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Utility-consistent poverty in Madagascar, 2001-10

Snapshots in the presence of multiple economy-wide shocks

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Abstract: We use Arndt and Simler's (2010) utility-consistent approach to calculating poverty lines to analyse poverty in Madagascar in 2001, 2005 and 2010. Because two major political crises occurred between the survey periods, the snapshots of national poverty rising from 56.3 per cent in 2001 to 59.6 per cent in 2005, and to 61.4 per cent in 2010, are not necessarily indicative of a trend of persistently rising poverty. Complementary data indicate that in the time periods between the shocks, the well-being of the poor improved. This evidence suggests that poverty estimates for Madagascar are more a reflection of short-term shocks than of long-term trends.

Keywords: poverty measurement, utility-consistent poverty lines, inequality, Madagascar

JEL classification: D63, I32, O55

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1 Introduction

By all estimates, Madagascar is one of the poorest countries in the world, with macroeconomic indicators suggesting that the nation is poorer today than it was over 40 years ago. Average real per capita income in 2010 was approximately one third of what it was in 1960. Yet our understanding of poverty in Madagascar is incomplete because it is hampered by issues with data and methodology. This is not surprising given the complexity of measuring poverty in a manner that is consistent over time and space, yet is also sensitive to local conditions. The contemporary literature on poverty in Madagascar has stressed consistency over time by focusing on the comparability of the survey instruments used to estimate nominal household consumption aggregates, the key welfare measure used in calculating poverty (Paternostro et al. 2001, Amendola and Vecchi 2007). Evidence that differing commodity lists (Pradhan 2000) and recall periods (Scott and Amenuvegbe 1990) affect the levels of reported consumption from household surveys led Malagasy statisticians to make every effort to ensure that the survey instruments used to measure poverty were comparable from 2001 onward.

The nominal household consumption aggregate, however, is but one admittedly important component of poverty measurement. Another is the poverty line. The appropriate estimation of poverty lines is essential not only to gauge a poverty threshold, but also as a cost-of-living index that allows interpersonal welfare comparisons when the costs of consuming basic needs vary over time and space (Ravallion 1998). The challenge is to estimate poverty lines that are consistent over time and space (i.e. the reference standard of living is fixed), and yet are also characterized by specificity in which the poverty lines reflect local consumption patterns and norms (Ravallion and Bidani 1994).

The purpose of this paper is to analyse poverty in Madagascar between 2001 and 2010 by starting with a series of surveys for which a comparable set of survey instruments were used, and applying to those surveys Arndt and Simler's (2010) utility-consistent approach to calculating cost-of-basic-needs (CBN) poverty lines. This method involves calculating region-specific poverty lines based on consumption patterns of the poor in each of the regions to reflect local perceptions of poverty (i.e. specificity). But, to ensure that each of the consumption bundles in the region-specific CBN poverty lines also represents the same level of utility (i.e. consistency), a maximum entropy approach is then employed to reconcile cases where revealed preference conditions are violated. These consistent yet specific poverty lines, along with consumption aggregates calculated from comparable survey instruments, form the basis of the poverty analysis in this paper.¹

Another conceptual issue that arises when analysing trends in poverty is that poverty estimates are based on nationally representative household surveys that are not typically conducted every year. As such, they represent snapshots of poverty during the particular years in which the survey took place. The challenge is to disentangle the long-term poverty trends from the short-term shocks that may affect poverty estimates in a particular year. This is particularly the case for Madagascar given that two major political crises, along with a rice price crisis and multiple cyclones, hit the country during the first decade of the twenty-first century. As such, we place the monetary poverty measures in context by comparing them to other macro- and micro-economic indicators. While recognizing that short-term shocks may also affect the long-term structure of the economy, we

¹ Since this approach is different from those used in previous analyses of poverty in Madagascar, the estimated poverty levels and trends in this paper differ from previous estimates. This difference is explored in the Appendix.

conclude that the poverty estimates for Madagascar are more of a reflection of short-term shocks than of long-term trends.

The structure of this paper is as follows. In Section 2, we elaborate on the methodology used to calculate poverty and describe the primary data sources. Section 3 provides a description of the political and economic context in which the surveys took place to better understand the long-term trends and short-term shocks. In Section 4, we present the estimates of poverty and inequality based on the utility-consistent approach to calculating poverty lines, and triangulate these results with other monetary and non-monetary indicators. Section 5 provides concluding remarks.

2 Methodology and data

In this section, we briefly describe the methodology and primary data sources used to measure poverty and inequality in a manner that is consistent over time and space, and which is specific to local consumption patterns and norms.

2.1 Methodology

As with any analysis of poverty, choices need to be made regarding (i) the welfare indicator, (ii) the threshold between the poor and the non-poor, and (iii) the measure of poverty. While we concentrate primarily on a money measure of welfare – per capita household consumption – we complement this later with other measures of well-being such as infant mortality rates, educational enrolments, and access to basic services. The household consumption aggregate is constructed in a standard manner by aggregating food and non-food expenditures, the estimated value of own produced food and non-food items and of in-kind payments, gifts received, and the estimated use value of durable goods and housing (Deaton and Zaidi 2002).

We briefly outline the procedure used to estimate poverty lines² for 12 spatial domains in Madagascar (urban and rural for each of the six provinces). Food poverty lines are estimated first, and are anchored to calorie requirements that are calculated separately for each domain, for purposes of specificity, based on the demographic structure and fertility patterns in the domain. This is a departure from the common practice, for poverty analysis in Madagascar, of using a standard requirement of 2,133 calories per person per day. An iterative approach is used to find the least-cost consumption bundle that meets the domain-specific calorie requirements and that reflects consumption patterns in the spatial domain. This provides specific initial estimates of the food poverty lines. Revealed preference tests are then conducted to test the utility consistency of these poverty lines (i.e. do the consumption patterns in other spatial domains cost no less than the own-domain consumption patterns when both are evaluated at own-domain prices).³ When these tests are violated, maximum entropy methods are used to reconcile the differences so that domain specificity is maintained in the new poverty lines, while utility consistency is not violated. Once the region-specific food poverty lines are determined, they are scaled up by the share of non-food

² See Arndt and Simler (2010) and Arndt et al. (2013) for more details about the general procedure. The household consumption aggregates and poverty lines were calculated using the Poverty Line Construction Toolkit developed by Arndt et al. (2013).

³ We note that revealed preference conditions should also hold over time (i.e. do the consumption patterns in the same spatial domain but in different time periods cost no less than the own-domain consumption patterns at a specific time when both are evaluated at own-domain prices for that specific time). When these conditions are violated over time, similar maximum-entropy methods can be used to reconcile the differences (Arndt and Simler 2010).

consumption representative of the households around the food poverty lines, to get the region-specific poverty lines.

With the welfare indicators and poverty lines in hand, we primarily employ the Foster-Greer-Thorbecke (1984) class of poverty indices to measure levels and changes in poverty. We also move beyond the use of poverty indices to analyse changes in poverty by employing standard tests of dominance. In order to do this, we note that poverty lines are more than poverty thresholds; they also serve as cost-of-living indices that allow interpersonal welfare comparisons. As such, we use the poverty lines to map nominal household consumption to real household consumption using indices constructed from these poverty lines (Blackorby and Donaldson 1987). Once mapped into comparable real values, the distributions of household consumption are then used to conduct dominance tests and to measure inequality.

2.2 Data

The primary data sources used in this analysis are the 2001, 2005 and 2010 Madagascar Enquête Périodique auprès des Ménages (EPM). The EPM are general-purpose LSMS-type cross-section surveys conducted by the Institut National de la Statistique (INSTAT). They are nationally representative, stratified and clustered surveys conducted over three-month periods at the end of the calendar year, and contain information on household characteristics, expenditure, activities and infrastructure. Detailed consumption information is collected for the purpose of constructing welfare measures.

Over the course of the three surveys, the sample size grew from 5,080 in 2001 to 11,781 in 2005, and to 12,460 in 2010. This reflects the need for the latter two surveys to be representative, at the urban and rural levels, of each of the 22 administrative regions created in 2004 as part of the government's decentralization programme. Fortunately, the 44 strata in these 2005 and 2010 surveys can be grouped to represent the same 12 strata in the 2001 survey (urban and rural for six provinces). Further, while slight changes were made to the questionnaire in response to demands from the government and from donors who financed the surveys, INSTAT's efforts over the years to maintain comparability for welfare measurement – reflected in the nearly identical questionnaire modules for food and non-food expenditures, education and health expenditures, housing values and characteristics, ownership of durable goods, gifts and remittances, and in-kind payments – bode well for consistent poverty and inequality measurement.

2.3 Regional CBN poverty lines

The utility-consistent regional poverty lines estimated from the EPM (Appendix Table 1) show that between 2001 and 2010, the costs of basic needs have risen by over 125 per cent (an average of 8.5 per cent per year). In some regions, such as urban Mahajanga, they have risen even further (200 per cent). Rising costs of basic non-food items drove the rise in overall basic needs costs between 2001 and 2005, while rising costs of basic food items were more responsible for rising overall basic needs costs in rural areas between 2005 and 2010. The poverty lines also illustrate substantial regional variation in costs of basic needs. For example, in 2005 the rural Fianarantsoa poverty line was 32 per cent below the urban Antananarivo poverty line, while in 2011 the urban Antsiranana poverty line was 39 per cent higher than in urban Antananarivo. In short, the different poverty lines and differential changes in these poverty lines lend credence to the need for specificity in constructing poverty lines.

3 Context

The first decade of the twenty-first century was a tumultuous one for Madagascar, with important political and economic shocks hampering gains made during the intervening years. It is thus important to place the snapshots of poverty as measured in the 2001, 2005 and 2010 EPM in the broader context of the events that took place in Madagascar during this time period. In this section, we lay the groundwork for the poverty analysis by describing the general political and economic environment throughout the decade and relate this to the timing of the EPM surveys.

The 2001 EPM survey was conducted at the end of 2001, just prior to the 16 December national elections. As such, it provides a reflection of livelihoods in Madagascar during the year prior to the negative fallout of the disputed elections. This was a year in which the IMF and the World Bank approved US\$819 million worth of debt relief for the country, and in which Madagascar qualified for the United States African Growth and Opportunity Act (AGOA) and 'Wearing Apparel' provisions. Growth of real per capita income in this year was a modest 3.1 per cent, driven largely by increased production in the industrial and service sectors (Table 1).

The year immediately following the survey, however, was one of economic and social disruption due to a disputed presidential election. Supporters of the incumbent president, Didier Ratsiraka, effectively blockaded the capital of Antananarivo by blowing up six bridges in protest to an 29 April ruling by the constitutional court that the challenger and former mayor of the capital city, Marc Ravalomanana, had won the first round of the election outright. By August, Ratsiraka had fled the country to live in exile in France, and the international community pledged US\$2.3 billion in support to the newly instated Ravalomanana government. But the damage had been done. The first eight months of the year witnessed tourism drying up, textile exports halting, some 30 textile factories shuttering their doors, fuel and foodstuff prices skyrocketing in the capital due to shortages, and foreign investors staying away. As a result, real per capita gross domestic product (GDP) shrank by 15 per cent over the course of the year, and by the end of 2002 the general price level was 16.5 per cent higher than in the previous year (Table 1). The industrial and service sectors were hardest hit, with production shrinking by 20.8 per cent and 15.0 per cent respectively. Given the remoteness that is characteristic of much of the agricultural sector, however, production in the primary sector fell by only 1.3 per cent. Clearly urban areas were hit hardest by the 2002 political crisis.

While 2003 was a year of recovery and of implementation of the country's first Poverty Reduction Strategy, 2004 was characterized by yet another crisis. This time, however, the origin was economic in nature, though it was likely exacerbated by the government's response. The combination of a 58 per cent depreciation of the Malagasy currency relative to the US dollar, along with a 43 per cent rise in the Bangkok US dollar price of rice in 2004, meant that domestic rice prices rose as the rice import parity rose substantially for a country that typically imports rice, its main staple crop. Coupled with uncertainty over government intentions and the harassment of rice importers, private-sector traders were discouraged and rice imports ended up being only 151 thousand tonnes in 2004, compared to 254 thousand tonnes in the previous year (Minten and Dorosh 2006). The reduction in the supply of rice in the domestic market manifested itself in an average increase in paddy rice prices of 50 per cent. Given the importance of rice in the Malagasy consumption basket and given the exchange rate depreciation, this also meant that general inflation was high at 14 per cent in 2004 (Table 1).

The 2005 EPM was conducted during a period of political stability and continued overall growth led primarily by services and industry. This growth however was moderate and per capita incomes did not recover to pre-political crisis levels until 2007. Inflation remained high during this period, led largely by rapid rice price inflation, as changes in domestic rice prices in the latter half of the

decade reflected changes in international rice prices. Tight monetary policy prevented general inflation from being even higher. This was also a period when Rio Tinto invested over US\$500 million in an ilmenite mine in southern Madagascar, and when a consortium led by Sherrit International initiated the construction of a US\$4.76 billion nickel laterite mine in the eastern part of the country. Further, while the textile sector benefited from exports growth under AGOA and the preferential access Madagascar had to European markets under the Lomé Convention, textile exports did take a hit from the dismantling of the Multi-Fibre Agreement in March 2005 (Africa Confidential 2005).

The government of Marc Ravalomanana was generally viewed favourably by the international community as it made strides to attract foreign investment. Madagascar joined the South African Development Community (SADC) in 2005, and was the first country to sign a compact with the United States Millennium Challenge Account (MCA) when it signed a US\$110 million poverty reduction agreement in April 2005. Following his re-election in 2006, Ravalomanana's government developed its second poverty reduction strategy, dubbed The Madagascar Action Plan, in consultation with the international financial institutions. Under his watch, the economy continued its steady growth as per capita incomes grew annually by 2 to 4 per cent through 2008.

Table 1: Production and inflation in Madagascar, 2001-10

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Per capita GDP (thousands of 2010 Ariary)	984	836	893	914	930	951	982	1,024	955	933
Growth of real per capita GDP	3.1	-15.0	6.8	2.4	1.8	2.2	3.3	4.2	-6.7	-2.3
GDP (billions of 2010 Ariary)	15.0	13.1	14.4	15.2	15.9	16.7	17.7	19.0	18.2	18.3
- Primary	4.7	4.6	4.7	4.9	5.0	5.1	5.2	5.3	5.8	5.6
- Industry	1.8	1.5	1.7	1.8	1.8	1.9	2.1	2.2	2.0	2.0
- Services	7.3	6.2	6.8	7.2	7.7	8.3	8.9	9.6	8.9	9.0
Growth of real GDP	6.0	-12.7	9.8	5.3	4.6	5.0	6.2	7.1	-4.1	0.4
- Primary	4.0	-1.3	1.3	3.1	2.5	2.1	2.2	2.9	8.5	-3.4
- Industry	7.6	-20.8	14.6	6.5	3.0	3.5	9.8	3.6	-7.8	0.2
- Services	6.1	-15.0	10.6	6.0	6.1	7.4	7.8	8.2	-7.5	1.7
Rice (paddy) price inflation	-16.4	-0.8	-5.3	50.6	33.6	18.3	33.1	-16.2	14.3	-4.9
General inflation	7.4	16.5	-1.7	14.0	18.4	10.8	10.3	9.2	9.0	9.2

Note: Shaded areas indicate years during which EPM surveys were conducted.

Source: Authors' elaboration based on data from INSTAT and FAOSTAT.

On the domestic front, however, resentment began to build over the president's potential conflicts of interest with respect to his agro-industrial corporation, his attempts to rapidly reform the army, the government's purchase of a luxurious official airplane, and the government's 2008 agreement to lease 1.3 million hectares of arable land to the South Korean conglomerate, Daewoo, for 99 years. Protests in the streets of the capital, led by the president's rival and mayor of Antananarivo, Andry Rajoelina, and supported by factions of the army, led to Ravalomanana's eventual ousting in March 2009.

Unlike the 2002 political crisis when the international donors rallied around the new government by rapidly recognizing it and by providing US\$2.3 billion in support, the 2009 political crisis was followed by a slashing of aid. The ascendancy of Rajoelina to Madagascar's top office was officially

viewed by most of the international community as effectively a coup d'état. As such, most donors cut all but humanitarian assistance, as net official development assistance receipts fell from US\$843 million in 2008 to US\$444 million in 2009 (OECD DAC 2013). Further, Madagascar was suspended from SADC and had its AGOA access terminated by January 2010. As a consequence, the 6.7 per cent fall in per capita income during 2009 was not followed by a recovery as seen in 2003, but rather by a stagnation of total GDP and a further 2.3 per cent fall of per capita GDP, negating all of the gains made after 2005. It is this environment of stagnation following the 2009 crisis (some would say 'continued crisis') that is characterized by the 2010 EPM.

4 Poverty and inequality in the 2000s

It is within the context of these multiple political and economic shocks that we analyse snapshots of poverty and inequality in Madagascar in the first decade of the 2000s. As illustrated in Table 1, if we simply compare real per capita incomes during the EPM survey years (2001, 2005 and 2010), we would conclude that the decade was characterized by stagnation and a persistent deterioration of well-being. However, when the intervening years are included, the picture becomes one of growth interrupted by political and economic shocks. As such, once we have described poverty and inequality levels using utility-consistent poverty lines for the three household survey years, we complement the analysis with indicators from other data sources to substantiate the consistency of these poverty and inequality estimates with the broader dynamic picture.

4.1 Monetary poverty and inequality

Poverty rates in Madagascar are high and rose over the course of the three survey periods (Table 2). In 2001, 56.3 per cent of the population was poor, compared to 59.6 per cent in 2005, and 61.4 per cent in 2010. Although poverty is largely a rural phenomenon, with over 63 per cent of the rural population below the poverty line, it is also becoming increasingly urban. The urban headcount ratio rose by a substantial 11.4 percentage points, from 33.1 per cent in 2001 to 44.6 per cent in 2010.⁴

The more distribution-sensitive measures of poverty reveal that the headcount ratios alone mask important distributional differences in changes in poverty. Indeed there is little change in the depth and severity of national poverty over the decade, and the changes that are observed indicate a slight reduction, not an increase. The poverty incidence curves shown in Figure 1 illustrate this graphically, as the crossing curves indicate no first-order dominance. For example, the real per capita household consumption levels (temporally and spatially deflated by the poverty lines to 2010 urban Antananarivo values) of the richest 55 per cent of the population fell between 2001 and 2005 (thick solid line above the thin solid line), and did so again slightly between 2005 and 2010 (thick dashed line above the thick solid line). At the same time, the poorest 45 per cent of the population experienced slight improvements in real consumption. Because the standardized poverty line⁵ is above the consumption level for the 45th percentile, the headcount ratio captures the deteriorating consumption levels for those above this level. The improvements in consumption levels of the poorest 45 per cent of the population are not captured by the headcount ratio because these households remain poor throughout the decade. Nonetheless, these improved living standards for the poorest 45 per cent are captured by the decreases in the depth and severity of

⁴ The discrepancy in the summation is due to rounding of the numbers.

⁵ Because all per capita household consumption aggregate values are converted into 2010 urban Antananarivo values by using the regional poverty lines, the 2010 urban Antananarivo poverty line represents the standardized poverty line for all households in each survey year.

poverty. In short, the well-being of the poorest of the poor improved. It was just not enough to raise them out of poverty.

Table 2: Monetary poverty in Madagascar, 2001-10

	Levels			Changes		
	2001	2005	2010	2001-05	2005-10	2001-10
National						
Headcount ratio (P ₀)	56.3	59.6	61.4	3.3	1.8	5.1
Depth of poverty (P ₁)	23.6	23.6	23.2	0.0	-0.4	-0.4
Severity of poverty (P ₂)	12.6	12.2	11.5	-0.4	-0.7	-1.1
Urban						
Headcount ratio (P ₀)	33.1	42.5	44.6	9.3	2.1	11.4
Depth of poverty (P ₁)	12.7	15.3	16.1	2.6	0.8	3.4
Severity of poverty (P ₂)	6.5	7.6	7.9	1.1	0.3	1.4
Rural						
Headcount ratio (P ₀)	63.0	64.4	65.7	1.5	1.2	2.7
Depth of poverty (P ₁)	26.9	25.9	25.0	-1.0	-0.9	-1.9
Severity of poverty (P ₂)	14.5	13.5	12.4	-1.0	-1.1	-2.1

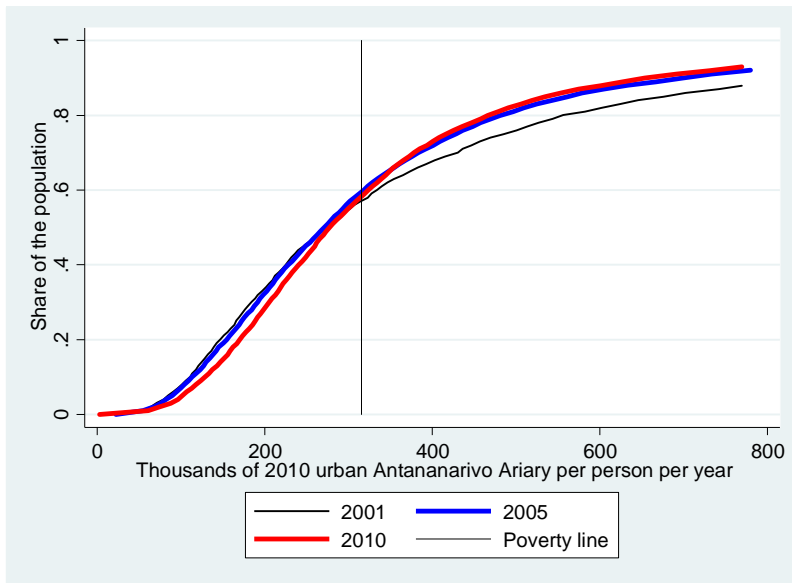
Note: Poverty measures are multiplied by 100.

Source: Authors' calculations from EPM data.

In urban areas, all of the poverty measures show a worsening of poverty, with the bulk of the change occurring between 2001 and 2005 (a 9.3 percentage point increase, compared to a 2.1 percentage point increase between 2005 and 2010). This is illustrated graphically in Figure 2a, where the poverty incidence curves for 2005 and 2010 are substantially higher than for 2001 for all but the poorest 10 per cent of the population. As noted in Section 3, urban areas were hit hardest by the 2002 political crisis. The poverty incidence curves in Figure 2a suggest that these areas had not recovered from the crisis by 2005, and that the 2009 crisis prevented real urban consumption levels from sustainably returning to 2001 levels. Higher levels of urban poverty, along with lower consumption levels among the non-poor, are arguably the legacy of the political and economic shocks that hit the country during this period.

Despite a greater percentage of the rural population falling below the poverty line over the course of the decade, the rural poor for the most part fared slightly better. As illustrated by the declining poverty depth and severity measures and by the improvements in the poverty incidence curves (lower) among the poorest 55 per cent of the rural population, the poorest half of the rural population was slightly better off at the end of the decade than it was at the beginning. Nonetheless, although rural areas weathered the storm better than urban areas, rural poverty remains high by any measure.

Figure 1: Poverty incidence curves, Madagascar 2001-10



Source: Authors' calculations from EPM data.

Figure 2a: Urban poverty incidence curves, Madagascar 2001-10

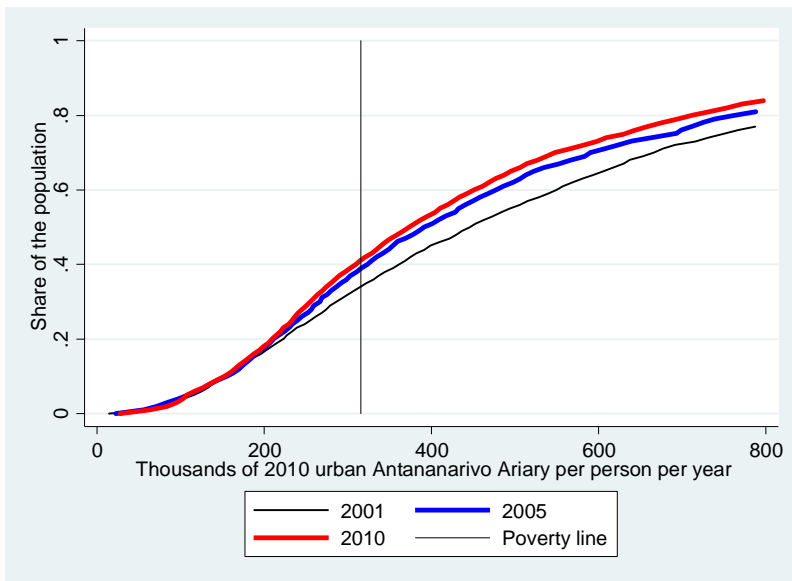


Figure 2b: Rural poverty incidence curves, Madagascar 2001-10



Source: Authors' calculations from EPM data.

Further disaggregation of poverty by region reveals some interesting messages. First, in 2001, urban poverty rates in all six of the provinces were lower than all of the poverty rates in rural areas, with the exception of rural Antananarivo (Table 3). The 44.3 per cent of the rural Antananarivo population that was poor was lower than the 46.5 and 49.9 per cent in urban Toamasina and Toliara, respectively. The spillovers from the national capital and major market centre in urban Antananarivo, and the corresponding lower prices of non-food items there, were likely responsible for the relatively low level of poverty in rural Antananarivo. The relatively high poverty rate in urban Toamasina is somewhat surprising given that this area includes one of the most important ports in the country, though the region is particularly susceptible to the adverse effects of annual cyclones given its location along the east coast.

Second, in 2001, poverty rates were lowest in urban Antsiranana and urban Antananarivo (location of the capital), 19.5 and 21.2 per cent, respectively. This is not surprising given the importance of the deep-water port, vanilla exports, and tourism in the former, and given that the national capital is in the latter. The poorest regions in the country, rural areas in Mahajanga, Toamasina and Fianarantsoa, were considerably poorer (more than 70 per cent of the populations) than urban Antsiranana and urban Antananarivo.

Third, the changes in regional poverty over the three survey years were not uniform, nor were they necessarily consistent with the observed changes at the more aggregated urban and rural levels. For example, while rural headcount ratios rose marginally overall between 2001 and 2005, they actually fell in the three poorest regions – rural Mahajanga, Toamasina and Fianarantsoa – and rose by some 20 percentage points in rural Antananarivo. Similarly, while urban poverty rates rose by over 9 percentage points overall during the period, poverty fell in urban Toamasina and Toliara. At the same time, urban poverty rose by over 13 percentage points in Antananarivo, Fianarantsoa and Antsiranana. This pattern is consistent with the directed and lasting effects of the blockade of the highlands (Antananarivo and Fianarantsoa) in 2002.

Table 3: Regional poverty in Madagascar, 2001-10

	Per cent poor			Changes		
	2001	2005	2010	2001-05	2005-10	2001-10
Antananarivo (urban)	21.2	37.8	35.4	16.7	-2.4	14.3
Antananarivo (rural)	44.3	64.9	52.3	20.6	-12.6	8.0
Fianarantsoa (urban)	41.3	58.8	53.7	17.5	-5.1	12.4
Fianarantsoa (rural)	73.0	65.8	76.4	-7.3	10.7	3.4
Toamasina (urban)	46.5	43.2	44.5	-3.3	1.3	-2.0
Toamasina (rural)	73.0	63.6	63.7	-9.4	0.1	-9.3
Mahajanga (urban)	29.4	37.5	46.9	8.1	9.3	17.5
Mahajanga (rural)	70.1	61.1	61.5	-9.0	0.4	-8.6
Toliara (urban)	49.9	41.7	58.5	-8.2	16.7	8.5
Toliara (rural)	66.9	65.4	71.9	-1.5	6.5	5.0
Antsiranana (urban)	19.5	32.6	35.4	13.1	2.7	15.9
Antsiranana (rural)	58.0	62.9	69.8	4.8	6.9	11.7
Urban	33.1	42.5	44.6	9.3	2.1	11.4
Rural	63.0	64.4	65.7	1.5	1.2	2.7
National	56.3	59.6	61.4	3.3	1.8	5.1

Source: Authors' calculations from EPM data.

Clearly, the differing poverty rates indicate that not all regions in Madagascar are equal. We now turn to how that translates into overall inequality of household consumption in the country as well as in urban and rural areas. The first thing to note is that the degree of inequality in Madagascar is typical of many African countries (World Bank 2011), as the Gini coefficient was 0.45 in 2001 (Table 4). Second, inequality fell over the course of the decade, as indicated by the Gini coefficient falling from 0.45 in 2001 to 0.39 in 2010, and the Theil Index falling from 0.37 to 0.33. This is not surprising given the compression of the consumption distribution observed in Figure 1, as the top half of the population experienced worsening conditions while the bottom half saw marginally improved conditions.

The degree of inequality in rural areas was higher than in urban areas in 2001. But due to declining rural inequality, urban inequality was greater by 2010. As with national inequality, the fall in rural inequality over the three survey periods is also consistent with the compression of the poverty incidence curves in Figure 2b as the poorest half of the population witnessed improved conditions alongside the worsening conditions of the richest 40 per cent. Unlike rural inequality, urban inequality worsened. It first rose between 2001 and 2005, but the change was ambiguous between 2005 and 2010. The Gini coefficient, for example, suggests that urban inequality fell back to 2001 levels by 2010, while the Theil index suggests that it rose further. This is consistent with crossing urban Lorenz curves during this time period (not shown here). However, what is clear about inequality in Madagascar is that it is driven primarily by inequality within urban and rural areas, rather than by the inequality between the two. Despite urban consumption levels being over 50 per cent higher on average than in rural areas, 94 per cent of total inequality is due to within-group inequality (Table 4). This follows largely from the rural population accounting for roughly 80 per cent of the national population. As with poverty, rural inequality largely drives national inequality.

Table 4: Inequality in Madagascar, 2001-10

	2001	2005	2010
<i>Gini coefficient</i>			
National	0.454	0.410	0.393
Urban	0.427	0.431	0.426
Rural	0.438	0.383	0.365
<i>Theil index</i>			
National	0.370	0.341	0.330
Urban	0.319	0.354	0.356
Rural	0.352	0.306	0.295
<i>Per cent due to</i>			
Within-group inequality	92.1	93.9	94.7
Between-group inequality	7.9	6.1	5.3

Source: Authors' calculations from EPM data.

4.2 Poverty and GDP

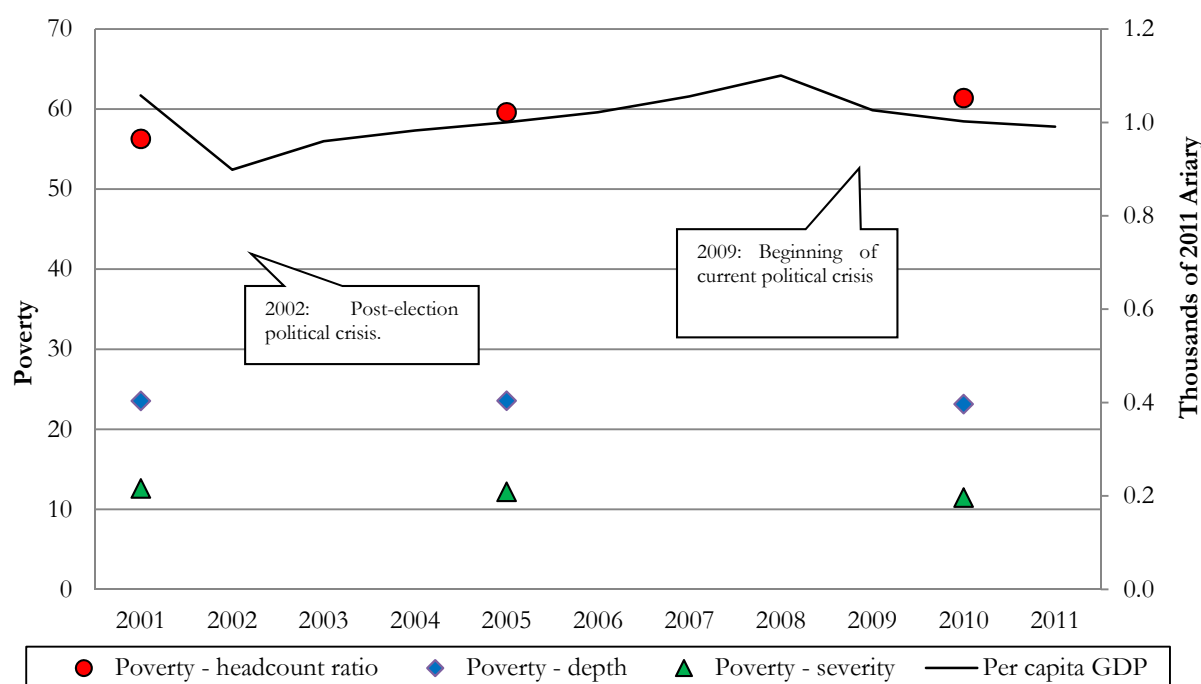
National poverty rates in 2001, 2005 and 2010 are consistent with volatile trends in real per capita GDP over the decade. To illustrate this, we plot the poverty estimates from the EPM surveys along with real per capita GDP in Figure 3. What is clear from this graph is that the short-term shocks to the economy (primarily the 2002 and 2009 political crises, but the 2004 rice price crisis as well) appear to dominate long-term trends in growth and poverty. In short, the adverse consequences of the 2002 political shock between the 2001 and 2005 EPM surveys meant that despite the subsequent recovery, poverty rates were higher in 2005 than 2001. Similarly, given that the 2009 political crisis occurred between the 2005 and 2010 EPM surveys, the gains in poverty reduction that likely occurred along with the persistent growth between 2005 and 2009 are not reflected in the 2010 headcount ratio, which is higher than in 2005. It would be a mistake to infer from these poverty estimates that there is a long-term trend of rising poverty in Madagascar. This is even more so the case when we consider that the effects of the short-term shocks were not felt uniformly across the country. Indeed, the moderate and persistent increases in consumption levels of the poorer rural population throughout this time period (as illustrated in Figure 2b and as manifested by the slightly lower depth and severity of national poverty in Figure 3) suggest that poorer and more remote areas (Stifel and Minten 2008) fared better during this time period and were cushioned from the shocks that afflicted urban and less remote rural areas.

A sectoral breakdown of GDP is instructive vis-à-vis the differential impact of the shocks on poverty, and it provides insights into the sources of growth and the volatility of this growth. In Figure 4, we plot real GDP by sector along with regional poverty rates to illustrate the sectoral production trends and how they relate to poverty. We begin with the non-mining primary sector given that it makes up 80 per cent of the labour force (Table 5), and given its strong link to the livelihoods of the poor (Stifel et al. 2007; Randrianarison and Minten 2003). Apart from the years directly affected by political crises, the primary sector experienced moderate growth that was slower than the industrial and service sectors (see also Table 1). Further, with the exception of 2009 when the growth rate was unexpectedly high,⁶ this growth was not enough to keep up the

⁶ According to FAO and Ministry of Agriculture data, the volume of rice production grew by 16 per cent in 2009 (see Appendix Table 1), contributing significantly to the 10.7 per cent growth of agricultural production that year.

with the population growth rate.⁷ As such, while the primary sector did not serve as an engine for growth, it appears that it did, however, serve as a safety net for urban households who resorted to primary-sector activities in the wake of falling production in the service and industrial sectors during the crisis years. For example, the share of urban employment in the primary sector rose from 39.6 per cent in 2001 to 54.5 per cent in 2010, while it fell in services and industry from 17.1 to 9.8 per cent, and 43.4 to 35.7 per cent, respectively. In rural areas, nonetheless, primary-sector growth did serve as a source of poverty reduction as the headcount ratio for rural households in this sector fell from 70 per cent to 65 per cent. Further, given the large portion of the rural population involved in agriculture, primary-sector growth likely contributed to the declining depth and severity of poverty illustrated in Figure 2b.

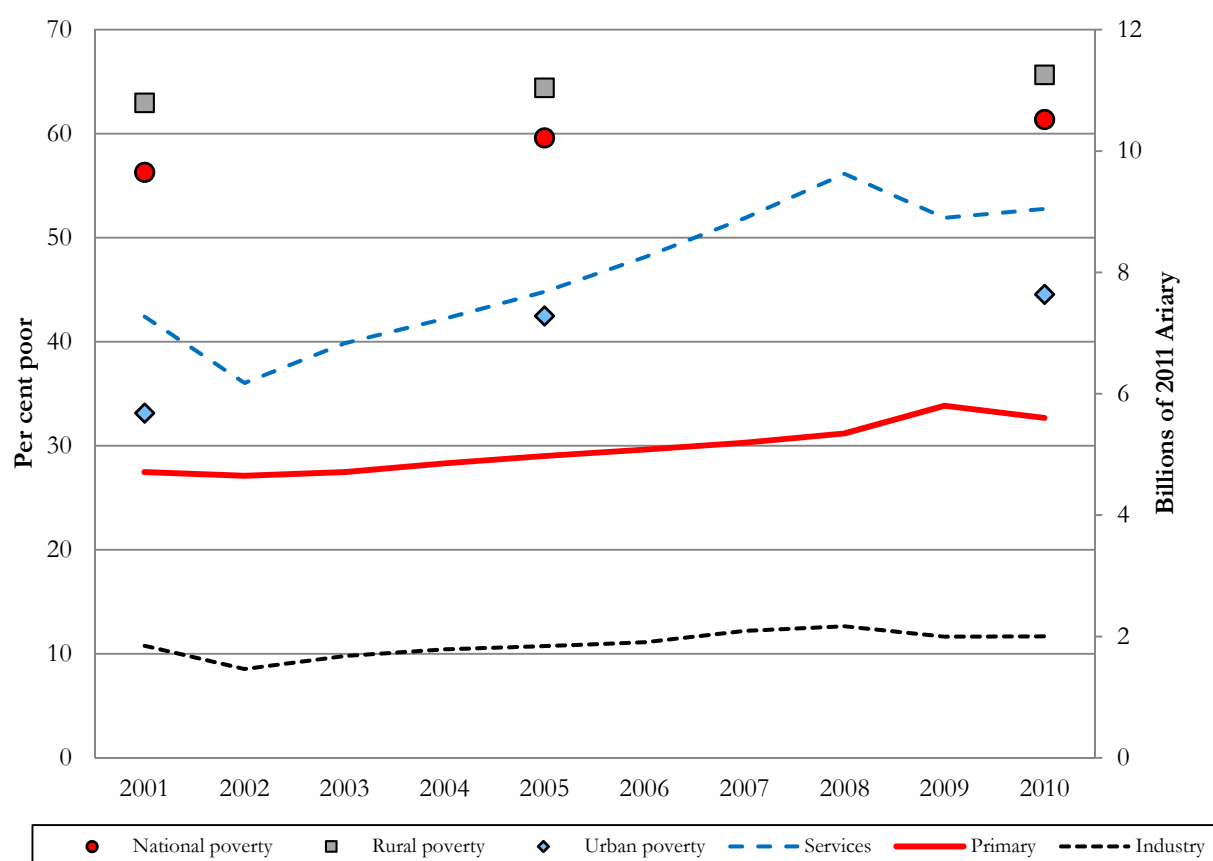
Figure 3: Poverty and real per capita GDP, Madagascar 2001-10



Source: Authors' calculations based on data from EPM surveys, and INSTAT.

⁷ Estimated by INSTAT to be between 2.8 per cent and 3.1 per cent.

Figure 4: Poverty and real GDP by sector, Madagascar 2001-10



Source: Authors' elaboration based on data from EPM (2001, 2005, 2010), and INSTAT.

The service sector, which employs 15 per cent of the total labour force, accounts for the largest share of real GDP (54 per cent in 2010), and experienced the most rapid intra-crisis growth rates. But it is also the sector that was most negatively affected by the political shocks. For example, real production in this sector fell by 1.1 billion Ariary in 2002, or roughly a 7 per cent fall in total real GDP. While industrial production also fell by 0.3 billion Ariary, it was the decline in service-sector production that contributed substantially to the increase in urban poverty observed between 2001 and 2005, despite the recovery in this sector beginning in 2003. This follows from the service sector accounting for the lion's share of urban employment (43.4 per cent in 2001), and the 9 percentage point rise in the urban service sector headcount ratio, even after 6 per cent of the labour in this sector shifted to agriculture. The impressive average annual 7.7 (6.8) per cent growth of service- (industrial-) sector production between 2003 and 2008 undoubtedly contributed to the 6.0 percentage point decline (4.9 percentage point increase) in poverty in this sector between 2005 and 2010, though the decline would likely have been greater, and perhaps reduced poverty levels to 2001 levels, if not for the 2009 political crisis.

Table 5: Sectoral distribution of employment and the poor in Madagascar, 2001-10

	Headcount ratio by			Distribution of workers by			Distribution of workers by		
	sector			sector within residence			residence within sector		
	2001	2005	2010	2001	2005	2010	2001	2005	2010
National									
Primary	69.3	64.4	64.6	76.4	82.0	80.4	100	100	100
Industry	22.6	31.1	38.0	6.8	3.4	4.6	100	100	100
Services	19.3	30.5	30.1	16.8	14.6	15.0	100	100	100
Total	56.3	59.6	61.4	100	100	100	100	100	100
Urban									
Primary	64.8	61.6	62.0	39.6	48.4	54.5	9.3	11.3	12.9
Industry	16.2	29.6	24.7	17.1	11.0	9.8	44.9	61.6	40.6
Services	17.0	26.0	20.0	43.4	40.6	35.7	46.1	53.3	45.1
Total	33.1	42.5	44.6	100	100	100	17.9	19.2	19.0
Rural									
Primary	69.8	64.8	64.9	84.4	89.9	86.5	90.7	88.7	87.1
Industry	27.8	33.5	47.2	4.6	1.6	3.4	55.1	38.4	59.4
Services	21.3	35.6	38.5	11.1	8.5	10.2	53.9	46.7	54.9
Total	63.0	64.4	65.7	100	100	100	82.1	80.8	81.0

Source: Authors' calculations from EPM (various years).

4.3 EPM poverty and other data sources on monetary poverty

Other non-nationally representative data sources show broadly consistent pictures of changes in poverty as those from the EPM. For example, a series of labour force surveys conducted in the capital Antananarivo, by Madio, show that wage poverty among formal-sector wage labourers rose significantly in the wake of the 2002 political crisis (Table 6), from 32 per cent to 38 per cent. These data also suggest, however, that by 2004 wage labourers in the capital had more than recovered as poverty for this group fell to less than 30 per cent. It is worth noting that these data did not include formal-sector labour until the 2010 survey (note the considerably higher estimate of wage poverty that year), and that the higher 2005 urban Antananarivo poverty rate from the EPM, shown in Table 2, suggests that informal non-wage labour earnings were slower to recover.

Household per capita consumption measured from annual panel data from four rural communities collected from 1999 to 2008 (Réseaux Observatoires Ruraux), show that although real per capita consumption levels fell during the 2002 political crisis for three of the four communities, they rose to above 2001 levels by 2005. This is consistent with the decline in rural poverty as measured by the depth and severity of poverty in rural areas in the EPM between 2001 and 2005.

Table 6: Urban labour poverty and rural household consumption in Madagascar, 2001-10

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Urban poverty										
Per cent of Antananarivo workers who are poor	31.9	37.8		29.9						39.6*
Rural household consumption (per capita)										
Thousands of 2001 Ariary										
Central (Itasy)	61.0	66.1	74.2	126.6	158.1	115.8	119.8	115.6		
South (Toliara)	81.0	73.8	62.0	120.5		167.9	150.1	127.7		
North east (Fenerive)	93.0	75.5	84.7	107.4	117.3	126.3		107.8		
North west (Marovoay)	109.0	88.4	89.1	172.6	161.4	149.2		150.5		

Notes: Shaded columns represent EPM survey years. The 2010 survey includes both formal- and informal-sector labour.

Source: Authors' calculation using data from Antananarivo Labour Force Survey and Réseaux Observatoires Ruraux.

4.4 Poverty and non-monetary measures of wellbeing

The Demographic and Health Surveys (DHS) for Madagascar provide a nationally representative set of non-monetary indicators that complement the poverty estimates from the EPM. Although the timing of these surveys (1997, 2003-04, 2008-09, 2011) is not the same as the EPM (2001, 2005 and 2010), they nonetheless provide a rough sense of consistency with the trends in monetary poverty, and in some cases may indicate long-term trends in welfare. For example, stunting rates in children under five have declined over the period between the three years (1997, 2004 and 2009) for which the DHS include anthropometric data for Madagascar (Table 7). While this high level of malnutrition – nearly half of all young children – is consistent with the high poverty rates in the country – over half of all individuals – the declines in stunting are also potentially consistent with the snapshots of poverty measured in the EPM. Declines in monetary poverty after 1997 (Paternostro et al. 2001; Amendola and Vecchi 2007), along with over US\$100 million in donor-supported nutrition and health sector projects, suggest that stunting rates likely fell between 1997 and 2001. These improvements, however, were interrupted by the political crisis in which skyrocketing fuel prices and road blockages led to farm incomes in 2002 falling by over 35 per cent (Randrianarison et al. 2002) and basic food prices more than doubling (Minten 2002), which disrupted household food consumption among for an extended period of time and consequently worsened chronic child malnutrition (World Food Program 2002). Further, the 2004 rice price crisis, in which prices for the main staple crop rose by over 50 per cent, had detrimental effects on household rice consumption for net buyers of rice who tend to be the poor (Barrett and Dorosh 1996). As such, the 2004 stunting rates measured in the DHS would likely have been even lower had these two crises not occurred.

Table 7: Stunting rates in Madagascar

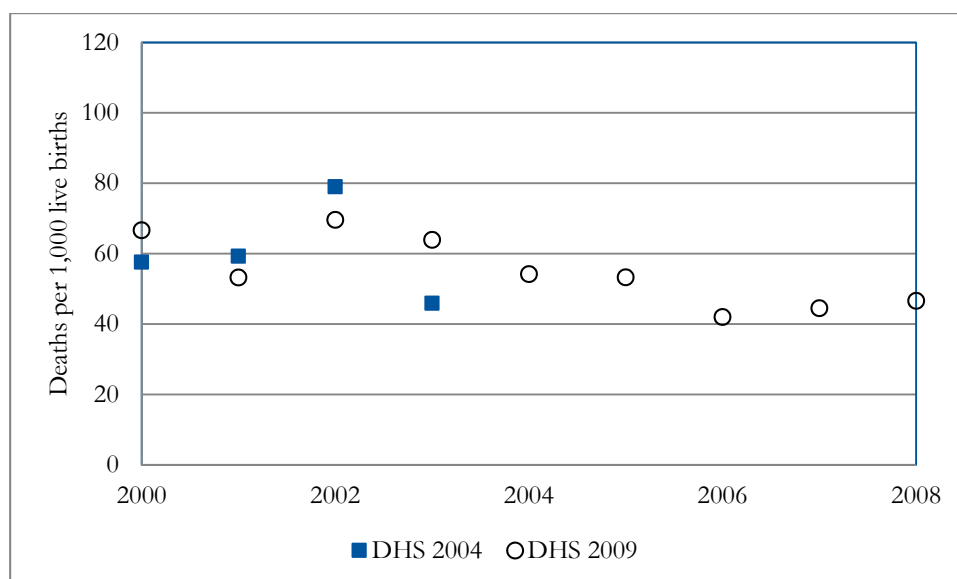
	1997	2004	2009
National	48.3	47.3	45.4
<i>Gender</i>			
Male	51.8	48.5	47.6
Female	44.8	46.2	43.1
<i>Residence</i>			
Urban	41.3	37.0	34.3
Rural	49.2	48.9	46.4
<i>Province</i>			
Antananarivo	57.0	52.4	48.6
Fianarantsoa	51.6	47.8	51.2
Toamasina	47.8	47.3	48.3
Mahajanga	41.0	47.6	30.3
Toliara	36.5	40.5	43.8
Antsiranana	37.1	37.1	33.3

Note: Sample of children under age five.

Source: Authors' calculations based on data from Madagascar DHS+.

Birth history data collected in the 2004 and 2009 DHS enable us to construct retrospective estimates of infant (under age one) mortality rates (IMR) for each of the eight years prior to, but not including, the survey year. Plotting these IMRs shows two things. First, mortality rates are high, which is not surprising given high monetary poverty in Madagascar. For example, in 2001, roughly 60 children per 1,000 live births died before they reached their first birthday. Second, there is evidence of a long-term trend of improvements consistent with the stunting data. But unlike the stunting data, because we estimate IMR for each year, not just the survey years, we observe a sharp rise in mortality rates coinciding with the 2002 political crisis, and a levelling-out in 2004 during the rice price crisis.

Figure 5: Annual infant mortality rates, Madagascar 2000-08



Source: Authors' calculations based on data from Madagascar DHS+.

Finally, as with other non-monetary measures of well-being, net schooling enrolment rates showed persistent improvement between 2001 and 2010 (Table 8), despite the increases in monetary poverty measured over the survey years. For example, the net primary enrolment rate rose from 49.4 per cent in 2001 to 73.4 per cent in 2010. In line with the Millennium Development Goal of equal access to education for girls, enrolment rates for girls rose faster than for boys over the decade. By 2010, girls' enrolment rates at all primary and secondary levels were higher than boys' enrolment rates regardless of area of residence. While more boys and girls attended school at the end of the decade, there is still considerable room for improvement. Only 6.3 per cent of upper-secondary school-aged (lycée) children were enrolled in school in 2010. This low level of human capital accumulation is going to prove challenging for future poverty reduction in Madagascar.

Table 8: Net schooling enrolment rates in Madagascar, 2001-10

	Total			Boys			Girls		
	2001	2005	2010	2001	2005	2010	2001	2005	2010
<i>National</i>									
Primary	49.4	66.2	73.4	50.6	65.9	72.4	48.2	66.4	74.5
Secondary (collège)	6.4	12.9	22.7	5.4	12.3	21.0	7.5	13.4	24.5
Secondary (lycée)	4.1	2.8	6.3	3.1	3.1	6.0	5.1	2.6	6.7
<i>Urban</i>									
Primary	67.5	72.5	80.1	63.8	71.5	78.9	70.9	73.6	81.4
Secondary (collège)	15.6	24.0	37.8	15.4	22.1	33.7	15.8	25.9	42.3
Secondary (lycée)	7.7	9.0	17.2	5.2	11.3	17.0	9.5	6.9	17.5
<i>Rural</i>									
Primary	45.0	64.7	71.9	47.5	64.6	70.8	42.7	64.8	73.0
Secondary (collège)	3.7	9.9	19.2	2.7	9.7	18.0	4.9	10.0	20.4
Secondary (lycée)	2.9	1.0	3.4	2.6	0.8	3.3	3.3	1.3	3.5

Source: Authors' calculations based on data from EPM.

5 Concluding remarks

In this paper, we analyse poverty in Madagascar in 2001, 2005 and 2010 using Arndt and Simler's (2010) utility-consistent approach to calculating cost-of-basic-needs (CBN) poverty lines. This method involves calculating region-specific poverty lines based on consumption patterns of the poor in each of the urban and rural areas in the six provinces to reflect local perceptions of poverty (i.e. specificity). To ensure that each of the consumption bundles used to construct the region-specific CBN poverty lines also represents the same level of utility (i.e. consistency), a maximum entropy approach is employed to reconcile cases where revealed preference conditions are violated. These consistent yet specific poverty lines, along with consumption aggregates calculated from comparable survey instruments, form the basis of the monetary poverty analysis in this paper.

The Madagascar case is complicated by the fact that two major political crises along with a rice price crisis occurred between the survey periods. As such, the snapshots of national poverty rising from 56.3 per cent in 2001 to 59.6 per cent in 2005, and to 61.4 per cent in 2010, are not necessarily indicative of a trend of persistently rising poverty. The challenge is to disentangle the long-term poverty trends from the short-term shocks that may affect poverty estimates in a particular year. Indeed, complementary data from the national accounts, non-nationally-representative surveys, and non-monetary measures of well-being suggest that in the time periods between the shocks, the well-being of the poorer segments of society improved. This evidence suggests that poverty estimates for Madagascar are more of a reflection of short-term shocks than of long-term trends.

Appendix Tables

Appendix Table 1: Original and utility-consistent (UC) poverty lines, Madagascar, 2001-10

	2001			2005			2010		
	Orig	UC	% Diff	Orig	UC	% Diff	Orig	UC	% Diff
<i>Ariary per person per day</i>									
Antananarivo (urban)	542	363	-32.9	836	661	-21.0	1,284	868	-32.4
Antananarivo (rural)	522	337	-35.4	821	542	-34.0	1,200	760	-36.6
Fianarantsoa (urban)	502	314	-37.5	818	514	-37.2	1,197	830	-30.6
Fianarantsoa (rural)	513	300	-41.5	823	447	-45.7	1,287	750	-41.8
Toamasina (urban)	550	362	-34.1	835	558	-33.1	1,361	916	-32.7
Toamasina (rural)	523	324	-38.0	822	511	-37.9	1,311	778	-40.7
Mahajanga (urban)	498	315	-36.7	824	566	-31.3	1,209	939	-22.3
Mahajanga (rural)	468	335	-28.4	791	506	-36.1	1,176	756	-35.8
Toliara (urban)	515	404	-21.5	884	487	-44.9	1,289	948	-26.4
Toliara (rural)	523	340	-34.9	794	504	-36.5	1,355	805	-40.6
Antsiranana (urban)	612	459	-25.0	909	770	-15.3	1,388	1,206	-13.1
Antsiranana (rural)	607	402	-33.7	902	664	-26.3	1,366	953	-30.3
<i>Relative to urban Antananarivo</i>									
Antananarivo (urban)	100.0	100.0	-	100.0	100.0	-	100.0	100.0	-
Antananarivo (rural)	96.4	92.8	-3.7	98.1	82.0	-16.4	93.4	87.5	-6.3
Fianarantsoa (urban)	92.7	86.4	-6.8	97.8	77.8	-20.4	93.2	95.6	2.6
Fianarantsoa (rural)	94.7	82.5	-12.8	98.4	67.7	-31.2	100.2	86.3	-13.9
Toamasina (urban)	101.5	99.6	-1.8	99.8	84.5	-15.3	106.0	105.5	-0.4
Toamasina (rural)	96.6	89.2	-7.6	98.3	77.3	-21.4	102.1	89.6	-12.2
Mahajanga (urban)	91.9	86.7	-5.6	98.5	85.7	-13.0	94.1	108.1	14.9
Mahajanga (rural)	86.3	92.1	6.7	94.5	76.5	-19.0	91.6	87.0	-5.0
Toliara (urban)	95.1	111.2	16.9	105.7	73.8	-30.2	100.3	109.2	8.8
Toliara (rural)	96.5	93.7	-2.9	94.9	76.4	-19.6	105.5	92.7	-12.1
Antsiranana (urban)	113.1	126.4	11.8	108.7	116.6	7.2	108.1	138.9	28.5
Antsiranana (rural)	112.0	110.7	-1.1	107.8	100.6	-6.7	106.4	109.7	3.2

Notes: 'Orig' indicates original poverty lines calculated by INSTAT. 'UC' indicates Arndt and Simler (2010) utility-consistent poverty lines. '% Diff' indicates the percentage difference.

Source: Authors' calculations from EPM data.

Appendix Table 2: Annual rice production in Madagascar, 2001-10

	Millions of tonnes									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
National	2.66	2.60	2.80	3.03	3.39	3.49	3.60	3.91	4.54	4.74
Antananarivo	0.56	0.52	0.78	0.79	0.88	0.91	0.94	1.03	1.20	1.28
Fianarantsoa	0.42	0.39	0.56	0.60	0.69	0.70	0.73	0.79	0.93	0.94
Toamasina	0.71	0.71	0.52	0.58	0.65	0.66	0.69	0.71	0.80	0.82
Mahajanga	0.56	0.57	0.48	0.54	0.60	0.62	0.63	0.74	0.88	0.92
Toliara	0.16	0.15	0.25	0.28	0.32	0.34	0.34	0.39	0.45	0.47
Antsiranana	0.26	0.26	0.21	0.23	0.26	0.26	0.27	0.26	0.27	0.30

Note: Shaded areas columns represent the EPM survey years.

Source: Authors' elaboration based on data from FAO and Ministry of Agriculture.

Appendix Table 3: Original INSTAT poverty estimates, Madagascar 2001-10

	INSTAT estimates			Difference with utility-consistent estimates		
	2001	2005	2010	2001	2005	2010
National						
Headcount ratio (P_0)	69.7	68.8	76.5	13.4	9.1	15.1
Depth of poverty (P_1)	34.9	26.8	34.9	11.3	3.2	11.7
Severity of poverty (P_2)	20.9	13.4	19.6	-7.5	6.2	-1.4
Urban						
Headcount ratio (P_0)	43.9	52.0	54.2	10.8	9.5	9.7
Depth of poverty (P_1)	18.1	19.3	21.3	5.4	4.0	5.2
Severity of poverty (P_2)	9.7	9.4	11.0	-0.3	1.6	1.3
Rural						
Headcount ratio (P_0)	77.2	73.5	82.2	14.2	9.0	16.5
Depth of poverty (P_1)	39.8	28.9	38.3	12.9	3.0	13.4
Severity of poverty (P_2)	24.2	14.5	21.7	-9.7	7.2	-2.5

Source: Authors' elaboration based on data from INSTAT and authors' calculations based on data from EPM.

Appendix Table 4: Region- and time-specific minimum calorie requirements

	2001	2005	2010	Difference from INSTAT standard (2,133)		
				2001	2005	2010
Antananrivo (urban)	2,221	2,224	2,212	88	91	79
Antananrivo (rural)	2,182	2,178	2,177	49	45	44
Fianarantsoa (urban)	2,176	2,197	2,185	43	64	52
Fianarantsoa (rural)	2,171	2,169	2,146	38	36	13
Toamasina (urban)	2,189	2,230	2,224	56	97	91
Toamasina (rural)	2,165	2,187	2,175	32	54	42
Mahajanga (urban)	2,189	2,218	2,189	56	85	56
Mahajanga (rural)	2,181	2,167	2,132	48	34	-1
Toliara (urban)	2,185	2,180	2,170	52	47	37
Toliara (rural)	2,167	2,169	2,130	34	36	-3
Antsiranana (urban)	2,202	2,212	2,216	69	79	83
Antsiranana (rural)	2,144	2,207	2,152	11	74	19
Minimum	2,144	2,167	2,130	11	34	-3
Maximum	2,221	2,230	2,224	88	97	91
Mean	2,181	2,195	2,176	48	62	43

Source: Authors' calculations from EPM data.

Appendix Table 5: Comparison of consumption weights in CPI and EPM 2010 poverty lines

	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliara	Antsiranana	Total
CPI weight structure in 2010							
Food and beverages	48.7	50.7	55.0	57.9	60.1	50.1	50.6
Clothing and footwear	6.2	10.7	8.9	10.1	4.4	7.3	6.8
Housing, water, electricity, gas and other fuels	19.5	16.3	12.5	13.1	14.0	19.4	18.0
Furnishings, household equipment and routine house items	4.5	4.8	4.6	5.0	4.0	5.1	4.5
Health	2.4	3.1	2.8	4.8	2.4	1.6	2.6
Transport	9.4	3.9	4.3	2.5	5.5	6.6	7.9
Recreation and culture	2.5	2.5	4.3	2.6	1.6	1.1	2.5
Education	3.5	5.3	4.0	2.5	3.3	6.1	3.7
Restaurants and hotels	2.0	0.2	0.6	0.2	2.6	0.0	1.6
Miscellaneous goods and services	1.4	2.4	3.0	1.4	2.0	2.7	1.7
Total	100	100	100	100	100	100	100
Difference relative to utility-consistent consumption weights (EPM 2010) – EPM – CPI							
Food and beverages	-11.1	-22.3	-13.7	-12.4	-7.7	-14.9	-15.9
Clothing and footwear	3.2	7.1	5.4	5.9	0.7	3.3	3.3
Housing, water, electricity, gas and other fuels	13.1	13.3	8.2	9.3	8.6	15.2	13.2
Furnishings, household equipment and routine house items	1.2	2.4	0.8	1.0	0.8	0.2	1.1
Health	1.6	2.6	1.9	3.5	1.0	0.4	1.6
Transport	3.3	1.0	1.3	-0.1	2.4	3.2	4.0

Recreation and culture	1.8	2.2	3.8	2.1	1.3	0.7	2.0
Education	-0.5	2.7	0.8	-1.0	0.8	0.0	0.2
Restaurants and hotels	-0.6	-0.2	0.0	-0.6	0.4	-0.6	0.1
Miscellaneous goods and services	-11.9	-8.7	-8.5	-7.8	-8.4	-7.4	-9.7

Sources: Authors' elaboration based on data from INSTAT and authors' calculations based on data from EPM 2010

Appendix: Comparison of INSTAT and utility-consistent poverty estimates

The poverty estimates in this paper based on utility-consistent poverty lines (UC) differ considerably from INSTAT's original estimates (Appendix Table 3). For the most part the original estimates are higher than the UC estimates. For example, the original headcount ratios are 9 to 16.5 percentage points higher than the UC poverty rates. The differences are less stark with the poverty severity estimates, and indeed, are lower in some cases. Moreover, the estimated changes in poverty over the three survey periods are different in nature. The original estimates indicated that the national poverty level fell by 1 percentage point between 2001 and 2005, compared to the 3.3 percentage point rise using the UC estimate. Although both approaches estimate a rise in the headcount ratio between 2005 and 2010, the magnitude from the original estimates (7.8 percentage points) is markedly higher than from the UC estimates (1.8 percentage points). Further, while the original estimates found large increases in the depth and severity of poverty (8.1 and 6.2 percentage points, respectively), the UC approach found slight decreases (-0.4 and -0.7 percentage points, respectively).

What accounts for these differences? Both approaches use similar methods to construct the nominal household consumption aggregate (Deaton and Zaidi 2002), and indeed the nominal household consumption aggregates are similar. The source of the differences thus follows from the handling of the poverty lines and deflation.

The original INSTAT approach to maintaining consistency with regard to the poverty line was to use 2001 as the benchmark. The national poverty line was calculated for 2001, and in subsequent years this poverty line was scaled up to 2005 and 2010 prices using the Antananarivo CPI. This inflated 2001 poverty line was then applied to the 2005 and 2010 regionally deflated household consumption aggregates to calculate poverty. The consumption aggregates were regionally deflated using Paasche indices calculated in each stratum relative to the consumption basket for the capital (Antananarivo) using the maximum number of common items (i.e. items consumed in all of the strata). For 2001, the spatial deflators were calculated from EPM data. This differs from the UC approach in that the latter estimates poverty lines for each region for each year and relies on revealed preference tests and maximum entropy methods to maintain consistency.

Further, the original 2001 national food poverty line, which forms the basis of the national poverty line, was estimated as the cost of consuming 2,133 calories per person per day based on the consumption patterns of the poorest 30 per cent of households ranked by the consumption aggregate. This also differs from the UC approach, which does not fix the calorie requirements to be the same across all regions. Rather it allows the demographic characteristics of the particular region to dictate the differing calorie requirements. As illustrated in Appendix Table 4, the UC minimum calorie requirements differ across regions and are on average 43 to 62 calories higher than the INSTAT-standard 2,133. One would thus expect, *ceteris paribus*, that the UC poverty lines would be higher than the original, given that the former is based on the estimated cost of acquiring more calories than the latter. But this is not the case. Indeed, as illustrated in Appendix Table 1, the UC poverty lines range from 21 to 46 per cent *lower* than the de facto original regional poverty lines (calculated by deflating the national poverty line to region-specific prices).

The source of the lower UC poverty lines thus must follow from the composition of the basket used to value the region-specific calorie requirements. Unfortunately, the original Stata code used to construct the 2001 poverty line and regional deflators cannot be located. Thus we cannot compare the consumption baskets used to create the UC poverty lines with the original basket from 2001. Nonetheless, we can compare the province-level urban CPI weights (these are only calculated at the urban level) to the UC consumption basket weights aggregated to the same level. As illustrated in Appendix Table 5 for 2010, the UC consumption baskets place more weight on non-food items compared to the CPI baskets, offsetting the higher calorie requirements of the former.

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