrants mainly move to large cities. Average pay in large cities is higher than in small cities so unskilled pay is higher where immigrants settle. Second, a low skilled resident of, say, Mississippi might in the past have increased his or her pay by moving to California. Because Californian unskilled wages have been forced down by the arrival of unskilled migrants that pay-increasing option may no longer be available or the pay increment associated with a move may be too small to warrant it. Third, native-born people living in immigrant-receiving areas whose pay stagnates or goes down may choose to move to other metropolitan areas, or outside of metropolitan areas altogether. Using the standard method this would obscure the effect of immigration on their wages. Because of this Borjas (2003) proposed an alternative, national level, method for estimating the effect of immigration on wages: group immigrants into skill groups defined by education and estimate the association between changes in the immigrant proportion in a skill group and changes in wages.

Canada’s pattern of immigration is different. The points system selects immigrants who, on average, are more highly educated than the native-born. This might lead one to expect that immigration reduces earnings at the top of the distribution rather than at the bottom. Aydemir and
Borjas (2007) used Borjas’s method to estimate the effects of immigration in the two countries. They estimated that, in the long run, immigration reduced the earnings of low skilled workers by about 4% in the US and reduced the earnings of college graduates by about 6% in Canada.

This is an interesting result. It suggests that the most direct effect of immigration in Canada has been to reduce inequality by squeezing down earnings at the top of the distribution. But there may have been other effects. Beach and Finney (2004: 236) speculate as follows.

the downward shift in age-earnings profiles of recent young entrants (relative to earlier cohorts) in the early to mid-1990s coincides with high immigration rates over a strong recession. It would be useful to analyse to what extent, if at all, keeping the immigration tap on over this period influenced this cohort effect among young entrants, since both groups represent essentially new entrants to the Canadian labour market and hence the margin that would likely be severely hit by recessions

On the one hand, then, immigration appears to have reduced inequality by exerting pressure on the wage levels of college graduates, who tend to have high earnings. On the other hand, it may have increased inequality by putting pressure on the earnings of young, new entrants, to the labour market whose wages tend to be lower.

Some conclusions

- The effects of pre tax and transfer inequality can be and are reduced through the tax and transfer system.
- If the institutional account is correct then pre-tax and transfer inequality might be reduced through institutional change - increased minimum wages, facilitated unionization, legislated limits on executive compensation, for example. Such policies would, of course, have other effects. Deciding on whether these sorts of institutional change are worthwhile would require weighing such other effects against any reduction in inequality.
- The broad trends in earnings inequality are clear: it has risen, particularly driven by rising earnings at the top of the distribution. But measurements of inequality are fairly fragile. This suggests that policies that treat inequality as a problem and try to weaken its causes and ameliorate its consequences should be formulated with some caution.
- There is first rate research using US data on the effects on inequality of changes in population composition. There is much less such work in Canada. I tend to think that there are good reasons to hope to see more of it.
- Inequality measures are necessarily abstract. There may be something to be said for fleshing out what inequality means in practice. Atkinson (2008) provides estimates of differences between earnings at the 90th and 95th percentiles and earnings at the median. In 2005 the 90th percentile was about twice the median, the 95th percentile about two and a half times the median. The median earnings of a full-time, full-year employee in Canada in 2005 were about $41,000. So, those at the 90th percentile earned $82,000 and those at the 95th $101,000. These were sums that were exceeded by significant proportions of university professors, even in 2005. To better understand the sources of inequality there might be something to be said for research that explores the internal processes within universities and other institutions that result in these differentials.
Literture Cited


