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The relationship between poverty and inequality: concepts and measurement

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THE LONDON SCHOOL
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Understanding the Links between Inequalities and Poverty (LIP)

Lin Yang

The relationship between poverty and inequality: Concepts and measurement

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The relationship between poverty and inequality: Concepts and measurement

Lin Yang

Contents

Summary	1
1 Introduction	2
2 Concepts	3
2.1 Poverty	3
2.2 Inequality.....	5
3 Poverty and inequality of what?	7
3.1 Economic resources	7
3.2 Material goods and services	9
3.3 Capabilities and multidimensional approaches	11
3.4 Social exclusion.....	15
4 Poverty and inequality between whom?	17
4.1 Horizontal and vertical comparisons.....	17
4.2 Comparisons over time	18
5 Measures	21
5.1 Poverty: Defining poverty lines to identify the poor.....	21
5.2 Poverty measures.....	25
5.3 Inequality measures	27
6 Conclusion	31
Bibliography	32

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Editorial note

Lin Yang is a Research Officer at CASE.

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Abstract

This paper defines and maps the variety of different concepts and measures of poverty and inequality that have been developed and used in research. These reflect differing views of what constitutes a minimum acceptable quality of life and how the disparity between the least and most well-off in society should be defined. Since the analytical conclusions of poverty and inequality research can depend on the concepts and measures chosen, it is worth laying out their underlying rationales. In this paper we discuss the concepts of poverty and inequality in broad terms; the focal variables of poverty and inequality that have been proposed in the literature, from unidimensional monetary indicators to broader multidimensional and subjective concepts; the issues in conducting comparative analyses of poverty and inequality over subgroups of individuals, households, countries and over time; and the properties of measures proposed for summarising levels of poverty and inequality over the population.

Key words: Poverty, inequalities, capabilities approach, social exclusion, measurement

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Summary

This paper defines and maps the variety of different concepts and measures of poverty and inequality that have been developed and used in research. These reflect differing views of what constitutes a minimum acceptable quality of life and how the disparity between the least and most well-off in society should be defined.

The analysis of poverty consists of two basic stages – first, identifying who is poor, and second, summarising this individual-level information into a measure of poverty for groups of individuals or for the whole society. This first stage of identifying who is poor requires the definition of a poverty threshold, and poverty can be viewed as an absolute or relative concept depending on how this threshold is defined. As an absolute concept, poverty refers to a level of resources that does not change as the general living standard changes over time, whereas this level does change with the general living standard in the understanding of poverty as a relative concept. There has been much debate surrounding the precise interpretation and operationalisation of absolute and relative poverty thresholds.

This issue does not arise in the analysis of inequality, which is by definition a relative concept. Inequality is concerned with summarising the unevenness in the distribution of resources and opportunities among individuals, among groups in a population or among countries. As with poverty, concepts of inequality can be operationalised in many ways, and various indices and metrics have been proposed for the measurement of both poverty and inequality. These metrics must satisfy certain mathematical properties for them to act as useful summary measures of poverty and inequality and changes in their levels, and different sets of properties have led to proposal for different families of measures.

While a large portion of the work on poverty and inequality has maintained a focus on incomes, there are long-standing strands of literature that focus on broader notions of advantage and disadvantage. These expand beyond indicators of economic resources and outcomes and take into account wider components of quality of life. These include consumption and deprivation of material goods and services; capabilities and attainments across multiple dimensions of life such as health, education, and dignity; and the wider societal context of social structures and social exclusion.

The analysis of poverty and inequality can provide different insights depending on which groups of individuals are selected in making comparisons. The focal group of analysis may be the entire distribution of the population, as with the analysis of population-level poverty and vertical inequality. Alternatively, horizontal inequality focuses on differences in the opportunities and outcomes between groups of different socially or culturally identified members of a population. Furthermore, comparing groups of individuals across generations, or the same groups of individuals at different points in time, can provide an intertemporal perspective on the evolution of poverty and inequality.

There are a variety of proposals and an abundance of debate surrounding how poverty and inequality should be understood and measured. An understanding of the context of these concepts and measures is important for any further research on poverty and inequality.

1 Introduction

There is no single way to conceptualise and measure poverty or inequality. The variety of different proposals that have been developed and used in research reflect differing views of what constitutes a minimum acceptable quality of life and how the disparity between the least and most well-off in society should be defined. The analytical conclusions of poverty and inequality research can depend on the concepts and measures chosen, and these decisions may be made on either theoretical or pragmatic grounds. In either case, it is worth laying out their underlying rationales.

The aim of this paper is to define and map these different concepts and measures of poverty and inequality, and how they are related to and contrast with one another. In Section 2, we introduce the concepts of poverty and inequality in broad terms, as being below a given threshold within a distribution and as the overall spread of the distribution, respectively. The focal variables of poverty and inequality in the literature range from unidimensional monetary indicators to broader multidimensional and subjective concepts; an overview of these is presented in Section 3. Comparative analyses of poverty and inequality can be carried out over subgroups of individuals, households, countries and over time; Section 4 provides discussion of the issues in making such comparisons. The concepts used to define poverty and inequality determine the methods used to measure them. While individual- or household-level poverty thresholds can be defined according to different concepts, measures for summarising levels of poverty and inequality over the population can also be defined according to different properties, or axioms. The setting of poverty thresholds and the main families of summary measures for poverty and inequality, and their properties, are reviewed Section 5.

In terms of scope, this paper explores both economic and multidimensional concepts of poverty. The discussion of inequality focuses on economic rather than other types of inequalities. From a practical perspective, this is because dimensions of well-being that lend themselves to dichotomous poverty or deprivation thresholds do not necessarily lend themselves to being conceptualised on a cardinal scale, which is necessary for the types of inequality measures considered. However, Section 4.1 briefly touches on inequalities viewed from rights-based and legalistic perspectives, such as those stemming from race or gender, in the discussion of horizontal inequalities. Readers are also referred to another paper in this series (Bucelli, 2017) for a discussion of the relationship

between the normative reasons for being concerned about poverty and inequality.

2 Concepts

2.1 Poverty

The analysis of poverty consists of two basic stages – first, identifying who is poor, and second, summarising this individual-level information into a measure of poverty for the whole society. The first stage usually requires a poverty line or threshold that distinguishes "the poor" from the non-poor population at a point in time, requiring criteria for the concept of poverty to be explicitly defined. There is general agreement that poverty is characterised by having insufficient resources to access the goods and services necessary for a minimal or socially acceptable standard of living. However, while this basic notion is generally uncontroversial, there has been fierce debate in the literature over the precise conceptual definitions and how poverty thresholds should be set to operationalise these concepts in practice. Whereas inequality is always a relative concept referring to the differences in quality of life across the distribution of society, poverty can be viewed as an absolute or relative concept depending on how the poverty threshold is defined. There has been a longstanding debate about whether an absolute or relative threshold should be used to decide who is poor or not (Gordon, 2006; Ravallion, 2010a), and we first turn to the origins of this distinction in the conceptualisation of poverty.

2.1.1 Absolute and relative poverty

The systematic study of poverty can be traced to the late 19th century, against the historical backdrop of Britain's poorhouses and the 1834 Poor Law Amendment Act (Rose, 1990). In particular, the pioneering work of Charles Booth (1889) and Seebohm Rowntree (1902) attempted to map and quantify poverty, constructing poverty lines and estimating those who fell below it in London and York, respectively. Rowntree in particular focused on the conceptualisation of poverty, and on finding a meaningful definition of poverty for measuring its magnitude. He has commonly been associated with developing the notion of absolute poverty (Rowntree, 1902).

As an absolute concept, poverty refers to a level of resources that does not change as the general living standard changes over time (although it may allow for changes in the general price level). In this absolute sense, poverty is often associated with a low threshold. Sen has argued that "there is ... an irreducible absolutist core in the idea of poverty. If there is starvation and hunger then, no matter what the relative picture looks like

– there clearly is poverty" (Sen, 1983 p. 159). As a relative concept, the level of deprivation associated with being poor changes in line with changes in the general living standard (over and above changes in inflation). For example, the current most commonly used definition of poverty in the UK is a relative measure, defined as having household income, adjusted for family size, which is less than 60% of median income. This is one of the agreed international measures used throughout the European Union. However, it is possible for the poverty rate to fall according to this measure when median income falls, such as during a recession, even though those previously classified as poor may be worse off in real terms. In the UK this definition has been intensely debated as the 2015 Conservative government has sought to change the criteria used to monitor and measure child poverty.

Rowntree (1902) defined poverty using a monetary threshold – beneath which earnings were deemed insufficient to meet the minimum requirements of a healthy and productive life. He used nutritional data to establish the minimum number of calories required for moderate physical labour, priced this at the lowest local prices, and added the costs for clothing, fuel, rent and other household sundries. Households with wages below this limit would be identified as being in primary, or absolute, poverty. The notion of absolute poverty is therefore associated with the ability to meet a set of minimum basic needs, and has also been linked to the idea of "extreme" poverty. The latter term has been used by the European Commission, for example, because "absolute poverty" does not translate very well into other EU languages (Bradshaw and Mayhew, 2010, p. 174). Note, however, that in principle it is possible to have a high absolute poverty threshold.

The concept of relative poverty is usually credited to Peter Townsend (1979), although Adam Smith also alluded to the relative nature of being deprived of "not only the commodities which are indispensably necessary for the support of life, but whatever the custom of the country renders indecent for creditable people, even of the lowest order, to be without" (Smith, 1776, part 2 article 4). For Townsend (1979, p. 31): "Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities, and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong. Their resources are so seriously below those commanded by the average individual or family that they are, in effect, excluded from ordinary patterns, customs and activities."

In this sense, both Smith and Townsend addressed the idea of deprivation as a relative phenomenon, dependent on the social context of the individual. Townsend also emphasised the direct concept of deprivations in aspects of living standards, using this as a way of locating the monetary poverty line – an indirect concept indicating a lack of resources to avoid these deprivations. This distinction and often mismatch in practice between direct and indirect concepts of poverty has also been discussed by other authors, notably by Ringen (1987, 1988), and is mentioned again in Section 3.2. Townsend originally provided two lists of direct deprivation indicators, one with sixty indicators and a second with a narrower set of twelve indicators. Such deprivation indicators and indices present an alternative way to the monetary approach of operationalising concepts of poverty, and are further discussed in the next section.

A major criticism of Townsend's original approach was that no distinction was made between whether the absence of deprivation items was due to choice or due to constraints. Piachaud (1981, p. 420) noted that going without the items could be "as much to do with tastes as with poverty". Responding to this critique, Mack and Lansley's (1985) subsequent Poor Britain survey, which built on the work of Townsend, defined poverty as an "enforced lack of socially perceived necessities", seeking to make this distinction between choice and constraint. Studies of material deprivation have continued in this vein, although there has been some debate over the efficacy of the "enforced lack" criterion amongst older subgroups, who are more likely than younger respondents to report that they do not want the items they lack (McKay, 2004). Furthermore, these differences by age do not seem to be due to particular differences in incomes. It has been argued that in general, however, the enforced lack criterion does help to distinguish between poverty and preference (Hick, 2013).

2.2 Inequality

Inequality is concerned with the uneven distribution of resources and opportunities among individuals, among groups in a population or among countries, occurring at a given point in time or over time. Economic inequality generally focuses on disparities in income, wealth and consumption, although many other related inequalities can arise, such as inequalities in education or health outcomes. As with poverty, concepts of inequality can be operationalised in many ways, and various indices and metrics have been proposed for measuring economic inequality. These will be discussed in Section 5.

The understanding of inequality has tended to develop around two points of view – the first is an outcome-oriented view, the second an opportunity-oriented view. In the former view, the inequalities to be targeted are those in income and other outcome variables in material dimensions of well-being, which may or may not come about as a result of circumstances beyond one's control (gender, race, social background, for example). The latter opportunity-oriented perspective has evolved with Sen's work on the capability approach, which will be discussed later in this paper. Under this view the focal variables of inequality are not solely income and other outcomes, but the individual circumstances governed by wider social structures and institutions that give rise to *opportunities* to pursue valued outcomes. This perspective is primarily concerned with the fairness of processes that lead to outcomes, rather than only the outcomes themselves.

Outcomes and opportunities are, however, highly interdependent. It is unlikely that equal outcomes can be achieved without equal opportunities, and equal opportunities are unlikely to be achieved when households have unequal starting points in terms of economic resources. Low levels of income and other outcomes can restrict opportunities as well as generate inequalities in outcome dimensions, and therefore these two points of view are not dichotomous but rather are complementary and interlinked.

3 Poverty and inequality of what?

This section discusses some of the focal variables of poverty and inequality measurement that have been examined in the literature. While a majority of the work on distributional inequality has maintained a traditional focus on income and wealth, the focus of poverty research has broadened from economic resources and outcomes to examining the prevalence of capability poverty, often in multiple dimensions of deprivation, and it is increasingly recognised that it is important to measure other things that capture the multi-faceted nature of poverty. As Burchardt and Hick (2017) point out, in principle "there is no reason to believe that variation between people in the rate of conversion of income and wealth into valuable ends applies only at the bottom of the distribution. Hence if conversion factors are a key part motivation for moving from material resources to multiple dimensions in assessing well-being, they are also likely to apply in assessing inequality." However, the measurement of inequality typically requires the variable(s) in question to be measurable on a cardinal scale due to the "transfer" axiom central to the measurement of inequality, as discussed in Section 5.3.1. Dimensions that lend themselves to dichotomous poverty or deprivation thresholds do not necessarily lend themselves to being conceptualised on a cardinal scale, which is necessary for the types of inequality measures considered. (Exceptions to this are recently-proposed ordinal inequality measures, such as those put forward by Cowell and Flachaire (2017) and Cowell et al. (2017).)

Bearing this in mind, we now turn to the various concepts of quality of life that have been used in poverty and inequality research. Defined and measured narrowly, we first discuss stocks and flows of economic resources – income, earnings and wealth. More broadly, we discuss the consumption and deprivation of material goods and services, and capabilities and capability deprivation across multiple dimensions such as health, education, and dignity. Finally, we consider the wider societal context of social exclusion, which overlaps with many of the previous concepts.

3.1 Economic resources

Poverty and inequality have most commonly been measured in terms of income. Income is not just money received from employment (wages, salaries, bonuses, self-employment income etc.), but also savings and investments (such as interest on savings accounts and dividends from shares of stock), state benefits, pension income (state, company or personal pension) and property income. It may also include transfers from other households, for example child maintenance or remittances, and home

production, such as the value of housing services provided by owner-occupiers as measured by imputed rent.

Measurement of income is usually on a household basis – the precise definition of a household can vary from survey to survey, but a typical definition is "one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room, sitting room or dining area" (ONS, 2016). Household income before tax that includes money received from the social security system is known as gross income. Household income factoring in all taxes and benefits is known as net income or disposable income, and reflects the economic resources effectively available to the household for consumption and savings. In the UK, the Department for Work and Pensions also produces data for income before and after housing costs, such rent or mortgage interest.

Income at the household level is also often adjusted or "equivalised" to account for the fact that households of different size and composition require and generate different levels of income to attain the same standard of living. This process allows for more meaningful comparisons to be made across households with differing compositions (for example, comparing a single-person household with a family of four). This measure of equivalised household net disposable income is the one used in the papers in this series investigating the empirical relationship between income inequality and different concepts of poverty (Karagiannaki, 2017; Yang and Vizard, 2017).

Individual-level income is difficult to calculate, as many elements are received at the level of the household or family unit, but one can investigate individual earnings. A person's earnings are different to their income. Earnings refers to payment from employment only. This can be on an hourly, monthly or annual basis, is typically paid weekly or monthly and may also include bonuses. Most analyses consider only gross earnings (Healey, 2016), which is earnings before any deductions are made in light of taxes (including National Insurance Contributions) and benefits. Earnings inequality therefore describes the difference between people's gross earnings. In contrast to income, earnings are typically measured on an individual basis.

While much of the research on poverty and inequality refers to flows of income, stocks of wealth and debts are also an important economic factor for households. Wealth refers to the total amount of assets of an individual or household. This may include financial assets, such as savings, stocks and bonds, the ownership of property, and wealth held in private pensions.

Research on wealth and assets tends to focus on inequalities rather than on poverty, and conceptions of asset poverty are limited. An early measure of 'asset poverty' in America was based on family members having 'insufficient wealth-type resources to enable them to meet their basic needs for three months at the threshold of the official poverty line' (Sherraden, 2005, pp. 64–65). Brandolini et al. (2010) have investigated cross-national poverty as measured by indicators of household net worth and annuity values of net worth, while Rowlingson and McKay (2011) have proposed a measure of asset poverty as having no or negative wealth, showing that half of the UK population fall in this category according to this definition and around a fifth experience both income and asset poverty.

3.1.1 Measures of income before and after housing costs

Housing costs represent a deduction from disposable income that typically must be met before other expenditure. Since housing costs are effectively a 'given', the remaining disposable income available for other purchasing decisions after housing costs (AHC) may therefore give a better indication of actual standard of living in terms of measuring inequality and poverty. Conversely, one can argue that housing costs reflect housing consumption and quality, with higher costs indicating higher value. For example, the higher housing costs of living in London also allow access to a more buoyant labour market, and higher mortgage costs could be due to a more valuable house. However, this is unlikely to be applicable to relatively poor groups, such as social housing tenants (Belfield et al., 2015).

AHC measures also remove the influence of housing benefits from income figures – when housing benefits rise to offset increases in rents, the before housing cost (BHC) measure counts this as an income rise (rather than no change), which can lead misleading conclusions about changes in poverty. The difference between AHC and BHC income can therefore be an important and nuanced distinction to consider in the measurement of poverty and inequalities in living standards. While AHC data is often unavailable in cross-national datasets, in the UK the Department for Work and Pensions does produce measures of income both before and after housing costs (DWP, 2017).

3.2 Material goods and services

It can be argued that focusing on income and wealth in the analysis of poverty and inequality provides an *indirect* indication of living standards via the private financial resources available to attain them (Ringen, 1987, 1988). Other indicators are, however, increasingly widely used and can provide a more direct insight to actual quality of life. Material deprivation measures provide a picture of the actual goods and services involuntarily

lacked by an individual or household (Townsend, 1993). It can be argued that measures of access to material goods and services have a more *direct* relationship to the quality of life people are able to attain and give a broader picture than simply the income available for expenditure at a point in time. Whereas we noted that wealth tends to be studied in the context of inequality rather than poverty, the opposite is true of material goods and services, which tend to be studied from the perspective of material deprivation rather than inequalities. Compared to income poverty measures, especially relative income poverty, material deprivation measures better capture hardship in countries with low mean incomes (OECD, 2008).

The concept of material deprivation, first introduced by Peter Townsend (1979), was intended to implement his relative concept of poverty and broaden the definition of poverty to take account of non-monetary resources. Whereas Townsend developed his list of deprivation items and activities based on his own beliefs, Mack and Lansley (1985) developed a similar list in the UK Breadline Britain studies based on surveying "socially perceived necessities". It should be noted that while the idea of material deprivation as conceived by Townsend and Mack and Lansley relates to a relative concept of poverty, in principle there is no reason why a measure of material deprivation cannot be constructed to reflect an absolute concept of poverty. For example, the list of deprivation items could be drawn up to consist of only basic necessities for subsistence, such as food, water, clothing, shelter and sanitation, as is the case in the development economics literature.

In the Breadline Britain studies, items would be included as deprivation indicators only if more than half the population thought that they were necessities that people should not have to do without in modern Britain. Likewise, the follow-up of Gordon et al. (2000) to the Mack and Lansley studies selects the 35 items considered by 50 percent or more of respondents to be necessary for an acceptable standard of living in Britain at the end of the twentieth century. This 'consensual' approach to poverty assumes that there are few differences across different sections of the population over what they perceive as the necessities of life (Gordon et al., 2000). More is said on this approach with respect to the income threshold component of this measure in Section 5.1.3.

The European Commission definition of material deprivation measures the proportion of the population with an enforced lack of at least three out of the following nine items (basic deprivation is defined as

enforced lack of at least two, and severe deprivation enforced lack of at least four):

- Arrears on mortgage or rent payments, utility bills, hire purchase instalments or other loan payments
- Capacity to afford paying for one week's annual holiday away from home
- Capacity to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day
- Capacity to face unexpected financial expenses (set amount corresponding to the monthly national at-risk-of-poverty threshold of the previous year)
- Household cannot afford a telephone (including mobile phone)
- Household cannot afford a colour TV
- Household cannot afford a washing machine
- Household cannot afford a car
- Ability of the household to pay for keeping its home adequately warm

Measures of material deprivation can be seen as being situated within multidimensional approaches to poverty measurement, which broaden and complement the purely monetary concept of poverty. While material deprivation measures refer to material aspects of living standards, multidimensional poverty may refer to wider factors that affect an individual's quality of life that may not be paid for, including subjective factors and social exclusion. For example, health, education, work satisfaction and environmental factors were excluded from the Mack and Lansley's original Breadline Britain study (Mack and Lansley, 1985) and subsequent studies (Gordon and Pantazis, 1997; Gordon et al., 2000), focusing on a narrower concept of material poverty. We now turn to a discussion of broader multidimensional approaches to poverty and inequality measurement, and the grounding of this multidimensional view of deprivation and well-being in Sen's capability approach.

3.3 Capabilities and multidimensional approaches

Amartya Sen's famous Tanner lecture first introducing the capability approach was titled "Equality of What?" (1980). The capability approach proposes that well-being should be primarily evaluated according to the extent of freedom people have to attain multiple "beings and doings" that they value. Sen proposes that these may range "from such elementary physical ones as being well nourished, being adequately clothed and sheltered, avoiding preventable morbidity, and so forth, to more complex social achievements such as taking part in the life of the community, being able to appear in public without shame, and so on" (Sen, 1995, p. 15). It

follows that the capability approach evaluates individual situations in the multidimensional space, since what people can be and do is inherently multidimensional.

According to Sen, focusing on income and economic outcomes confuses the means and ends of well-being and development. Sen proposed that well-being should be defined and measured in terms of (1) the beings and doings that people value or have reason to value (functionings), such as participating in society and being healthy, and (2) the real and substantive freedom to choose and achieve such functionings (capabilities), such as the *ability* to participate in society (Sen, 1999, p. 75). A capability set is then a set of combinations of functionings, where each combination represents a feasible alternative life (of beings and doings) for the individual. The concept of capabilities emphasises the existence of functionings that a person *could* exercise if desired, irrespective of whether they choose to exercise them or not. As Hick (2012, p. 295) points out, Sen's distinction between functionings and capabilities (and his priority of the latter) closely mirrors Piachaud's critique (1981) that Townsend's definition of material deprivation should specify whether deprivation was due to choice or constraints. "Both emphasise the importance of constraints for the conceptualisation of poverty."

In the capability approach, addressing low income or equalising economic variables such as income should not be the primary goal, because not all people convert income into functionings in the same way. These conversion rates may be highly dependent on "contingent circumstances, both personal and social" (Sen, 1999, p. 70). Such circumstances might include:

- Heterogeneous physical characteristics, such as age, gender, illness or disability, meaning that some individuals require higher expenditures on treatment or care;
- Local environmental variation, such as climate, epidemiology, and pollution, which can impose particular costs such as more or less expensive heating or clothing requirements;
- Differences in social conditions, such as the quality of public services and the nature of community relationships across class or ethnic divisions, which affect the conversion of personal resources into functionings;
- Differences in relational perspectives, for example conventions and customs may require that certain community-specific expenditures or commodities are essential for social inclusion;

- Differences in the distribution of resources within the family, for example different household or family members may differ in how food, resources and opportunities are allocated between them.

Variation between people in the rate of conversion of income and wealth into valuable beings and doings applies not only at the bottom of the distribution, but across the distributional spectrum. This points to a rationale for moving from material resources to the multidimensional space of capabilities and functionings in the assessment of inequality as well as the assessment of poverty. Indeed there has long been theoretical development in multidimensional inequality measurement (see Kolm (1977); Maasoumi (1986); Tsui (1995); Lugo (2005)), but unlike multidimensional poverty measurement this has tended to be motivated from approaches other than the capability approach, and has seen far fewer empirical applications. This may be because the measurement of inequality typically requires the variable(s) in question to be measurable on a cardinal scale, whereas many capabilities may not be measurable on such a scale. Therefore, while the capability approach has broadened the focus of poverty research from monetary and material resources to a broader dimensions of well-being, as Burchardt and Hick (2017) note, the majority of applied work on distributional inequality has still tended to focus on income and wealth, "interpreting them in most cases uncritically as markers of advantage and disadvantage".

The capability approach stresses that what counts is not what people possess, but what it enables them to do. In this light, Sen critiques Townsend's concept of relative deprivation, arguing that it confuses the lack of commodities with the individual's or household's capabilities to meet social conventions, participate in social activities, and retain self respect. The concept of relative deprivation measures relative standards, whereas capabilities are absolute requirements for full membership of society.¹ Sen points out that being relatively income poor in a wealthy society can entail absolute poverty in some important capabilities, because they may require more resources to achieve. For example, the capability for employment may require more years of education in a richer society.

¹ It is important to note the qualifier that capabilities are limited to those choices and freedoms that enable us 'to accomplish *what we value*', and therefore exclude potentially harmful choices and freedoms. As Alkire (2005) notes, however, a further research agenda might be to consider harmful beings and doings, or harmful inequalities in beings and doings .

It remains an open question how the multidimensionality of the capability approach should be operationalised; however, two main perspectives can be distinguished. The first is to take a dashboard approach, analysing different dimensions or indicators of quality of life separately for each individual without explicitly aggregating or taking account of their joint distribution – examples are the Millennium Development Goals and the Equality Measurement Framework (Burchardt and Vizard, 2007). The second is to take an aggregative approach, whereby indicators in multiple dimensions (possibly the same as those in a dashboard approach) are combined to generate individual deprivation or well-being scores, which may then be aggregated into a social assessment of poverty – a well-known example of this approach is the UNDP Multidimensional Poverty Index. Only this second approach can identify who is multidimensionally poor by considering the joint distribution of indicators. However, a contentious issue in this approach has been how to set the weights for different dimensions – the so-called ‘index problem’ (Rawls, 1999). Many proposed measures simply disregard that there may be a diversity of personal preferences and needs between people when weighing the importance of multiple beings and doings (Fleurbaey, 2007; Yang, 2017).

Another prominent question regards whether functionings or capabilities are selected in attempts to operationalise the capability approach. While Sen emphasises the importance of capabilities because of their distinction between constraint and freedom to choose, it is difficult to measure capabilities and even more difficult to measure capability sets to evaluate an individual's overall capability. In practice, the most common approach is to use indicators of functionings rather than capabilities (i.e. outcomes rather than opportunities), with the assumption that people are deprived in these dimensions due to constraints rather than choice. Unlike indicators of material deprivation, which now usually refer to "enforced" or "involuntary" deprivation, in most cases indicators of broader dimensions of well-being do not refer explicitly to constraints, and therefore refer to functionings rather than capabilities (Hick, 2016).

Empirical applications of the capability approach require specific dimensions and indicators to be selected. On this matter, Sen did not endorse a fixed list of capabilities, arguing that their selection should be explicitly reasoned, based on the values of the reference populations, and open to democratic debate and scrutiny. Burchardt and Vizard (2011) adopted such a deliberative approach in their capability-based framework for monitoring equality and human rights in the UK. In contrast, Nussbaum (2000) prescribed an explicit list of capabilities, grouped together under ten

"central human capabilities" consisting of: life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play; and control over one's environment. In an alternative approach, Anand et al. (2009) explored the extent to which prospective capability indicators are covariates of a life satisfaction measure of utility. There is no consensus on one single method for selecting dimensions; however, it can be argued that however this is done, good practice would be to make this process transparent and explicit (Alkire, 2007).

3.4 Social exclusion

Social exclusion is a concept related to relative poverty and deprivation (Wolff, 2015). Readers are referred to another paper in this series (Bucelli, 2017), which discusses how the overlap between social exclusion and deprivation shape the reasons for our normative concerns about poverty and inequality. Although the precise definition of 'social exclusion' has been contested (Burchardt et al., 2002). The concept of social exclusion can be traced back to France in the 1970s, where Lenoir (1974) referred to 'les exclus' as those who were not protected by the welfare state and were considered social misfits. It has since been adopted and interpreted in numerous ways in research and policy contexts.

Silver (1994) has stressed three contrasting paradigms of social exclusion, each attributing exclusion to a different cause and grounded in a different conception of integration. In the 'solidarity paradigm' dominant in France, social exclusion is "the breakdown of a social bond between the individual and society that is cultural and moral, rather than economically interested" (Silver, 1994, p. 570). In the Anglo-Saxon 'specialisation paradigm', exclusion reflects discrimination, rooted in unenforced rights and market failures. The third paradigm is the 'monopoly paradigm', particularly influential on the European Left, but also in Britain. The monopoly paradigm emphasises the existence of hierarchical power relations in a social order. Powerful groups restrict the access of outsiders through social closure, where labour market segmentation provides the link between social closure and economic exclusion. In a similar vein, Byrne (1999) has argued that exclusion is "an inherent characteristic of an unequal post-industrial capitalism founded around a flexible labour markets and with a systematic constraining of the organizational powers of workers as collective actors." (Byrne, 1999, p. 128)

In terms of finding an operational definition of social exclusion, Burchardt et al. (1999) proposed that: "An individual is socially excluded if (a) he or she is geographically resident in a society but (b) for reasons

beyond his or her control he or she cannot participate in the normal activities of citizens in that society and (c) he or she would like to so participate." The EU has operationalised a concept of social exclusion by developing a joint indicator to monitor poverty and social exclusion reduction as part of its Europe 2020 strategy (Atkinson et al., 2017). This poverty and social exclusion target, the so-called 'at risk of poverty or social exclusion' ('ARPE') measure, covers three dimensions – relative income poverty risk, severe material deprivation and low work intensity households. The indicator takes a 'union' approach, meaning that people are defined as at risk of poverty or social exclusion if they are in *at least one* of the following three conditions:

- At risk of income poverty (falling below 60 percent of the national median equivalised disposable income after social transfers);
- Severely materially deprived (involuntarily unable to afford at least four of the following nine items: 1. to pay rent, mortgage or utility bills; 2. to keep the home adequately warm; 3. to face unexpected expenses; 4. to eat meat or proteins regularly; 5. to go on holiday; 6. a television set; 7. a washing machine; 8. a car; 9. a telephone);
- Living in households with very low work intensity (living in a household where the ratio of total number of months that all working-age household members worked in the previous year is below a fifth of the total number of months those members theoretically could have worked).

The EU's combination of poverty and social exclusion into a single indicator points to the overlapping nature of the two concepts. While poverty and social exclusion are indeed closely related, there are distinctions that can be drawn between the two. In the simple framework proposed by Förster and Vleminckx (2004), 'poverty' and 'material deprivation' describe one-dimensional or multidimensional outcomes, whereas the dynamic processes of arriving or remaining at these outcomes are conveyed by the terms 'impoverishment' or 'persistent poverty', and 'social exclusion' respectively. An example of a process of persistent poverty could be low income mobility and low growth making it more difficult to cross the poverty line. Table 1 summarises the relationships between these terms.

Several empirical studies on social exclusion have examined correlations in various dimensions of deprivation, aiming to identify the affected groups and processes of social exclusion. Paugam (1995), for example, studied correlations in dimensions of social exclusion with an added time dimension to study the "spiral of precariousness" in France. So while social exclusion can be seen as a state of exclusion as in the definition

proposed by Burchardt et al. (1999), Förster and Vleminckx's framework illustrates that it can also be thought of as the dynamic and multidimensional processes that lead to exclusion, which could be mutually reinforcing.

Table 1. Conceptualisation of poverty and social exclusion

	Static outcome	Dynamic process
One-dimensional (income)	Poverty	Impoverishment (or persistent poverty)
Multidimensional	Material deprivation	Social exclusion

Source: Förster and Vleminckx (2004), Table 2

4 Poverty and inequality between whom?

4.1 Horizontal and vertical comparisons

A concept advanced by Stewart (2002), horizontal inequalities are defined as "inequalities among groups with common felt cultural identities ... They include ethnic, religious, racial or regional affiliations" (Stewart et al., 2007b, p. 4). Horizontal inequalities are often the result of systematic discrimination and exclusion, not dissimilar to the those proposed in the 'specialisation' and 'monopoly' paradigms of social exclusion by Silver (1994), discussed in Section 3.4. In contrast, vertical inequality is understood as economic inequality in the conventional sense between individuals and households across the distribution as a whole. Note the use of the term 'horizontal' and 'vertical' in this context is distinct from the concepts of 'horizontal' and 'vertical' analysis in financial economics, which refers to time-series and cross-sectional analysis respectively.

Horizontal inequalities manifest themselves in unequal opportunities and outcomes across economic, political and social spheres. In the economic sphere, for example, restricted rights to legal asset ownership such as land or inheritance for women result in unequal opportunities and outcomes. Examples in the political sphere include restrictions on the political rights of specific groups, and disproportionately low percentages of women and ethnic minorities in political leadership positions. Examples in the social sphere include low-quality public services for racial minorities living in certain areas, and limited recognition of minority languages and ethno-cultural practices.

While there is abundant literature on the measurement of vertical income inequality, with the existence of well-known measures such as those discussed in Section 5.3, methods for measuring horizontal inequality

have only recently been proposed (e.g. Stewart, et al. (2007a)). A prominent example of an analysis of horizontal inequality is the Report of the National Equality Panel (Hills et al., 2010). Horizontal inequality in incomes can be represented by the comparison of average per capita incomes of different groups, although this measure conceals distributional differences within those groups. Group distributional data are therefore necessary, such as comparisons of the proportions of each group in each income quantile relative to its proportion in the overall population. This method reveals by how much each group is over- or under-represented at different points in the income distribution. Another possibility is to estimate the ratios of average incomes between groups for each decile or quintile. Where data for non-income dimensions permit, performance could again be compared in these non-income dimensions across group distributions.

4.2 Comparisons over time

Horizontal inequalities can persist over long periods in many cases but prove temporary in others (Stewart and Langer, 2007). Similarly, the likelihood of moving to different positions in the vertical distribution, and therefore of being in or out of poverty, varies over the life cycle and can accumulate from one generation to the next through the accumulation of different types of capital perpetuating upward or downward cycles. In this section, we discuss some of the measurement issues that arise from analysing poverty and inequality over time that do not arise in the cross-sectional context, and some proposed approaches. Another paper in this series focuses on the underlying mechanisms that may perpetuate poverty and inequality over the life cycle, their intergenerational transmission, and the dynamic relationship between the two (Duque and McKnight, forthcoming).

A simple way of introducing time in the measurement of poverty and inequality is to build a series of indices that allow for the analysis of poverty and inequality trends in time, based on two or more cross-sections of individuals. This simple approach allows the tracking of trends over time, and the distinction of cross-sectional poverty and inequality levels within and between countries, and over time within countries and between countries. The empirical papers in this series (Karagiannaki, 2017; Yang and Vizard, 2017) use this approach to show that the cross-sectional relationship between poverty and inequality is distinct from the relationship between their trends over time. It is perfectly possible, therefore, to observe different relationships between measures of poverty and inequality depending on their cross-sectional or over-time context.

This approach cannot, however, capture the nature of poverty and inequality in terms of the changing circumstances of individuals over time. For example, many people may fall into poverty at any time due to a variety of factors such as a change in their circumstances in the labour market (losing a job), in their household (divorce, or birth of a child) or in their benefit eligibility (losing unemployment compensation). In terms of measurement, a given level of poverty or inequality at a point in time does not provide information about the flows of individuals into and out of poverty, or up and down the income distribution. For example, a stable poverty rate over time is compatible with a high and a low flow of individuals in and out of poverty, so that the portion of the population in poverty at one point in time may be quite different from the portion in poverty in a subsequent time period (Hills, 2014).

Analysing these complex dynamics requires individual-level data over time, and is therefore demanding in terms of data. Panel datasets are usually required, and while there is increasing availability of panel data in a variety of countries, there is a lack of long panel data comparable between countries. Most research therefore focuses on short-term dynamics instead of a more comprehensive lifetime perspective. Three main approaches have emerged from the literature on the dynamics of economic welfare to address some of these complexities, mainly in the context of poverty dynamics:

- The first approach is the 'spells' approach, and focuses on transitions in poverty status into and out of poverty;
- The second approach is the 'components' approach, and focuses on estimating the transitory and permanent components of economic welfare;
- The third approach uses the current distribution of economic welfare across households to predict the future distribution of economic welfare for an individual.

The 'spells' approach focuses on the duration of poverty, and identifies a chronically poor household as one that shows levels of income or consumption at or below the poverty line over a period of assessment (Baulch and Hoddinott, 2000). On the other hand, households in transient poverty are those that show variation in income or consumption around the poverty line, but remain mostly above the line at each point in time. Eurostat defines such a 'spells' approach-based measure as the persistent-at-risk-of-poverty rate. This is defined as the share of persons with an equivalised disposable income below the national risk-of-poverty threshold (60 percent of the contemporary median) in the current year and in at least

two of the preceding three years. Jenkins and van Kerm (2013) find a close linear relationship between rates of persistent poverty and transient poverty across EU countries from 1995-9 and 2004-7, which is attributed to constant poverty entry and exit rates within countries over time.

The 'components' approach focuses on income shortfall over a period of time. It is based on the permanent income hypothesis, which suggests that changes in the consumption patterns of individuals and households are driven by expected long-term average income, rather than transitory changes in income. The components approach suggests that income and consumption can be separated into constant (permanent) and fluctuating (transitory) components, which can be empirically estimated (Ravallion, 1988). A household is said to be chronically poor if its constant (permanent) component of income is below the poverty line, whereas transient poverty is the poverty generated by temporary (transitory) fluctuations in income.

The third approach focuses on the probability of low future consumption. It uses variability in current cross-sectional income across households to estimate the probability that their future income will be below the poverty line (Chaudhuri et al., 2002; Pritchett et al., 2000). A household is identified as chronically poor if its current income is below the poverty line and has a high probability of future consumption also being at or below the poverty line.

These methods of identifying households in chronic or transient poverty allow us to distinguish, to some extent, whether poverty comparisons over time are being made between the same, or different, households. While not discussed here, the literature on income mobility similarly provides tools with which to distinguish whether trends in inequality over time are due to the dynamics of households moving up and down the income distribution, or to the entrenchment of existing positions.

5 Measures

5.1 Poverty: Defining poverty lines to identify the poor

The setting of poverty lines is perhaps the subject of more attention and debate than any other area in poverty analysis. It is interesting to note the absence of any definition of an analogous "riches" line (Robeyns, 2017) or a maximum social reference income, and this could be the subject of a further research agenda. This section, however, reviews the different methods for constructing a poverty line, the assumptions and rationales for each approach, and some examples.

5.1.1 Absolute poverty line/budget standards approach

Absolute poverty lines, including the widely cited and recently up-rated World Bank global poverty line of \$1.90 a day, are widely used by developing countries since large portions of their populations count on a limited number of goods to meet their basic needs (Casazza, 2015). Although the World Bank's poverty line has been criticised as being "arbitrary", most prominently by Pogge and Reddy (2010), the initial calibration of this poverty line was based on studies of budget standards across a number of developing countries, in line with Rowntree's approach (1902). As Ravallion (2010b) points out, however, "there is ample scope for different people to form different judgments on the key parameters in setting a poverty line, including the composition of the food bundle and the allowance made for non-food needs". This provides one key area of contention. Another contention comes about because this absolute poverty line is then carried forth from year to year, irrespective of whether the same budgeting procedure applied to current data would yield the same result. In a growing economy, the gap between the hypothetical recalibrated level and the historical standard may well be quite large.

The United States is an example of a high-income country that has also chosen to adopt an absolute poverty line as its official national poverty line. Similar to Rowntree's original definition of poverty, the US poverty threshold, developed by Mollie Orshansky in the 1960s, also has its origins in a food budget. The costs of a minimal food budget for different family sizes was taken and multiplied by three to derive the poverty thresholds, since the average family of three or more persons spent around one third of their after-tax income on food according to the Department of Agriculture's 1955 Household Food Consumption Survey. This poverty threshold has been up-rated every year in line with the Consumer Price Index, but has otherwise remained unchanged.

However, although the poverty threshold is adjusted for inflation, it is not adjusted for changes in the general standard of living (Michael et al., 1997). In the US example, as the real standard of living has increased the average proportion of income spent on food has decreased, indicating that the use of three as the multiplier of the food budget does not fully reflect changes in the relative standard of living. As a consequence, it has been criticised for failing to keep up with changes in living standards and social relevance, and therefore for being too low, especially as a threshold for the elderly (Hutto et al., 2011). Up-rating an absolute poverty line with inflation over time does not necessarily make it a measure of relative poverty, and indeed a National Academy of Sciences panel (Citro and Michael, 1995) recommended adopting a greater degree of relativity in the US poverty measure by anchoring to the current median expenditures on food, clothing and shelter. A supplemental poverty measure closely in line with these recommendation has been published by the US Census Bureau since 2011 (Short, 2011).

The case of the US poverty line highlights a wider point that for a poverty threshold to be absolute in the space of basic need satisfaction, the commodity-based monetary poverty line may have to rise as the general level of income rises. Over time the commodity-based poverty line then seems to resemble a relative poverty line, in that it moves relative to the affluence of the country as the resources needed to be capable of meeting minimum basic needs rise (or fall) over time. As Amartya Sen has observed, "an absolute approach in the space of capabilities translates into a relative approach in the space of commodities" (Sen, 1983, p. 168).

Somewhere in between an absolute and relative poverty line, the EU publishes an at-risk-of-poverty rate anchored at a point in time relative to the general level of income at that time. This measure is not anchored for a very long time, however, and has been changed to a new point every five years or so. Therefore while the US poverty standard has been effectively anchored since the 1960s, the EU anchored poverty measure comes much closer to a measure of relative poverty since it reflects relative changes in standard of living each time the anchor is updated.

In making international comparisons using consumption-based poverty lines, a further issue arises in determining what constitutes a comparable baskets of goods satisfying basic needs in different countries, and whether standard purchasing power parity (PPP) adjustments are appropriate for adjusting the price of these baskets to be comparable. For example, whether poor people's goods are reflected adequately in PPP

adjustments and whether a fixed basket or different baskets should be used to reflect differences in consumption needs and patterns across countries.

5.1.2 Relative poverty line/relative income approach

As levels of absolute poverty become very small for countries with high general standards of living, countries may opt to move towards relative poverty lines. Relative poverty lines are defined in relation to the overall distribution of income in a country, set as a proportion (usually between 40 and 60 percent) of the country's mean or median income. Taking a relative view, poverty in prosperous countries may be deemed to have a higher threshold than in poorer countries, implicitly assuming that the cost of social inclusion increases proportionally with average incomes. A number of countries have adopted relative poverty lines, particularly in Europe where the internationally recognised relative poverty cut-off is 60% of median household income.

Although widely used by governments and international agencies because it is straightforward to estimate in many countries, this approach has been criticised as not being based on independent criteria of deprivation, individual needs, nor an agreed definition of what it means to be poor. As mentioned, other international definitions of poverty do relate to criteria of a minimum acceptable way of life. Budget standards, defining the income needed to buy a basket of basic goods, have a closer relationship to the ability of people to purchase basic items. However, as discussed in Section 5.1.1, this type of approach may also become unsatisfactory over time if the budgets used for benchmarking are not continuously updated.

5.1.3 Subjective poverty line/consensual approach

Another option for identifying who is poor is to use a subjective poverty line, or a "consensual approach". This approach was pioneered in the UK in the Breadline poverty surveys as originally implemented in the Poor Britain survey (Mack and Lansley, 1985). The consensual approach draws from Townsend's concept of relative deprivation. However, instead of relying on expert judgement to determine which deprivation items are most important in determining a minimum acceptable way of life, the consensual approach identifies these necessities by public opinion. Having identified publicly perceived necessities, a large-scale survey of living standards identifies who has an enforced lack of these necessities and a poverty threshold is calculated to identify the degree of deprivation that can be seen as being in overall deprivation poverty. This poverty threshold is calibrated in income terms to find the level of deprivation that maximises the differences

between the 'poor' and the 'not poor', and minimise the differences within these groups (Gordon et al., 2000).

The Joseph Rowntree Foundation has developed a Minimum Income Standards (MIS) approach (Hirsch and Davis, 2009), combining the budget standards and consensual approaches. This approach allows research-based budget standards to be tested alongside poverty lines derived from social consensus. Rather than using large-scale surveys to establish majority opinion, as in the consensual method, consensus on what should be in the basket of necessities for the MIS is reached by discussion and negotiation through a sequential series of deliberative discussion groups. Different baskets are discussed for different family types.

The groups, advised by experts where necessary on issues like nutrition, are charged with defining a minimum standard necessary to meet basic needs. The cost of each item in the basket is then drawn up by experts in each area, based on market prices at outlets agreed by the groups participating in the study. Having established the breakdown of a minimum weekly budget, checks are made against actual spending preferences, as shown in expenditure surveys, to ensure that the minimum budgets set reflected spending patterns. In this way, the budget necessary to achieve the minimum socially acceptable standard of living for different household types in the UK is established, and has since been updated every four years.

The Poverty and Social Exclusion (PSE) Surveys have also used a combined approach, in this case combining a consensual poverty line with a deprivation index (Gordon et al., 2000). The PSE's approach identifies an "optimal" poverty threshold corresponding to the joint criteria of three or more deprivations (previously two or more in the original PSE Survey) *and* a low income threshold (for 2012 this threshold was £295 per week after housing costs (Gordon, 2017)). On this basis, the PSE considers people to be 'poor' if both of these criteria are met and 'not poor' if neither are met.

However, this results in cases of people with relatively high incomes with enforced lack of three or more socially defined necessities, and similarly people with relatively low incomes who do not lack three or more necessities. The authors classify this first group as "having risen out of poverty recently" – for example, having secured a job but not yet been able to buy all the basics – and the second group as "being vulnerable to poverty" – for example, having recently seen their incomes fall through losing a job but not yet lost some of the items perceived to be necessities. This extrapolation to statements about poverty dynamics from the cross-sectional PSE survey data may, however, be tenuous.

5.2 Poverty measures

Once individuals are identified as poor or not according to one of the definitions of poverty and a poverty line, the proportion of the population who are identified as poor are aggregated into an overall poverty assessment. While the notions of "absolute" and "relative" have been discussed in the context of setting absolute and relative *poverty lines* to identify which individuals are poor, there is a second usage of these two terms to describe the summary measures that aggregate poor individuals into an overall poverty index.

A "relative poverty index" deems poverty to be unaffected if the poverty line *and* all incomes change by the same *proportionate* amount. Formally, a poverty measure satisfying this property is 'scale invariant'. An "absolute poverty index" deems poverty to be unaffected if the poverty line and all incomes change by the same *absolute*, or additive, amount. A poverty measure satisfying such a property is 'translation invariant'.

5.2.1 Standard properties of poverty measures

Poverty measures have been characterised by economists in terms of whether they satisfy certain desirable axioms for making poverty comparisons. As will be seen, however, some of the most popular poverty measures do not satisfy all of them.

1. *Focus* – according to this axiom, poverty should not be affected by changes in the incomes (or other indicator of interest) of those who are not deemed poor.
2. *Monotonicity* – if a poor individual's income falls, then this should register as a rise in poverty.
3. *Transfer among the poor* – if a transfer is made from a less poor individual to a poorer individual without changing their ranking, then this should register as a reduction in poverty.
4. *Replication invariance* – if all individuals in the population were to be replicated the same number of times, poverty should not change.
5. *Subgroup decomposability* – this results in poverty measures that are additive, that is, measures whereby overall poverty can be expressed as the weighted sum subgroup poverty levels.
6. *Scale invariance* or *translation invariance* – poverty is deemed to be unaffected if all incomes *and* the poverty line change by the same proportionate amount, or by the same additive amount respectively. This property is further discussed in Section 5.3.

5.2.2 Some examples of poverty measures

Foster-Greer-Thorbecke (FGT) index: The FGT index is a family of measures. The FGT family allows the amount of weight placed on income changes of the poorest to vary. However, not all members of this family satisfy the axioms listed above. The members of the FGT family are:

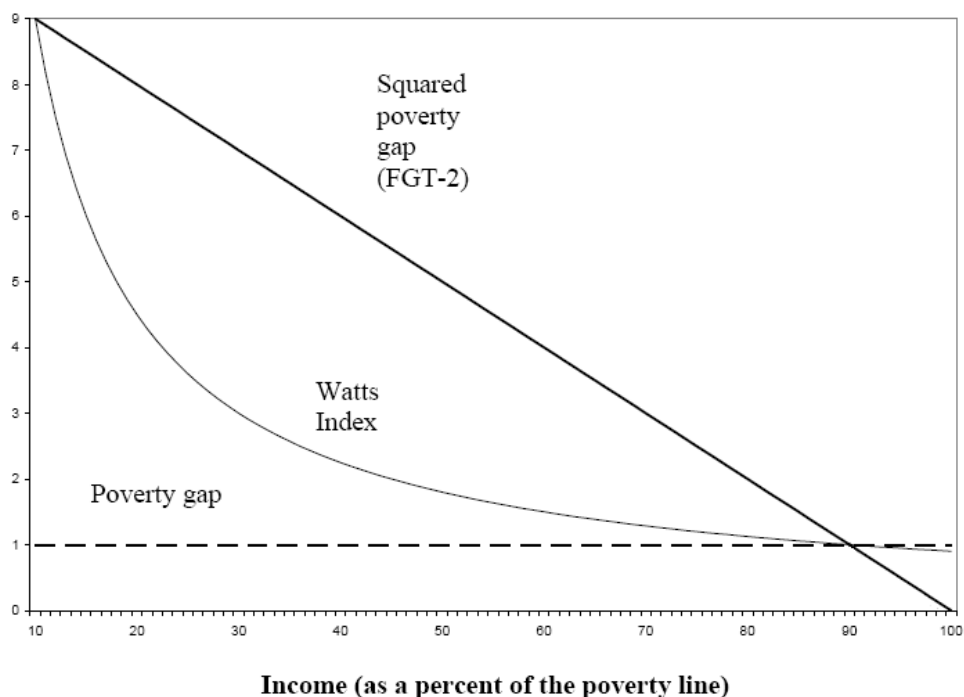
- **Poverty headcount:** proportion of the population living at or below the poverty line. Although hugely popular, this measure does not satisfy most of the axioms other than *focus* and *scale invariance*.
- **Poverty gap:** mean shortfall below the poverty line, with the shortfall expressed as a proportion of the poverty line. The mean is taken over the whole population, counting those above the poverty line as having zero shortfall. This does not satisfy the transfer axiom.
- **Squared poverty gap:** instead of taking the mean of the proportional shortfall, the mean is taken of the squared values of proportional shortfalls. This measure does satisfy all of the axioms.

Watts index: this is mean proportional poverty gap, with the proportional gap taken as the logged value of the poverty line minus logged value of incomes of the poor. It also satisfies all of the axioms.

Table 2. Poverty measures grouped by sensitivity to the bottom of the distribution

Bottom-sensitivity		
Totally insensitive	Equally weighted	Bottom weighted more
Poverty headcount	Poverty gap	Squared poverty gap Watts index

Figure 1. Comparison of implicit weights in poverty measures



The weight of an additional \$1 of income for poor individuals at different levels, relative to the weight on an additional \$1 of income for individuals with income equal to 90 percent of the poverty line.

Source: Morduch (2008)

Of the poverty measures listed, only the squared poverty gap and Watts index satisfy *transfer among the poor*. This axiom can be interpreted as sensitivity to changes at the bottom of the distribution; Table 2 summarises how the listed poverty measures fare in this respect. Although both these measures place higher weight nearer the bottom of the distribution, they do so at differing rates. Figure 1, taken from Morduch (2008), shows graphically how they differ. The Watts index places exponentially higher weights on the poorest and destitute, whereas the squared poverty gap places linearly increasing weights as individuals become poorer. (The poverty gap measure, which equally weights individuals irrespective of how poor they are, is also shown for reference.) The choice amongst these measures is a value judgement – we must decide how much we care about the incomes of the worst-off. These and other value judgements are explored in Bucelli (2017).

5.3 Inequality measures

As with measures of poverty, measures of inequality have also been characterised in terms of whether they satisfy certain desirable axioms for making inequality comparisons. According to the relative definition of inequality, inequality is deemed to be unaffected if all incomes change by the same proportionate amount. An inequality measure satisfying this

property is 'scale invariant'. Although this relative view of inequality is the one most often used in applied literature, an "absolute" definition has also been proposed and studied more extensively in the theoretical literature. According to this view, inequality is deemed to be unaffected if all incomes increase or decrease by the same absolute, or additive, amount. Equivalently, a measure satisfying such a property is 'translation invariant'.

Contrary to the heavy focus on relative inequality in the applied literature, there is in fact no theoretical justification for preferring this relative view over the absolute view (Bosmans et al., 2011). Rather, the choice between them is a normative one. Amiel and Cowell (1999a, 1999b) find, using questionnaire responses from a series of simple experiments, that people do indeed disagree on these views of inequality. They found that 40% of the university students they surveyed (in Israel, the UK and US) think about inequality in absolute rather than relative terms. In similar studies to some of the Amiel and Cowell experiments, Harrison and Seidl (1994) and Ravallion (2016) have generally found similar splits between the relative and absolute views. Interestingly, Ravallion notes that in his sample "the "absolutists" are a clear majority when the stylised incomes are "low" but the "relativists" become the majority when the incomes are "high".

5.3.1 Standard properties of inequality measures

As mentioned earlier, these two differing views of inequality are formalised in the theoretical literature by requiring that a measure of inequality satisfies either 'scale invariance' for a relative measure, or 'translation invariance' for an absolute measure. These are just two among a list of properties, or axioms, used by economists to pin down measures producing reasonable inequality comparisons between distributions. The standard list of axioms can be summarised as follows:

1. *Anonymity (symmetry)* – according to this axiom, inequality is deemed to be unaffected by which individual has which income level; if the income levels of two individuals in the distribution were to be switched, the amount of inequality should not change.
2. *Transfer* – if one transfer is made from a richer individual to a less well-off individual without changing their ranking in the distribution, then this should register as a reduction in inequality.
3. *Replication invariance (population invariance)* – if each individual in the distribution were to be duplicated the same number of times, then inequality in the new population should be the same as inequality in the original unduplicated population.

4. *Decomposability* – according to this axiom, it should be possible to express overall inequality calculated over the whole population as a weighted average of a) inequality calculated within subgroups of the population and b) inequality calculated between those subgroups.
5. *Scale invariance* or *translation invariance* – as discussed, these determine whether the measure is sensitive to relative or absolute changes in the distribution.

Though these properties are quite conventional in the economists' axiomatic approach to inequality, they are not irrefutable rules. Rather, they set out judgments about what reasonably constitutes a more or less equal distribution. Ultimately, judgments about what is reasonable or not may differ from one person to the next, as made evident by the result of Amiel & Cowell's experiments. (Most people seem to agree with the anonymity and transfer axioms. However, as discussed many disagree between scale invariance and translation invariance (Amiel and Cowell, 1999a).)

5.3.2 Some examples of inequality measures

Gini coefficient: The Gini coefficient is perhaps the most widely used inequality measure. For measuring income inequality it is bounded between 0 and 1, with 0 indicating complete equality and 1 indicating complete inequality (with one person having everything). Its main limitations are that it is not easily decomposable or additive, and is very sensitive to changes that occur around the mode of the distribution and less sensitive to changes that occur at the tails. Simultaneous changes in different directions at the top and bottom of the distribution can result in a net effect of zero on the Gini coefficient (Förster and Vleminckx, 2004). Small distributional changes at the bottom, which may not affect the Gini coefficient very much, may have a large effect on poverty (Naschold, 2002).

Generalised Entropy (GE) index: This is a family of measures, characterised by a common parameter, α . The measure becomes more sensitive to changes at the bottom end of the distribution the lower the value of α (< 0), and to changes at the top end the higher the value of α (> 1). In this sense, it can be thought of as a "customisable" measure.

- **Mean log deviation** ($\alpha = 0$)
- **Theil** ($\alpha = 1$)
- **Squared coefficient of variation** ($\alpha = 2$)

Atkinson index: Similar to the GE index, the Atkinson index is also a family of measures characterised by a parameter, ε . Although

mathematically different, the Atkinson family provides the same inequality comparisons as the GE family if $\alpha = 1 - \varepsilon$. Therefore, the sensitivity of the Atkinson measures to the top and bottom of the distribution as ε changes is opposite to the direction of α for the GE measures.

Of the measures listed, only the GE and Atkinson families of measures satisfy the full set of axioms. The GE family satisfies additive decomposability, whereas the Atkinson family satisfies multiplicative decomposability (Lasso de la Vega et al., 2010). Table 3 summarises the sensitivities of the listed measures to changes in different parts of the distribution.

Table 3. Inequality measures grouped by sensitivity to different parts of the distribution

Lower tail	Middle	Upper tail
Income shares	Gini coefficient	Income shares
GE index $\alpha < 0$	GE index $0 \leq \alpha \leq 1$	GE index $\alpha > 1$
Atkinson $\varepsilon > 1$	Atkinson $1 \geq \varepsilon \geq 0$	Atkinson (extended) $\varepsilon < 0$

Income share ratios: These present the ratio of the share of income in a topmost quantile of the distribution to the share of income in a bottommost quantile. Unlike income quantile ratios (see below), income share ratios are vulnerable to extreme values and outliers at the top or bottom tails of the distribution. The Palma ratio is one example of an income share ratio, which compares the share of total national income of the top 10 percent of households to the share of the bottom 40 percent. It is based on economist José Gabriel Palma's empirical observation that incomes in the 'middle' of the distribution tend to represent about half of national income while the other half is split between the richest 10 percent and poorest 40 percent, although the share of these two groups varies considerably across countries.

Income quantile ratios: Quantile ratios are straightforward indicators of economic inequality that are easy to interpret. They do not provide as much information as the more complex measures described above. However, they are intuitive and easy to understand, and offer few data and computational challenges. The most common quantile ratio is the P90/P10 ratio, which is the income at the 90th percentile of the income distribution as a ratio of the income at the 10th percentile. For example, if the P90/P10 ratio is equal to 4, then the poorest person of the richest 10 percent of the population receives four times as much as the richest person of the poorest

10 percent. The P90/P10 ratio can be decomposed; it is equal to the product of the P90/P50 ratio and the P50/P10 ratio. This decomposition tells us to what extent the P90/P10 ratio is driven by inequality in the top of the distribution versus inequality at the bottom end. Quantile ratios are insensitive to outliers either in the very top or very bottom tail of the distribution. However, quantile ratios do not reflect what happens in other parts of the distribution.

Note that income *share* ratios are distinct from the ratio of quantile *points*, which measure the income of the person at a specified upper percentile as a ratio of the income of the person at a specified lower percentile. An income *share* ratio, on the other hand, measures the income received by a specified topmost quantile of the population as a ratio of the income received by a specified bottommost quantile of the distribution. For example, the 20/20 income quintile ratio used by the United Nations Development Programme is interpreted as an income quantile ratio, measuring the ratio of the average income point within the richest 20 percent of the population to the average income point within the poorest 20 percent of the population. On the other hand, the income quintile *share* ratio (the S80/S20 measure) used by the European Union is calculated as the ratio of total income received by the 20 percent of the population with the highest income (the top quintile) to that received by the 20 percent of the population with the lowest income (the bottom quintile).

6 Conclusion

In this paper, we have defined and discussed some of the key concepts and measures of poverty and inequality, and the connections between them. While there are overlapping features between approaches to both poverty and inequality measurement, such as the focus of traditional approaches on income and the use of indices for the summarisation of income poverty and inequality, there are also distinct challenges for both. The variety of proposals and abundance of debate shows that there is little consensus on how these challenges should be met. However, this paper has attempted to present the salient points among some of the most prominent issues and approaches. In doing so, it is hoped that the analysis of poverty and inequality, and the relationship between the two, can be better understood within the context of the menu of concepts and measures currently available.

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