Inequality Briefing

Defining and Measuring Inequality

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Introduction: The Importance of Inequality

Many examples attest to the dramatic extent of inequality within and between countries. In 2000 the richest country in the world (Luxembourg) enjoyed a per capita gross national income level more than 90 times that of the poorest (Sierra Leone). In 1998 the average consumption levels of the richest 10% of Zambians were 37 times those of the poorest 10%. In India in 1990, 56% of those aged 15 years and above were illiterate, while the 3.6% that had attended tertiary education had received around 16% of the total number of person years of formal education. In Venezuela in 1996/97, 48.4% of land holdings were of 5 hectares or less, representing in total 1.6% of agricultural land; 2.2% were of 500 hectares or above, collectively accounting for 59.7% of land area. To add to this there is a growing body of evidence that income inequality (at least) within and between countries has been increasing over the last two decades.

There are several reasons why development agencies should be concerned with inequality, including:

- **Inequality matters for poverty**. For a given level of average income, education, land ownership etc., increased inequality of these characteristics will almost always imply higher levels of both absolute and relative deprivation in these dimensions.
- **Inequality matters for growth**. As acknowledged in the 2000 White Paper, there is increasing evidence that countries with high levels of inequality – especially of assets – achieve lower economic growth rates on average. In addition, a given rate and pattern of growth of household incomes will have a larger poverty reduction impact when these incomes are more equally distributed to begin with (see Inequality Briefing No 2).
- **Inequality matters in its own right**. There is a strong, and quite widely accepted, ethical basis for being concerned that there is a reasonable degree of equality between individuals, though disagreement about the question 'equality of what?' (for instance, outcomes or opportunities?), as well as about what might be 'reasonable'.
- **Inequality is often a significant factor behind crime, social unrest or violent conflict**. These are often important contributors to poverty in their own right. Inequalities – even perceived ones – between clearly defined groups, for example according to ethnicity, may be an important issue here.
- **Inequality is likely to be critically important for the attainment of the Millenium Development Goals (MDG)**.[1] This is not confined only to the income poverty MDG. Similarly it also matters for PRSPs, country strategies and so on.

[1]   See Halving World Poverty by 2015: Economic Growth, Equity and Security Target Strategy Paper (DFID, 2000) for further details on internationally agreed targets (now known as goals).

What is Inequality? Definitions and Dimensions

Inequality is different from poverty but related to it. Inequality concerns variations in living standards across a whole population. By contrast poverty focuses only on those whose standard of living falls below an appropriate threshold level (such as a poverty line). This threshold may be set in absolute terms (based on an externally determined norm, such as calorie requirements) or in relative terms (for example a fraction of the overall average standard of living). Intuitively relative poverty is more closely related to inequality in that what it means to be poor reflects prevailing living conditions in the whole population. But the degree of inequality will have implications for both conceptions of poverty. Inequality Briefing No 2 discusses these relationships in more detail.

Just as living standards and poverty are multidimensional in nature, the same must also apply to variations in wellbeing between people (or groups of people) – that is inequality. This multidimensionality is implied for instance in a recent development economics textbook's definition of economic inequality as 'the fundamental disparity that permits one individual certain material choices, while denying another individual those very same choices'.[2] These material choices, and the factors that permit or deny them, are themselves multidimensional. This definition also reflects a fundamental focus on inequality between individuals (or groups of individuals). It encompasses both inequality in opportunities and inequality in outcomes. It can allow for different time horizons over which these choices can be permitted or denied. And yet broader perspectives on inequality can still be developed.

A number of specific issues need to be addressed in developing practical measures and definitions of inequality, including the following:

Inequality of What? Beyond Incomes and Outcomes

As with poverty, in practice it is generally easiest to consider the different dimensions of inequality separately. These dimensions are well known from discussions of poverty, including education, health and nutrition, security, power, social inclusion, income or consumption and assets. Though distinct, these different dimensions of inequality are often related to each other, even if the correlation is not perfect. For example, patterns of educational inequality may reflect gender disparities, or asset inequalities may be consequences of – and/or contribute to – inequality in political power.

Another aspect of this question is the need to consider inequality both in terms of opportunities and of outcomes.

[2]   Ray (1998). Development Economics. Princeton: Princeton University Press.

While much discussion focuses on inequality in outcomes (typically more easily observed based on available information), it is important to understand the factors and processes behind this. Some inequality in outcomes is part of the normal functioning of a market economy, such as the extent to which people take up the opportunities they have, and uncertainty can also play an important role. But a substantial component of inequality in people's circumstances may reflect inequality of opportunities, with people favoured or disfavoured according to where they live, parental circumstances and so on. The relative importance of these different sources of inequality is important in discussing appropriate policy responses (see also the discussion of functional and dysfunctional inequality in Inequality Briefing No 3).

Some dimensions of inequality can provide more information on opportunity (e.g. social inclusion). But in any case it is essential to understand the processes behind inequality, notably persistent or inter-generational inequality. Sometimes other aspects of inequality can be important here, such as attitudes towards women or disadvantaged ethnic groups, and vicious circles may also be present (such as the children of less-educated parents being less educated themselves).

Inequality between Whom?

Inequality is typically thought of as differences between individuals within a population, normally a country, though it can also be considered for smaller or larger populations (for instance, within local communities or at a global level). In practice the most widely used measures of inequality (i.e. income, consumption or assets) are generally looking at inequalities between household-based measures. This fails to take account of intra-household inequality, clearly an important issue in practice which then needs to be considered in terms of attributes that can be measured at the individual level (nutritional measures are commonly used for this purpose) and looked at within the household.

It is also important to consider inequality between groups of people, including global inequality between countries, inequality between regions or communities within a country, and inequality between groups of individuals or households classified according to various criteria (for example gender, class). The last is often referred to as horizontal inequality, though as seen later is easily considered as part of a more general analysis of inequality.

Inequality over What Time Horizon?

The data used to measure inequality are often collected at a single point in time whereas many aspects of living conditions vary over time. This is a common criticism of income-based measures of the standard of living – as typically measured they are static in nature, whereas income fluctuates over time, within a year, from one year to the next, or over the life cycle. By analogy with poverty, in the case of income inequality it would be highly desirable to be able to distinguish transient and chronic components based on longitudinal data to judge how much inequality is transient (reflecting life cycle factors or one-off shocks). The same point can equally apply to several other dimensions of inequality that could change significantly over time (such as malnutrition). For other dimensions of inequality this may be less important. For example social exclusion typically implies structural deprivation (sometimes interpreted as relative poverty) which is liable to last indefinitely.

The concept of inequality is less well developed in empirical work than in the case of poverty, and several aspects discussed above have not been sufficiently considered to date. With inequality being increasingly recognised as an important issue in policy discussions developing a broader understanding becomes more and more necessary.

Measuring Inequality

Measurement and Methods: Standard Techniques

Inequality is typically viewed as different people having different degrees of something, often considered in terms of income or consumption but equally applicable to other dimensions of living standards that show a continuous pattern of variation, such as the level of education or the degree of malnutrition. Figure 1 represents a typical distribution of consumption per adult equivalent across households in Uganda showing the skewed shape of such distributions.

Figure 1   Distribution of Households by Consumption in Uganda (per adult equivalent, 1999/00)
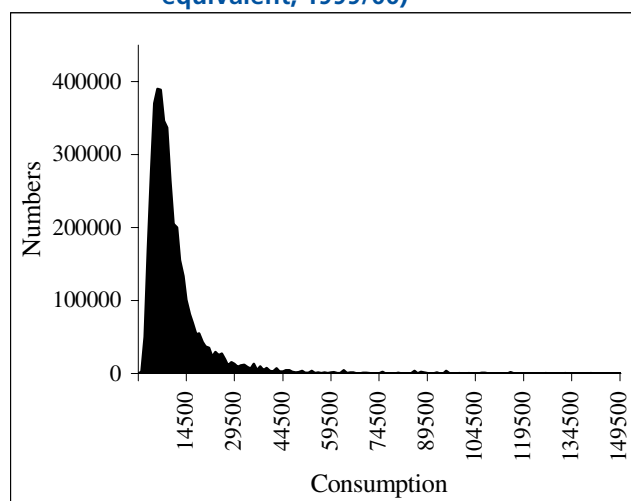
Source: Computed from the Uganda National Household Survey (1999/00)

The data to measure these types of variables is typically available from household surveys, now available for many countries. As always it is important to be aware of the strengths and weaknesses of the data, an issue which applies to all dimensions. Thus, for example, consumption is a key aspect of inequality, but common limitations of the available data include its failure to allow for intra-household inequality, its often static nature, and the fact that its estimation is based on short period recall tends to exaggerate extremes (and so inequality).

Inequality in such variables is generally summarised by an inequality index, which in terms of Figure 1 can be expressed as the degree of dispersion (or "width") of the distribution. While a wide range of inequality indices of inequality have been developed, some general properties apply to all. Inequality is concerned with the relative position of different individuals (or households) within a distribution. This means that measures of inequality should be insensitive to the absolute number of people or the average absolute value of the measure under consideration. In addition, inequality indices must register a reduction in inequality when a small transfer is made from a richer to poorer individual. Some standard statistical measures of dispersion satisfy these properties, such as the coefficient of variation.

One straightforward but informative way of considering inequality is to consider the shares of those at different parts of the distribution, for example by dividing the population, ranked by the living standard measure, into quintile groups. For the case of income this is illustrated in Table 1 for selected countries in recent years. By definition these income shares increase with the quintile group, and how much they do so provides an informal indication of inequality. Bolivia in 1997 shows a very high degree of inequality, with the richest quintile earning more than thirty times the amount earned by the poorest 20%. Ghana and Latvia represent examples with progressively lower levels of inequality. The OECD Development Assistance Committee uses the consumption share of the lowest quintile as one of its core indicators for measuring development progress.

Table 1   Income Shares by Quintile Group (1997/98)

| | | Income share of quintile: | | | | |
	Year	Lowest	Second	Third	Fourth	Highest
Bolivia	1997	1.9	5.9	11.1	19.3	61.8
Ghana	1998	5.9	10.4	15.3	22.5	45.9
Latvia	1998	7.6	12.9	17.1	22.1	40.3

Source: World Development Indicators (2001)

Figure 2   Lorenz curves for consumption: Ghana (1998/99)
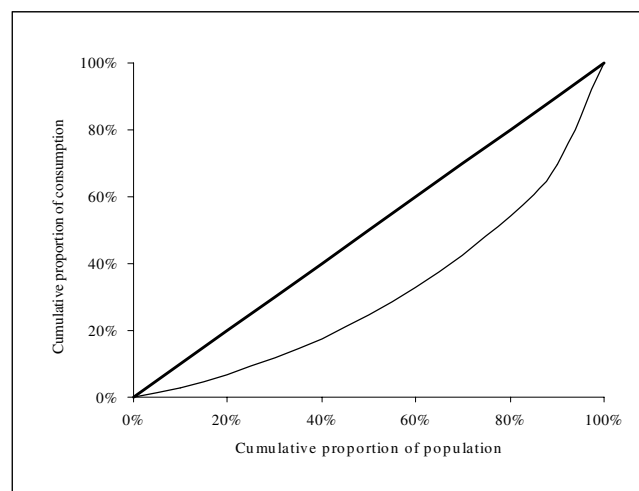
Source: Computed from the Fourth Round of Ghana Living Standards Survey (1998/99)

Developing this idea, Figure 2 presents a Lorenz curve for Ghana in 1998/99 based on a consumption standard of living measure. This is based on ranking the population according to consumption, and plotting the cumulative proportion of consumption against the cumulative proportion of the population enjoying that consumption (see Box 1 for further details). The area between the Lorenz curve and the 45 degree diagonal line divided by the total area under the 45 degree line gives a widely reported measure of inequality, the Gini coefficient. The Gini coefficient takes values between zero and one, with higher values indicating greater inequality.

Levels of Gini coefficients can vary substantially between countries and can show quite large changes over time (Figure 3). In the 1990s the Gini coefficient for Nicaragua in the 1990s is almost twice that in Latvia (Figure 3). There is no generalisable systematic trend in inequality over time, with Gini coefficients having increased in some countries and fallen

in others between the two points in time considered. Some of the increases though are quite large, notably (but not only) in transition countries over the 1990s. These comparisons between two points in time are not necessarily indicative of long term trends; but the magnitude of changes in some cases does show that income inequality can often change substantially over relatively short time periods, in contrast to sometimes expressed "conventional wisdom".

A number of initiatives have tried to collate inequality estimates across countries, including the Deininger–Squire data set[3] at the World Bank and the World Income Inequality Distribution (WIID) data set[4] complied by UNU/WIDER. However, while cross-country comparisons can be informative, considerable care is required to be sure that apparently similar data are indeed comparable across countries very often they are not.

Many other inequality indices have been developed, and some of these have additional desirable properties not necessarily satisfied by the Gini coefficient or by quintile shares. One important example is the Theil Index (Box 2), which is widely used in empirical work index even though it does not have an obvious intuitive explanation. The World Bank PovertyNet website[5] provides further discussion of the above and additional inequality indices.

In the end the choice of an inequality index is more than just a technical choice. Different inequality indices implicitly represent different value judgements, notably on the relative weight to be given to different parts of the distribution. For example, in the case of the Gini coefficient, the effect of a transfer between a richer and a poorer person depends only on the difference in their ranks in the distribution it does not depend on how poor the poorer person is.

[3]   www.worldbank.org/research/growth/dddeisqu.htm
[4]   www.wider.unu.edu/wiid/wiid.htm
[5]   www.worldbank.org/poverty/inequal/index.htm

While Lorenz curves and Gini coefficients are most commonly applied to measures of consumption, income and asset ownership, they can equally be applied to other variables that are continuous in nature. Figure 4 presents a Lorenz curve for educational attainment in India. Here information is available on seven levels of educational attainment: illiterate, and partial and complete attainment at each of primary, secondary and tertiary level. Estimating the number of years corresponding to each is the basis for plotting the Lorenz curve and estimating the Gini coefficient of educational attainment.

Figure 3   Changes in Gini Coefficients (1990s)
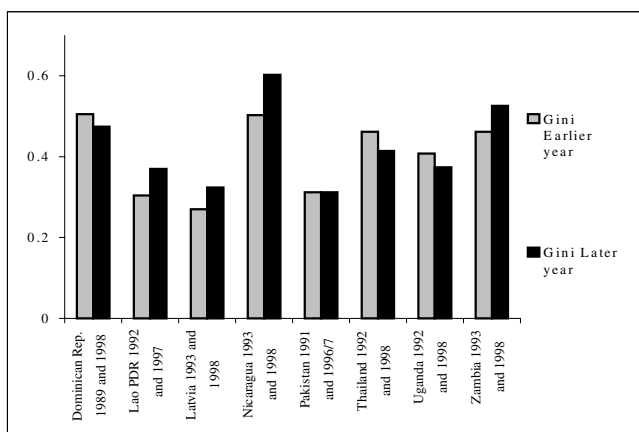
Source: World Development Indicators (2001)

Figure 4   Education Lorenz Curve for India (1990)
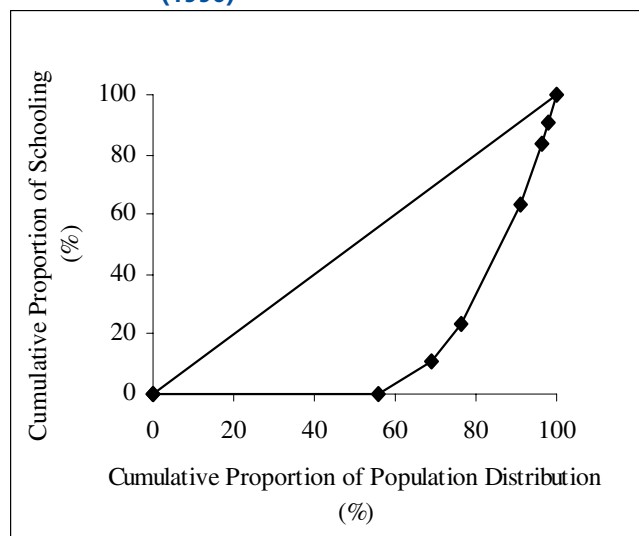
Source: Thomas, V., Wang, Y. and Fan, X. (2000), *Measuring Education Inequality: Gini Coefficients of Education*, World Bank

These indices are equally applicable to analysing inequality between individuals of households at a global level or across populations crossing national borders. The only additional challenge this presents is the need to express the need to express all values (income, consumption, assets or whatever) in meaningful common values, such as PPP dollars for monetary comparisons. A recent World Bank study has attempted to do this, and Table 2 reports estimated values for Gini coefficients between households at the regional level.

Finally, given that different inequality indices reflect value judgements, conclusions reached by comparisons over time about the direction of change can be sensitive to the index chosen – and there are many examples of where the choice of index can reverse the conclusion. However, Lorenz curves can be used to identify instances where the direction of change

in inequality is unambiguous, in that if the Lorenz curve at one point in time lies everywhere below that in an earlier time period, this indicates that inequality has unambiguously increased between these periods. This conclusion applies not just to the Gini coefficient, but for all inequality indices satisfying the standard (weak) properties discussed above. But in the many cases where the Lorenz curves cross, different inequality indices are likely to give different conclusions about the change in inequality, because implicitly they place different relative weights on different parts in the distribution. This same principle can be applied in comparing inequality between subgroups of a population.

Table 2   Estimated Gini Coefficients for Household Level Distribution of Income/Consumption (in PPP)

	Gini Coefficients (%)	
	1998	1993
Africa	42.7	47.2
Asia	55.9	61.8
Latin America and the Caribbean	57.1	55.6
Eastern Europe and the FSU	25.6	46.4
Western Europe, North America & Oceania	37.1	36.6
World	62.8	66.0

Source: Milanovic, B. (1999), *True world income distribution, 1988 and 1993: First calculations based on household surveys alone*, World Bank.

Developing Concepts of Inequality

This involves placing more emphasis on both qualitative sources of information and on other quantitative measures not amenable to being measured and analysed using the techniques discussed above. In terms of qualitative approaches there is a long tradition in participatory investigation of using wealth ranking and similar techniques. This is often very successful in identifying different groups within the local community, based on the criteria that local residents consider most relevant for assessing wealth or wellbeing. Moreover, because of the contextual and more open-ended nature of participatory methods, they can be especially valuable in understanding the factors lying behind local level inequalities. Of course because the criteria used may differ from one village to another, this may limit comparability across communities, but the factors behind inequality can still be compared. Apart from this, participatory methods can also be valuable in identifying many other aspects of inequality, such as gender inequality or inequality in access to services. Again they may be helpful in identifying factors behind such inequalities. Because of their local level focus though, participatory methods are typically much less helpful in identifying inequality between communities.

However many quantitative methods can be helpful in identifying inequalities between communities and other groups – at least in quantifiable dimensions. For many quantitative aspects the focus is often not at the individual or household level, but rather on groups (such as communities, gender or countries). While data on levels of education or infant mortality may be collected at an individual, household or community level, it is often studied in terms of group averages. For instance under five mortality rates (U5MR) are often measured at the regional or state level and can show substantial variations (in Ghana in 1998 the U5MR varied across regions from a low of 62 to a high of 155). Similarly, discussions of health inequalities often focus on differences between groups defined by social class or other criteria. In other cases indicators are defined at the individual level but are zero-one in nature (such as literacy, access to safe drinking water). Differences in these represent real inequalities but it is not easy to think about the degree of difference between people – one is literate or one is not. But again comparisons of average values of such measures between groups of people defined according to different criteria often indicate substantial inequalities. Such comparisons cannot provide information on variations within the groups, highlighting the importance of choosing groups by various and meaningful criteria, and disaggregating to the extent possible.

Table 3   Indices of Human Development for Provinces of South Africa (1996)

Province	HDI	GDI	GEM
Eastern Cape	0.596	0.586	0.618
Free State	0.650	0.646	0.567
Gauteng	0.712	0.708	0.659
KwaZulu-Natal	0.602	0.596	0.634
Mpumalanga	0.628	0.619	0.549
Northern Cape	0.632	0.626	0.614
Northern Province	0.531	0.525	0.620
North West	0.630	0.622	0.565
Western Cape	0.702	0.695	0.641
South Africa	0.628	0.625	0.573

Source: South Africa Human Development Report (2000)

Such differentials are not routinely discussed in terms of inequality, but they are in fact measuring an integral part of it, and one on which a lot of information is already available. National Human Development Reports (HDRs) are often valuable sources of such information. Human Development Indices (HDI) computed at the regional level (and other UNDP indices) are a valuable means of looking at regional inequality (see Table 3 for South Africa). National HDRs and many poverty studies commonly look at variations between groups' education outcomes, access to health, education and drinking water, community-level proximity to markets and so on. OECD-DAC use two indicators of gender inequality in their core indicators (based on combined primary and secondary enrolment, and literacy in the 15-24 years age range). The UNDP Gender related Development Index (GDI) or Gender Empowerment Measure (GEM) provide summary information on gender inequality – this can be more informative where available at a disaggregated level within a country (see Table 3). Finally, national level Human Development Indices, their components and other similar measures can be used as a way of comparing inequality between countries (these will show less inequality than comparisons based on per capita GDP).

This still excludes many aspects of inequality, some of which are not easily or meaningfully quantified, or sufficiently captured by local level participatory methods. Examples include social exclusion, vulnerability or powerlessness. Nonetheless such inequality is likely to be just as important as inequality in other dimensions – and inequality in power or vulnerability may be key factors behind, and also consequences of, inequality in other dimensions, such as asset ownership. Further understanding these dimensions of inequality, as well as their links to other dimensions, would appear to be an important priority and a major gap in existing discussions.

Understanding Factors Behind Inequality

Though national level data on inequality are of interest in knowing the extent of inequality, for cross-country comparisons and in monitoring trends, for many purposes it is also important to consider inequality at a more detailed level. This is particularly important when seeking to identify the determinants of income inequality. It is true that variations in inequality – in terms of income or consumption – have been the subject of a number of cross-country studies, investigating relationships between inequality and per capita income, or investigating the impact of policy factors – such as openness – on inequality. But as elsewhere, cross-country regression studies of this type suffer serious conceptual and practical limitations, and there is relatively little evidence for robust relationships of this type that are generalisable across countries – nor any compelling reason to think there should be. In-depth country case studies are likely to be much more successful in identifying and understanding the factors behind inequality.

When the focus is specifically on income inequality, it can be valuable to identify which specific income sources contribute most to inequality, or indeed offset it (if an income source, say state transfers, goes disproportionately to poorer households). This can be identified based on the Gini coefficient. Among other things this involves computing Gini coefficients for income from each individual source (which can often be very high as many receive zero – some times even negative – income from a given source). The overall results of such a computation for rural Egypt in 1997 are

reported in Table 4; here the high inequality in agricultural income and rental income make large contributions to overall inequality (relative to their average contributions to the budget). Transfers and non-farm income are less unequalising, but are still received disproportionately by the non-poor groups. This is a useful first step in linking the personal distribution to its functional distribution (between labour, capital and other factors of production) which it is often easier to relate to policy measures. However it needs to be complemented by consideration of factors behind the inequality in each income source.

Table 4 Contribution of Different Sources to Overall Inequality (Rural Egypt, 1997)

Income Source	Receiving income from source (%)	Average contribution to income (%)	Gini coefficient for income source	Contribution to overall Gini coefficient
Non-farm	60.7	42.2	0.634	29.7
Agricultural	66.9	24.6	1.155	40.2
Transfer	50.9	15.4	0.848	12.0
Livestock	69.5	9.4	0.935	6.4
Rental	31.7	8.3	0.924	11.7
ALL		100.0	0.532	100.0

Source: Adams, R. (2001) *Nonfarm Income, Inequality and Poverty in Rural Egypt and Jordan*, World Bank.

Another way to characterise inequality is to divide the population into groups according to different criteria (such as economic activity, ethnicity), identifying the relative importance of inequality within these groups and inequality between the groups (the latter the matter of horizontal inequality referred to above). The Theil Index (Box 2) is a widely used example of an inequality index that is decomposable by subgroups, meaning loosely that it is possible to identify the relative importance in the total of inequality within the groups (for each of the groups) and inequality between the groups. This procedure is exactly comparable to the analysis of variance in statistics, and can be used to identify the importance of the factor used to define the groups in accounting for overall inequality. For instance, results of such a decomposition of income inequality by ethnic group is South Africa in 1991 measured by the Theil index (Table 5) shows that the contribution of inequality between the groups to overall inequality is substantial, though there is also significant inequality within groups as well.

Table 5 Theil Indices of Inequality (South Africa by ethnic group, 1991)

Group	Theil Index
Asian	0.20
Black	0.34
Coloured	0.22
White	0.18
Within-group component	0.23
Between group component	0.16
Total	0.39

Source: Jenkins, C. and Thomas, L. (2000), *The Changing Nature of Inequality on South Africa*, UNU/WIDER.

Not all inequality indices can be decomposed in this way (the Gini cannot). These and various other decomposition procedures can represent useful starting points in understanding the correlates of inequality, but are only a first step. Indeed decomposition techniques leave much of the inequality unexplained – for example, what accounts for the large within-group inequalities typically observed (generally more so than in the South Africa example above)? Regression-based decomposition methods can be used to try to account more fully for the factors behind inequality, and other more detailed analysis of survey data can support this. But ultimately these methods need to be complemented by consideration of sectoral trends, policy factors and so on.

Decomposition methods ultimately identify correlations, which suggests but does not necessarily imply causality. A greater understanding of the factors behind inequality is required, notably of the processes by which inequality comes about and persists. This needs to be based on broader concepts of inequality, and is likely to require both qualitative and quantitative approaches. Qualitative techniques are typically more powerful in identifying the underlying processes, but quantitative analysis can also be valuable in this (for example in considering whether less educated or poorer parents are less likely to educate their children) , and in understanding relationships between different dimensions of inequality behind inequality. This is clearly a priority in future work on inequality.

Key Conclusions

- Inequality is clearly an important issue requiring much more attention in policy discussion than has been the case to date. Rather than conflicting with a poverty reduction focus or with the attainment of the MDGs, this is likely to be important for the successful attainment of these.
- Conventional techniques for measuring and decomposing inequality remain useful and valuable, but it is important to broaden concepts of inequality beyond those typically considered in discussions on this issue. This includes developing a more multidimensional perspective on inequality, but also other aspects such as considering inequality at different levels of aggregation and different time horizons. Drawing on both qualitative and quantitative techniques is likely to be particularly valuable.
- It is important to enrich our understanding the processes behind inequality and changes in inequality, and to bring this to the forefront of policy debate.

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