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# INEQUALITY in FOCUS

## The State of Opportunities in South Africa: Inequality among Children and in the Labor Market

Ambar Narayan and Sandeep Mahajan

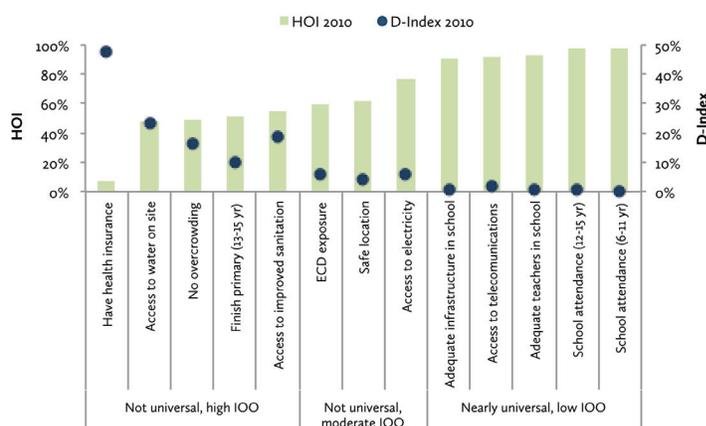
South Africa, the African continent's largest economy by far, displays strikingly high and persistent inequality for an upper middle-income country. While GDP growth has averaged a credible 3.2 percent a year since 1995 (1.6 percent per capita), it has been highly uneven in its distribution.<sup>1</sup> In large part, inequality in South Africa is an enduring legacy of the apartheid system, which denied the non-whites the chance to accumulate capital in any form—land, finance, skills, education, or social networks. Even though social assistance grants have had a moderating influence on inequality, an income Gini of about 0.70 in 2008 makes South Africa one of the most unequal countries in the world.<sup>2</sup>

The high and persistent patterns of inequality predictably polarize the political and economic debate in the country, with consensus being especially hard to achieve on the questions of what notions of equality (or equity) should guide policy, and how? Consensus, however, is easier to reach on the need to promote equality of opportunity—the principle that predetermined circumstances such as gender, ethnicity, and location of birth or family origins should not play a role in determining an individual's chance of success in life.<sup>3</sup> The simple yet powerful idea of “leveling the playing field for all” tends to find acceptance across the ideological spectrum in most countries, and South Africa is no exception.

Equality of opportunity is the lens through which the World Bank's recent South Africa Economic Update Volume 3 (SAEU<sub>3</sub>) has examined inequality. This includes a focus on

This article is based on Section 2 of South Africa Economic Update (Issue 3): Focus on Inequality of Opportunity, World Bank (July 2012). The report was produced by a team led by Sandeep Mahajan and Fernando Im, with Allen Dennis, Sailesh Tiwari, Alejandro Hoyos Suarez, Shabana Mitra, Phindile Ngwenya, and Ambar Narayan, who was a special guest coauthor for the focus topic.

Figure 1 D-Indices and HOIs for Key Opportunities of South African Children, 2010



Note: IOO refers to inequality of opportunity, as measured by D-Index. Source: SAEU<sub>3</sub>, based on General Household Survey (2010).

children's access to basic services in education, health care, and essential infrastructure, which provide an individual the *opportunity* to advance and reach his or her human potential. How universal the basic services are—and the extent to which availability is influenced by a child's circumstances—are important (if imperfect) predictors of future outcomes, including inequality in earnings and of economic mobility within and across generations. Given the important role played by labor markets in driving income inequality, the report also examined how individual attributes influence inequality in employment status.

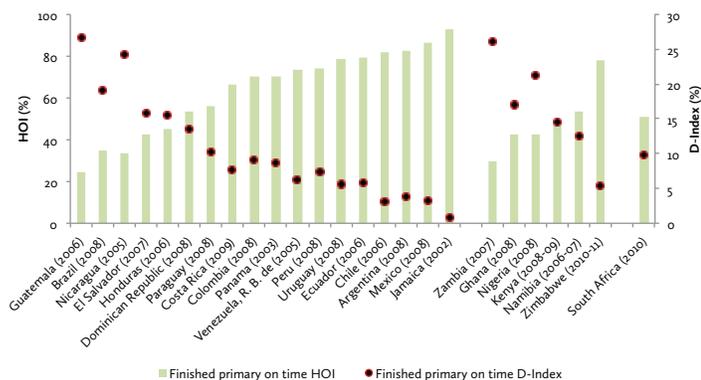
### Opportunities among Children: A Story of Mixed Progress

Access to a set of basic goods and services is taken as a proxy for opportunities among South African children. The metric chosen is the well-known Human Opportunity

Index (HOI), which is the coverage rate of a good or service discounted by how equitably it is distributed among groups with different circumstances, such as gender, race, and family background.<sup>4</sup> The HOI runs from zero to 100; a higher number indicates greater opportunity.<sup>5</sup> Embedded within HOI is a “dissimilarity” index (or D-Index) that is a metric for inequality of opportunity, with a higher value indicating greater inequality.<sup>6</sup>

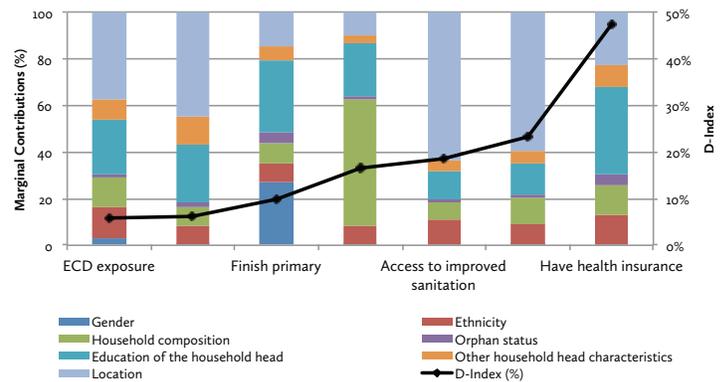
For South Africa, the circumstances considered are personal and family-related: gender and ethnicity of the child; household composition;<sup>7</sup> education, gender, and age of the household head; orphan status (whether both parents are alive); and location of the household (urban townships and informal settlements, other urban areas, or rural areas). Opportunities include exposure to early childhood development (ECD) programs (ages 0–4 years), school enrollment (ages 6–11 and 12–15), completion of primary school (ages 13–15), adequacy of school infrastructure and teachers (as reported by parents), and having health insurance. Completion of primary school and parents’ perceptions of schools are proxies for education quality, used in lieu of measures of student learning achievement that are not available. Exposure to ECD programs is a proxy for cognitive inputs early in a child’s development process.<sup>8</sup> Having health insurance is an indirect measure of access to quality health services in the South African context.<sup>9</sup> Other opportunities include access to safe water on site and improved sanitation, which are known to reduce the risk of diseases that are the leading cause of undernourishment in children.<sup>10</sup> Access to electricity and telecommunications, lack of overcrowding in the household, and the opportunity to grow up in a safe neighborhood, for a number of different reasons, are likely to improve a child’s cognitive and academic development.<sup>11</sup>

**Figure 2 Finishing Primary School on Time, South Africa and Other Countries**



Source: SAEU3, using General Household Surveys (2002 and 2010) for South Africa; national household surveys for Latin America and the Caribbean countries; and DHS for African countries.

**Figure 3 Contribution of Circumstances to Inequality of Opportunity, 2010**



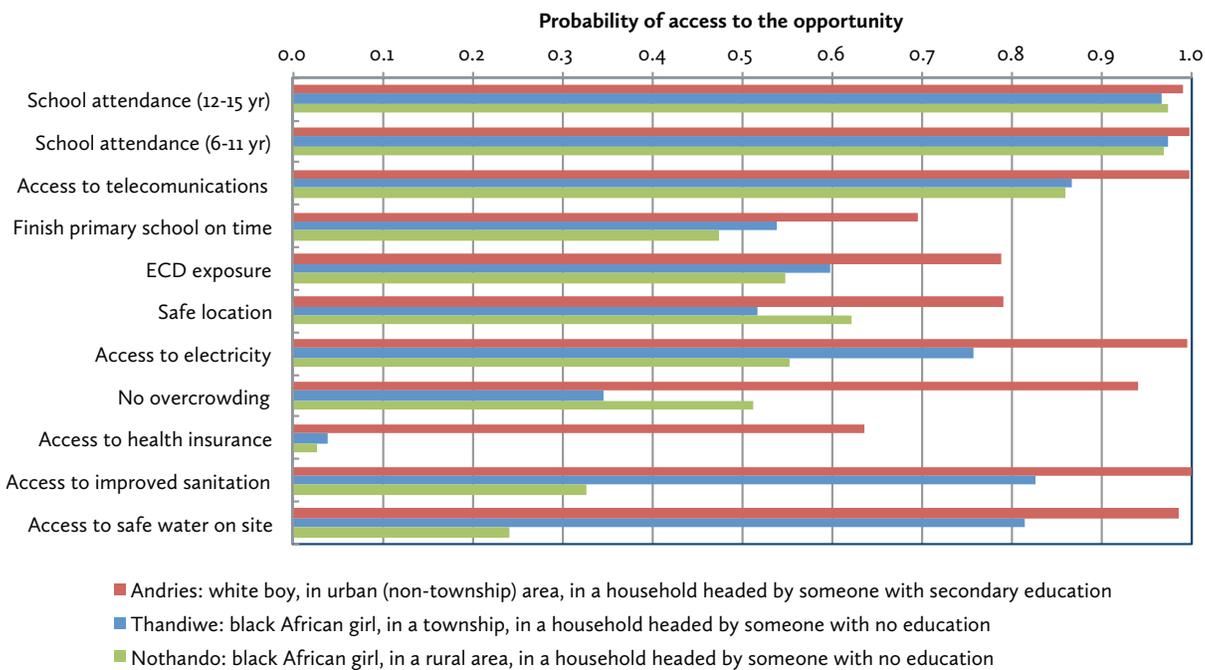
Note: Results of Shapley decompositions of D-Index, shown only for opportunities where D-Index > 0.5.  
Source: World Bank staff calculations in SAEU3, based on General Household Survey (2010).

Some opportunities, like school attendance and access to telecommunications, are nearly universal (HOI above 90 percent) among South African children. Other opportunities—health insurance, access to safe water and improved sanitation, adequate space without overcrowding, and finishing primary school—are inadequate and distributed with high inequality among children of different circumstances. Still other opportunities—access to ECD programs, neighborhood safety, and access to electricity—are below universal, but have low to moderate inequality of opportunity (figure 1). Accordingly, South Africa fares well in international comparisons on HOI for school attendance. But for completion of primary school on time, which is related more closely to quality of education, South Africa is surpassed by most of its Latin American peers (figure 2). On access to safe water and improved sanitation, South Africa, though ahead of other African countries, lags behind all except the poorest among Latin American countries (e.g. El Salvador and Honduras).

South Africa made significant progress between 2002 and 2010 in providing access to telecommunications, and to a lesser extent in sanitation, adequate infrastructure in school, and electricity. Most of the gains in HOI were driven by a general expansion of service coverage for children of all circumstances. But for improvements in sanitation and telecommunications, reduction in inequality also played a key role, with opportunities improving more than proportionately for underserved groups.

In most cases where inequality of opportunity is moderate or high, the most important circumstances are a child’s location and the education of the head of the child’s household (figure 3). Location is particularly important for opportunities related to infrastructure; education of the household head

Figure 4 Contrasting Opportunities of Three (Hypothetical) Children, 2010



Source: SAEU3, based on General Household Survey (2010).

is the most important for finishing primary school on time and having health insurance, underscoring how the family's socioeconomic background holds a lock on children's future. Household size matters the most for the opportunity to grow up in a house with no overcrowding. Interestingly, the child's gender contributes appreciably to inequality only for finishing primary school on time. Ethnicity contributes to inequality, but does not rank among the top two contributors for any opportunity.<sup>12</sup> This seems to suggest that the contributions of race and gender to inequality of opportunity among children are intertwined with that of family background and location. Thus many of the apparent racial and gender gaps in opportunities for children in South Africa today can be narrowed if opportunities could be equalized across groups differentiated by socioeconomic status and, above all, location.

To what extent key circumstances matter, and for which opportunities, can be illustrated through an example of three imaginary children with contrasting profiles and their likelihood of access to different basic services (figure 4). In this hypothetical example, Thandiwe and Nothando are black African girls, growing up in households headed by individuals with no education, with the difference that Thandiwe lives in an urban township and Nothando in a village. Andries is a white boy, living with a household head who has secondary education, in an urban area that is not a township or informal settlement.

Both Thandiwe and Nothando's chances of attending school up to the age of 15 are just as good as Andries's. But compared with Andries, they have a lower chance of finishing primary school by age 15, having exposure to an ECD program, health insurance, and access to basic infrastructure, and living in a safe environment with adequate space. Thandiwe and Nothando's opportunities also vary relative to each other. For access to safe water on site, improved sanitation, and electricity, Thandiwe has a big advantage over Nothando, reflecting the inadequacy of these services in rural areas. For primary school completion and access to ECD and telecommunications, the gaps between the two children are smaller. Living in a township, however, puts Thandiwe at a disadvantage in terms of a safe environment and adequate living space.

### Inequality in Access to Jobs, and How Circumstances Matter

Lack of access to employment is a driver of income inequality and an obstacle to economic mobility. This is especially true in South Africa, where the narrowest measure of unemployment stood at 25 percent in 2012,<sup>13</sup> with nearly 70 percent of the bottom income quintile being unemployed in 2008. Inequality in employment, and the extent to which it is related to circumstances, is thus an important concern.

Two definitions of employment were used in SAEU3: an adult of working age (ages 15–64) is considered to be “em-

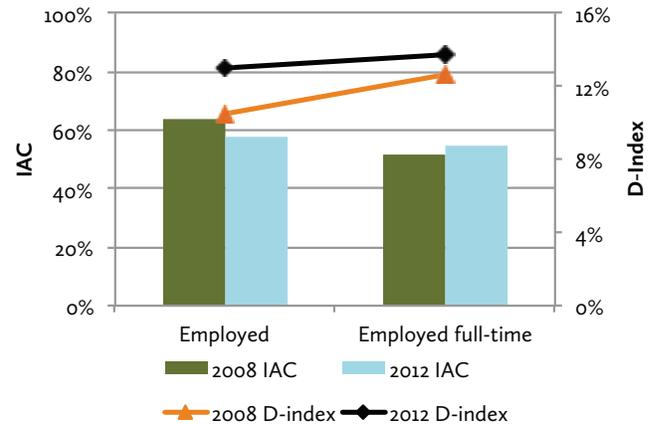
employed” if s/he has any job (as opposed to being unemployed or discouraged from seeking employment), or “employed full-time” (as opposed to being unemployed, underemployed, or discouraged). The HOI methodology is used to estimate an “inequality-adjusted coverage rate” (IAC), which discounts average employment rate by inequality in employment between groups of working-age adults differentiated by two types of attributes: circumstances that a worker has little or no control over (gender, ethnicity, and location) and characteristics (education level and age of the worker).<sup>14</sup> The contribution of *circumstances* to overall inequality indicates the extent of inequality of opportunity in the labor market—the part of inequality that is not explained by the individual’s education or experience, but by attributes the individual has no control over.

IAC for being employed fell between the first quarters of 2008 and 2012, reflecting lower availability of jobs due to the global crisis as well as a rise in inequality between groups (figure 5). Even as IAC for being employed full-time rose slightly over the period, so did inequality between groups. Thus inequality between groups has risen in employment and full-time employment, while the adverse impacts of the global crisis are seen more on part-time than full-time employment. When compared with 17 middle-income countries around 2008, South Africa—ranked 13th out of 18 countries by per capita GDP – was ranked the lowest by IAC and highest by between-group inequality in having a job (figure 6). The low IAC in South Africa is explained not only by too few jobs (high unemployment) but also by higher inequality in how the available jobs are distributed among workers of different attributes.

More than half the between-group inequality (in being employed or employed full-time) in South Africa is driven by differences in education and age. The remaining inequality is attributable to circumstances, of which location appears to contribute the most, followed by ethnicity and gender (figure 7). The chances of being employed or employed full-time for a township and informal settlement resident or especially a rural resident are much lower than those of a resident of other urban areas, and the gap is larger in 2012 than it was in 2008. Being a woman and non-white increases the likelihood of being unemployed or underemployed significantly, even as these circumstances have declined in importance in the past four years. Importantly, circumstances related to parental socioeconomic background, likely to be correlated with circumstances such as location and ethnicity, are missing due to a lack of data. Given this caveat, the contributions of race and location are best interpreted as reflecting socioeconomic factors (including, but not limited to, race and location) that contribute to inequality in employment opportunities.

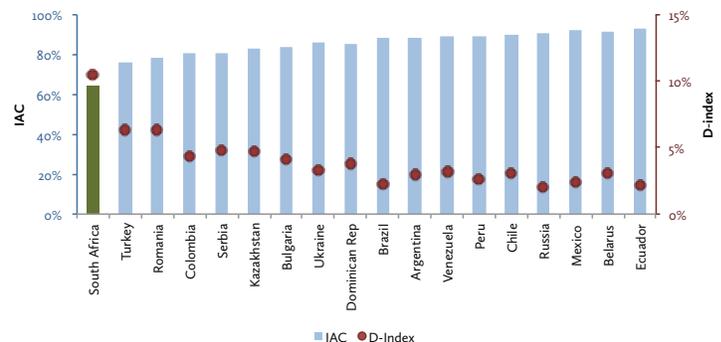
Education, which contributes between 15 and 20 percent

**Figure 5 IAC and Inequality between Groups Differentiated by Circumstances, Education, and Age**



Source: SAEU3, based on Quarterly Labour Force Surveys (2008q1 and 2012q1).

**Figure 6 D-Index and Inequality-Adjusted Coverage by Employment, circa 2008**

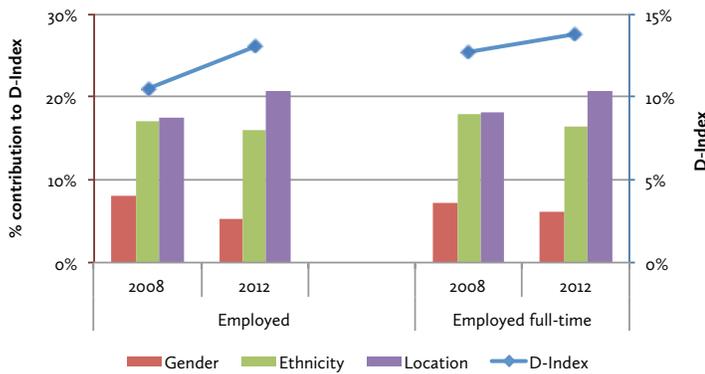


Note: Computed using similar but not identical definitions of circumstances across countries.

Source: SAEU3, based on Latino Barometro (2008) for Latin America and the Caribbean countries; Life in Transition Surveys (2006) for Europe and Central Asian countries; and Quarterly Labour Force Survey (2008q1) for South Africa.

of inequality in employment status, has increased in importance from 2008 to 2012.<sup>15</sup> While this is a trend toward a fairer labor market, it also implies that disadvantages conferred by unequal opportunities in education earlier in life are increasingly important obstacles to an individual’s economic mobility. More calculations show that for formal-sector employment outside agriculture, a proxy for quality jobs, education accounts for a much higher and increasing share of inequality. This appears to be consistent with other literature that finds high (and rising) skills premium to be a key driver of income inequality in South Africa.<sup>16</sup> Some literature also suggest sharp disparities in wage earnings among those with jobs, by

**Figure 7 How Circumstances Contribute to Inequality**



Note: Each contribution is expressed as % of total value of D-Index. Source: SAEU3, based on QLFS (2008q1 and 2012q1).

race, gender, location, and union membership—an aspect of group-based inequality that our measures do not capture because they are based on a binary measure of employment.

While labor markets typically reward experience, the extent to which age contributes to inequality in employment status in South Africa is unusually large, relative to its middle-income comparators.<sup>17</sup> When computed separately for each age group, IAC increases and inequality declines progressively with age of the workers (figure 8). The trends also seem to be against young workers—the 15-24 age group is the only group for which IAC has fallen and inequality risen for both employment and full-time employment between 2008 and 2012. More

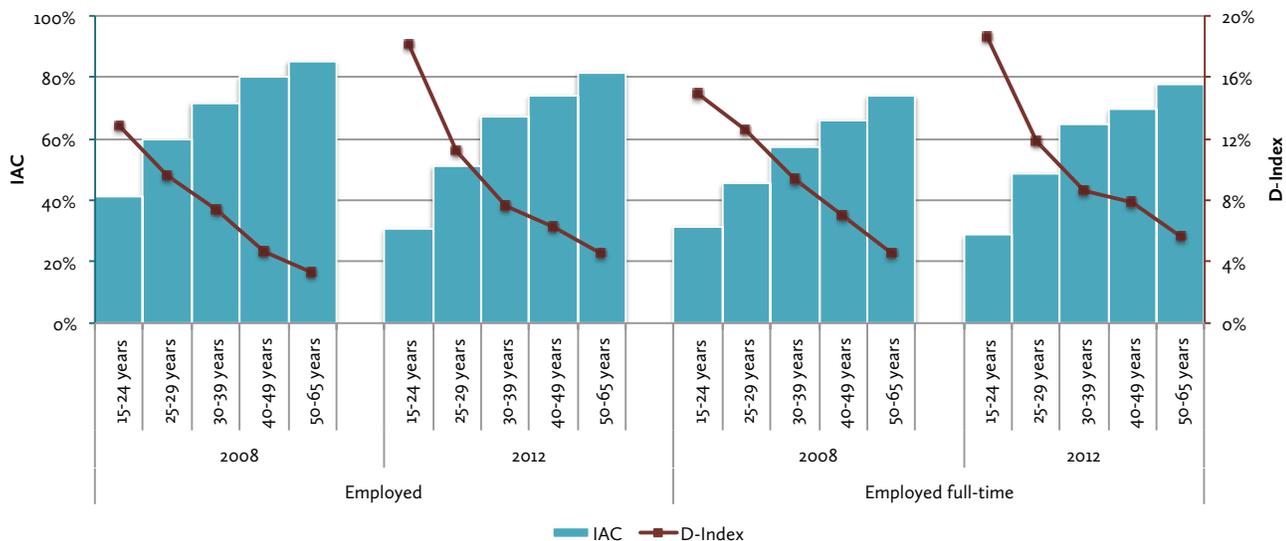
analysis shows that inequality of opportunity—the part of inequality attributable to gender, ethnicity and location—is much higher among workers ages 15-29 than among older workers.<sup>18</sup> Thus not only do young workers face a disadvantage in the labor market, they also compete for jobs in a market seemingly more “unfair” in allocating opportunities among the young, relative to what is seen for older workers.

### Final Thoughts

Equality of opportunity provides a powerful guiding principle for policy on which political consensus is easier to achieve. As with any objective, an intuitive and objective measure of progress is crucial—a need that is in part filled by the human opportunity index for South Africa. Analysis using this index shows that extraneous circumstances that a South African child is born into (ethnicity, location, gender, and family background) variably affect the child’s access to basic opportunities. Some of these circumstances (such as location and ethnicity) are also important for inequality in employment opportunities later in life, raising the prospect of a persistent role of adverse circumstances in perpetuating inequalities over successive stages in life. A child born into disadvantageous circumstances has to work harder to overcome these in order to attain her human potential; having done so, she may find that disadvantages reemerge when she enters the job market. And the disadvantages do not necessarily end in a generation, but are likely to be carried over to the next.

While there are no simple, elegant policy solutions in the

**Figure 8 Inequality-Adjusted Coverage and D-Index for Workers of Different Age Groups, 2008 and 2012**



Note: Circumstances/characteristics are gender, ethnicity, education, location, and age. Source: SAEU3, based on Quarterly Labour Force Surveys (2008q1 and 2012q1).

quest for equity, a few broad principles seem to be relevant for South Africa. To be sure, that would involve leveling the playing field in the quality of education children get and the employment opportunities they face as young adults, irrespective of location, gender, or ethnicity. It would also be important to pay special attention to the water, sanitation, and health-care needs of rural areas and townships, and overcrowding in townships. Academic research has found interventions that equalize opportunities earlier in life to be much more cost-effective and successful than those later in life. Policy design also needs to recognize that children of certain circumstances are vulnerable to deprivations in multiple dimensions simultaneously. For example, black South Africans living in rural areas, and with household heads lacking education, are much more likely to not complete primary school, and not to be covered by an ECD program and health insurance. Policy interventions in different sectors thus need to coordinate closely in order to achieve better efficiency and results.

## Notes

- 1 In 2008, the top decile of the population accounted for 58 percent of the country's income while the bottom half accounted for less than 8 percent (Leibbrandt and others, 2010).
- 2 Noncontributory and means-tested (except for foster care) financial transfers from the budget account for more than 70 percent of the income of the bottom quintile, up from 15 percent in 1993 and 29 percent in 2000. In the absence of social assistance, estimated average incomes of the bottom four deciles of the population would have actually fallen between 1995 and 2005. Bhorat and van der Westhuizen (2011) find that in 2005 income Gini would increase from 0.72 (including social assistance grants) to 0.77 (without the grant incomes).
- 3 While the concept of equality of opportunity—a subject of growing research among academics and at the World Bank—draws from a large volume of literature, the economist John Roemer's 1998 book *Equality of Opportunity* was the first to formalize an equality of opportunity principle.
- 4 Equality of opportunity was highlighted by the 2006 World Development Report on Equity and Development. Recent work by researchers has provided various measures of inequality of opportunity in countries (for example, see Ferreira and Gignoux, 2011). The Human Opportunity Index (HOI) was developed by a group of World Bank staff and external researchers. First applied in Latin American countries in 2009, it has now been computed for a growing list of countries around the world. For a description of HOI, see Barros and others (2009, 2010, and 2012).
- 5 Thus two societies with the same coverage rate for any service can have different HOIs if citizens' access to that service in one society is determined to a greater extent by personal circumstances beyond their control.
- 6 The relationship between HOI and D-Index can be expressed as  $HOI = C(1-D)$ ; where C: coverage rate of the good or service, and D: dissimilarity index. D is also equivalent to the ratio of "penalty" due to inequality to the coverage rate. Intuitively, D measures the share of available opportunities that needs to be reallocated across circumstance groups in order to achieve equality of opportunity.
- 7 Household composition includes presence of the spouse of the household head in the household, total number of children ages 0–16 in the household, and whether both parents live in the household.
- 8 See, for example, Chetty and others (2010) for evidence that early childhood education has substantial long-term impacts, ranging from adult earnings to retirement savings.
- 9 Ideally, opportunities would also include indicators of child health such as nutritional outcomes, access to preventive care, and access to maternal care services, which are absent in the dataset for this analysis.
- 10 Child malnutrition has been shown to generate life-long learning difficulties, poor health, and lower productivity and earnings over a lifetime (Alderman and others 2001; Hoddinott and others 2008).
- 11 See, for example, Gove and others (1979) for the adverse impacts of overcrowding.
- 12 The limited role of gender in explaining inequality in accessing infrastructure facilities is driven by the fact that access is measured at the household level (and not the individual child's).
- 13 Unemployment rate is 25 percent in 2012 (quarter 1), and 34 percent when discouraged workers are included in a broader measure (SAEU3, page 7).
- 14 Unlike gender and ethnicity, location is somewhat debatable as a circumstance because working-age individuals have some control over where they live. In practice, however, spatial mobility is restricted by cost considerations, (lack of) social networks, and cultural and family ties. In South Africa particularly, mobility out of rural areas and townships and informal settlements is fairly restricted because of historical reasons that affect the poorest more than others.
- 15 Inequality of opportunity in employment would be even higher than what is estimated here, if the indirect effect of circumstances on employment through education were to be taken into account. The estimate here of inequality produced in the labor market does not take into account the unequal distribution of opportunities earlier in life (such as timely completion of schooling or ECD exposure) that mat-

ter for human capital formation and are also affected by the same circumstances.

16 See, for example, Borhat and others (2009).

17 The average contribution of age to between-group inequality in employment was 42 percent in 2008, compared to 19 percent for the 17 middle-income countries included in figure 7.

18 Circumstances contribute around 70 percent of the D-Indices in being employed or employed full-time for those between 15 and 29 years, compared to less than 60 percent for those between 30 and 65 years of age.

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# Climate Change and Inequality: What Can Current Patterns of Food Insecurity Tell Us?

Nancy McCarthy, Leslie Lipper, and Maximillian Ashwill

**M**uch of the discussion about climate change and inequality focuses on how the greenhouse gas emissions of wealthy nations contribute to the negative climate impacts that poor nations face. The discussions center on how developed countries like the United States and quickly developing countries like India and China can reduce their emissions, or at least compensate poorer countries that emit low amounts of greenhouse gas but face the most perilous impacts.

To a poor farmer in the highlands of Bolivia or a fisher in the Maldives, these discussions are light years away from the real problem. These individuals must contend with the everyday consequences of climate impacts, such as feeding a family and

maintaining a livelihood. According to the Food and Agriculture Organization (FAO) of the UN (2012), in 2010–2012 nearly 870 million people were chronically undernourished, with 850 million of those living in developing countries. That is almost 15 percent of the population of poor countries. FAO (2008) shows that climate change is having an impact on all dimensions of food security, with changing food prices playing a major role, as highlighted in figure 1.

This leads to important questions regarding climate change, food security, poverty, and inequality. How will climate change affect the food security of poor households in rural and urban areas? How will climate-change impacts on poverty and food security affect poverty and inequality?

Evidence discussed below suggests that the food security of

the urban poor will deteriorate as food prices rise. Because poor people in urban environments spend a large share of their budgets on food, they will be hit disproportionately by relatively higher food prices, leading to both higher poverty rates and increased inequality in urban areas.

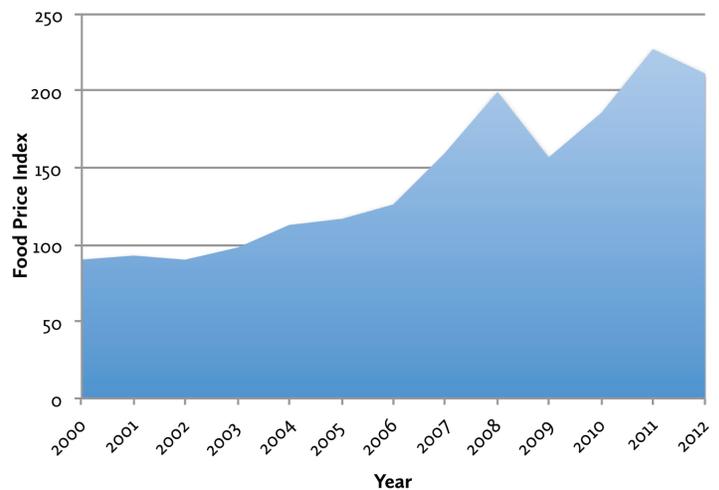
In rural areas, the impacts will be more complex. Some producers might benefit from higher food prices by maintaining or expanding output despite higher temperatures and more erratic climate. Rural laborers might also benefit if the overall agricultural economy expands. Other farmers, however, might not be able to expand production; in fact, output might well fall despite price increases. In this case, rural poverty will increase. Crucially, given thin or nonexistent insurance markets, farmers will need to be able to self-insure against increased climate risks. Because wealthier farmers are better placed to self-insure, inequality in rural areas might well increase. In developing countries, overall impacts on poverty and inequality will be largely driven by the rural sector because a large share of the population lives in rural areas, as highlighted in figure 2.

### Impacts of Climate Change on Food Production and Prices

Global weather patterns are changing. The planet is warming and as a consequence environmental change is happening more quickly. According to the Intergovernmental Panel on Climate Change (IPCC), floods, droughts, and other weather-related shocks are predicted to become more severe and more frequent. Certain parts of the globe are becoming wetter and others are becoming drier. In some cases, formerly productive lands are now barren. The weather is becoming more variable and seasons are becoming more difficult to predict (IPCC 2012). All of this can have negative impacts on the world's food producers.

In turn, climate change is having an impact on food security. All components of the global food system, including food markets and prices, stand to be affected. Food processing, production, storage, and transport can be affected through increased disruptions and costs associated with productive land, energy, and water. Since 1970, rising incomes for the world's poor, combined with falling food (real) prices have helped make much of the global population more food secure (Schmidhuber and Tubiello 2007). But population growth, cli-

Figure 1 The Rising Food Price Index

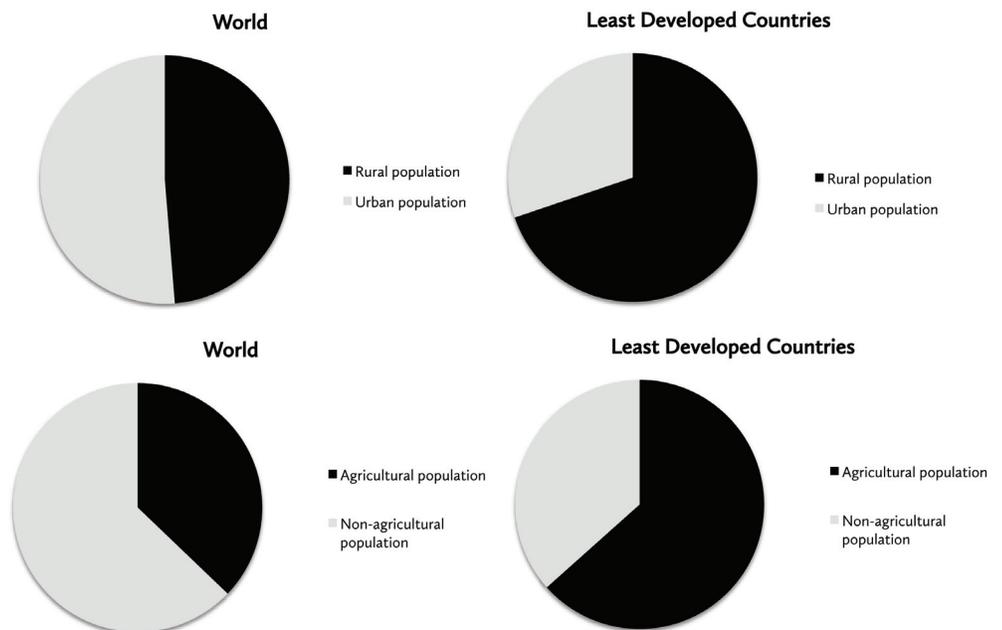


Note: The Food Price Index consists of the average of five commodity group price indices (meat, dairy, cereals, oils and fats, and sugar) weighted with the average export shares of each of the groups for 2002–2004.  
Source: FAO 2013b.

mate change, and competing demands for agricultural lands (for example, for biofuel production) have caused prices to reach near all-time highs (see figure 1) (World Bank 2013).

Climate change is also affecting the ability of some lands to grow food. Higher temperatures, increased water scarcity, floods, rising soil salinity, and extreme weather all can dimin-

Figure 2 Location of the World's Rural and Agricultural Populations



Source: FAO 2013a.

## The Four Dimensions of Food Security

**Food availability:** The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

**Food access:** Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community in which they live (including traditional rights such as access to common resources).

**Utilization:** Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

**Stability:** To be food secure, a population, household, or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Source: FAO.

ish land productivity. Some of this loss can be offset by the increased use of previously unused or moderately productive lands, or by adopting different agronomic practices. Still, this is an alarming trend because climate change is projected to have a negative impact on agricultural systems located in poor, low-latitude countries where agriculture is an important source of livelihood (Fischer et al. 2002; Parry et al. 2004). For example, Africa is projected to bear the largest loss in productive lands (Fischer et al. 2002). So, although crop production and yields continue to increase to meet global demand, these are growing at a slower pace than in the past. According to FAO (2009), crop yields over the next 50 years will grow at half the rate that they have increased historically.

## Impacts of Climate Change on Food Security

Generally, projections indicate that developing countries are likely to suffer greater negative impacts on the various dimensions of food security—in both the short and long term—although some exceptions and considerable uncertainty still remain. In the short term, the increased frequency and intensity of climate shocks are expected to directly affect *stability*, with indirect effects on the other three dimensions—*availability*, *access*, and *utilization* (see box). In the long term, climate change is projected to affect the entire food system. Changes in temperature, rainfall patterns, and pest and disease incidence

are expected to affect *availability* (food supply), *access* (food prices as well as agricultural incomes), and *utilization* (spoilage, human health).

Within developing countries, the impacts of climate change on food security are likely to be unequally distributed as well. The distribution of these impacts is largely determined by two factors: first, by how much people depend on agricultural production for their livelihoods and incomes, and second, by how much they depend on purchased food to maintain food security.

We have identified five distinct types of households that depend on these two factors in different ways. These types are: 1) net food-selling farm households, 2) self-sufficient farm households that neither purchase nor sell food to the market, 3) net food-purchasing farm households, 4) rural landless and non-farm rural households dependent on rural wages, and 5) poor urban households. These groups are presented in order of those most likely to gain from higher food prices (as long as land productivity does not fall too much) to those most likely to lose.

### Food-Selling Farm Households

Results from an analysis of nine developing countries show that, on average, 23 percent of all households and 32 percent of rural households were net food sellers (Aksoy and Isik-Dikmelik 2008). Like all farm households, net food sellers will be vulnerable to reduced crop yields because of climate-change-induced reductions in farmland productivity, hence impacting *availability*. However, the net effects on *access* could be positive, to the extent that food-selling households benefit from higher prices as long as negative impacts on productivity are not too severe (e.g. negative impacts on productivity outweighing positive price effects). The degree to which households are integrated into markets and can reap the benefits of higher prices is an important determinant of net effects. However, even if incomes remain constant, impacts on *utilization* could affect the food security of this group, though it is difficult to predict how current net sellers will alter their consumption basket in response to changes in yields and agricultural prices. Food safety and food waste may become a more difficult issue because higher temperatures and changing rainfall patterns require improved on-farm storage (Vermueulen et al. 2012). And stability could be threatened by increased climate risk and uncertainty if the incentives to invest in farming are reduced (Dercon and Christiaensen 2011; Hurley 2010).

### Self-Sufficient Farm Households

Self-sufficient households usually constitute a small share of the rural population, because most households engage in some form of market transactions (Karfakis et al. 2011). This group includes subsistence farmers, herders, fishers, and forest-dependent people who rely on their own production. As a

result, they are vulnerable to production risks and the loss of natural resources (land, water, fish) from climate change. This can negatively affect *availability*, as well as *access* since their own production is their sole means of *access*. The extent to which they are impacted is largely determined by the extent of the climate impact on production levels. It is more likely that highly vulnerable households will have to reduce consumption or sell off assets in the event of a climate shock (Kazianga and Udry 2006; Skoufias and Quisumbing 2005). Wealthier households will have a greater capacity to adapt and prepare for the impacts of climate change. Also, self-sufficient households have limited *access* to markets, which can make them less able than others to purchase food, impacting *access*. Like other farm households, self-sufficient producers may face higher costs to improve storage to ensure food safety, affecting *utilization*. They are also more likely than net sellers to be negatively affected by the reduced nutritional value of their food consumption basket. The fate of self-sufficient households is less influenced by changing food prices than are net sellers or buyers of food, so price volatility has less of an impact on food *stability*. However, like net food sellers, self-sufficient households will experience more frequent climate shocks that will reduce incentives to make long-term investments in farming in the absence of policy interventions to help manage risks.

#### Food-Purchasing Farm Households

Most farming households in developing countries are both buyers and sellers of food. They use markets to supplement a lack of quantity or variety in domestic production or to bridge seasonal food shortages. However, those that generally buy more than they sell make up the largest share of poor rural households (FAO 2008b). These households are vulnerable to both price increases and production losses; as a result, they are vulnerable to negative impacts on *availability* from climate change. The double impacts of reduced production and higher food expenditures constitute a threat to the food security of this group. Food-purchasing households are less likely to have adequate food-storage facilities than food-selling households; this affects *utilization* by increasing their exposure to spoiled or unsafe food (Brown et al. 2009). *Stability* for these households will be vulnerable to both market and production volatility.

#### Rural Landless and Non-Farm Rural Households

In rural areas, there are many individuals who don't participate in the local agricultural economy, but still rely on it. These non-producers are typically landless but they are still involved in agriculture through wage labor, trading, services, or input sales. These individuals may benefit from increased food prices, depending on the overall effects on agricultural production and incomes of local producers. Rising rural wages could thus be associated with increases in *access* for this group, even if *availability* decreases locally. However, where net effects of climate

change on the rural economy are negative, but as food prices increase, *access* for this group will significantly decline.

Reduced incomes can result in households switching to less nutritious and lower-quality foods, negatively affecting *utilization*. Their *stability* is vulnerable to the effects of climate shocks on rural incomes and food prices (FAO 2011).

#### Poor Urban Households

Like the rural landless, the urban poor's food security depends on relative changes in incomes and food prices. Generally, the livelihoods of urban families, and food *availability*, are less negatively affected by the weather than those of rural families. However, urban consumers are especially vulnerable to changes in global food prices because they are more likely to consume staple foods derived from globally traded commodities. This can have severe impacts on *access*. By contrast, rural populations are more dependent on local market surpluses and more traditional staple crops such as roots or tubers (FAO 2008a). This makes both urban and rural groups susceptible to price volatility caused by climate shocks, although their vulnerability depends on the relative volatility in their market source.

Also, if urban incomes rise at a slower pace than food prices, the urban poor are less likely to consume nutritious and safe foods, or more likely to make dietary cuts. This negatively impacts *utilization*. The *stability* of urban food supplies would be negatively impacted by food price volatility, but this could be mitigated by greater *access* to non-local food markets or storage.

#### Summary

As we have seen, there are many different pathways through which climate change might impact food security via impacts on the four dimensions of food security for the five household groups. Net impacts for any particular group (the "sum" of impacts across the four dimensions) are generally ambiguous and conditional on other factors. However, net food sellers are the most likely to gain, and the urban poor are most likely to lose. Self-sufficient and net food-purchasing households might gain if their ability to benefit from higher prices outweighs other negative impacts on *utilization* and *stability*, but lose otherwise. Rural non-farmers and the landless might gain if the rural economy expands and they see increased incomes, but the gain must be significant enough to offset the likely negative impacts on *utilization* and *stability*.

#### How to Minimize the Impact of Climate Change on Poverty and Inequality

For the urban poor, maintaining and improving food security will be directly related to their ability to access nutritious foods. Minimizing the impact of climate change on poverty and inequality depends on protecting the *access* and *utilization* dimensions of food security. Broad-based economic growth and development certainly is key. Additionally, well-functioning

global food markets—and domestic trade regulations regulating access to these markets—can help by dampening increases in locally driven food prices and ensuring a more stable supply of affordable, nutritious food.

In rural areas, the *stability* and *availability* dimensions of food security will be particularly important in determining the ultimate impacts of climate change on poverty and inequality. Inequality in rural areas is likely to be determined by the differences in agricultural households' ability to take advantage of higher long-term food prices to expand production and thus incomes.

Unfortunately, current wealth is likely to be a key determinant in this differential ability. Relatively wealthy producers, who can self-insure or are better connected to individuals not directly dependent on the local rural economy (such as those whose educated children have migrated to urban areas), will be better able to manage increases in climate risks. They will also be less likely to reduce important expenditures on food, education, and health care. In addition, they may not need to sell productive assets in response to climate shocks, thereby protecting the income of the next generation.

Social safety nets and innovative insurance products can help level the playing field, enabling poorer farmers to take advantage of higher prices now, and avoid having to sell assets, remove their children from school, and reduce nutritious consumption—all of which would have negative impacts on future income.

More general rural agricultural-development policies that reduce transaction costs can also enable more producers to benefit from relatively higher prices, thereby reducing poverty rates and inequality. Finally, policies and extension services that promote wider adoption of sustainable land-management practices can also help minimize the negative impacts of climate extremes, and potentially lead to increases in yield.

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