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Simulating the effect on households' real consumption and poverty of the increase in prices that followed the 2015–16 economic crisis in Mozambique

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Abstract: Poverty declined substantially in Mozambique between 1996/97 and 2014/15. However, the recent economic crisis, characterized by a significant increase in domestic prices, may have dragged several households into poverty. Using consumer price index and 2014/15 household budged survey data, we calculate that the cost of purchasing a basic basket may have risen between 55 per cent and 70 per cent in the period 2014–2016, and we simulate the impact of the rise in prices on households' real consumption and poverty rate. We estimate that the national poverty rate may have risen to 55–60 per cent of the population, from 46,1 per cent estimated in 2014/15. The results of our study provide important elements for a more complete assessment of the microeconomic impact of the 2015–16 crisis and for an analysis of households' vulnerability to sudden prices change. They also inform policymakers about the possible microeconomic impacts of macroeconomic decisions that affect the confidence of international institutions and development partners in the state's economy and institutions.

Keywords: price increase, economic crisis, poverty, simulation, Mozambique
JEL classification: E21, E27, E31, E65, H12, I32

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1 Introduction

The Fourth National Poverty Assessment showed that Mozambique managed to substantially reduce both the consumption and multidimensional poverty between 1996/97 and 2014/15. This was the result of a period of sustained economic growth that spanned across different sectors of the economy in the years prior to the 2014/15 Household Budget Survey (IOF), conducted between August 2014 and August 2015 (DEEF, 2016).

However, after the completion of the survey, a period of intense economic crisis began, mainly due to three factors: (i) the disclosure of a hidden debt of approximately US$ 2 billion, contracted by three Mozambican state-owned companies and guaranteed by the Mozambican State; ii) the fall in the prices of some of the most important export goods; and iii) weak international demand due to the economic crisis in Europe and the BRICS, among others. All these factors led to a deep deceleration of GDP growth, a rapid and significant depreciation of the national currency - the Metical - and a consequent increase in prices of imported goods, causing an increase in domestic prices by around 40 per cent between August 2014 and December 2016. In addition, foreign aid and state budget support have also been reduced following the hidden debt scandal, creating additional problems of public finances and reducing the fiscal space for price stabilization policies.

A closer look at the prices of distinct product categories suggests that prices of food products, and especially basic food products, increased much more than the price of non-food products. This implies that the cost of purchasing a basic basket, which is reflected in the poverty lines, may have increased more than the official value of inflation for the same period. A disaggregated analysis also shows that the rise in food prices hit all the areas of the country, which means that poverty lines are likely to have increased in all regions and provinces of the country.[1]

In this context, there is a high probability that many households who in 2014/15—with the prices prevailing in that year—could buy or produce for their own consumption a basic food basket of approximately 2150 kcal/person/day, plus a set of non-alimentary basic goods, could no longer do so in 2016, given the higher price level, particularly in the last months of the year. Estimating the impact on real household consumption and on national, urban/rural and provincial poverty incidence, is therefore essential to assess the microeconomic impact of the 2015–16 crisis and Mozambican households' vulnerability to changes in price variations, as well as to inform policymakers on possible mitigation measures for the effects of sudden price increases. The rest of the article is organized as follows: in section 2 the context is described; the data and methodology used are presented in Sections 3 and 4, respectively; section 5 shows the results of the analysis and section 6 contains policy conclusions and implications.

2 Context

Since the early 1990s, after emerging from a devastating and prolonged conflict, Mozambique experienced a sustained economic growth, which led the country to have one of the best economic performances in the region. According to Jones (2006), improving human capital played a critical role in the economic growth. He also suggests that both public and private investment have

[1] Poverty lines reflect the cost of purchasing a basic basket in the different provinces and rural/urban areas of the country.

contributed to post-war growth and poverty reduction. The reduction in the poverty rate is displayed in Table 1.

Table 1: Consumption poverty estimates, 1996/97 – 2014/15 (per cent)

Area	1996/97	2002/03	2008/09	2014/15
National	69.7	52.8	51.7	46.1
Urban	61.8	48.2	46.8	37.4
Rural	71.8	55.0	53.8	50.1
North	67.3	51.9	45.1	55.1
Centre	74.1	49.2	57.0	46.2
South	65.5	59.9	51.2	32.8

Province	1996/97	2002/03	2008/09	2014/15
Niassa	71.9	48.3	33.0	60.6
Cabo Delgado	59.1	60.3	39.0	44.8
Nampula	69.4	49.1	51.4	57.1
Zambézia	67.6	49.7	67.2	56.5
Tete	81.9	60.5	41.0	31.8
Manica	62.4	44.7	52.8	41.0
Sofala	87.8	41.3	54.4	44.2
Inhambane	83.0	78.1	54.6	48.6
Gaza	64.8	55.4	61.0	51.2
Maputo Prov	65.6	59.0	55.9	18.9
Maputo City	47.1	42.9	29.9	11.6

Source: DEEF (2016)

In 2016, Mozambique produced consumption poverty estimates suggesting that 46.1 per cent of the Mozambican population could be considered poor from the consumption point of view in 2014/15, with huge differences depending on the province and urban/rural location (Table 1). This represents a reduction compared to 2008/09, when 51.7 per cent of the Mozambican population was considered poor. Likewise, the incidence of multidimensional poverty, calculated using the Alkire-Foster method for the period 1996/97–2014/15, followed a decreasing trend, as shown in Table 2. The multidimensional poverty incidence is 55 per cent, a relatively lower level compared to 2008/09 and 1996/97. The same table shows variations by province, with multidimensional poverty being worse for the northern and central regions of the country and for rural areas (Table 2)[2].

[2] The consumption aggregate was estimated based on the cost of basic needs methodology, and the poverty measures belonging to the Foster, Greer and Thorbecke (1984) classes were subsequently applied. For multidimensional poverty, the Alkire-Foster method was applied, taking into account six well-being indicators, with same weight, grouped into four dimensions: i) education; ii) health determinants; iii) housing conditions; and iv) durable goods (DEEF, 2016). For more information on the Alkire-Foster method see Alkire et al. (2015).

Table 2: Multidimensional Poverty Incidence (H), and Multidimensional Poverty Index (M0), 1996/97—2014/15

	H (%)				M^0			
	1996/97	2002/03	2008/09	2014/15	1996/97	2002/03	2008/09	2014/15
National	85.7	75.7	69.3	54.8	0.771	0.660	0.586	0.449
Urban	50.2	41.2	31.4	18.1	0.397	0.323	0.251	0.142
Rural	95.2	92.1	85.9	71.9	0.872	0.819	0.732	0.593
North	95.3	86.8	81.3	67.8	0.872	0.769	0.693	0.566
Center	92.5	83.8	80.3	63.6	0.851	0.746	0.685	0.521
South	64.0	48.4	33.0	18.8	0.531	0.380	0.261	0.141
Niassa	94.6	89.1	76.8	72.8	0.870	0.774	0.631	0.598
Cabo Delgado	97.3	89.9	83.3	63.6	0.873	0.796	0.701	0.523
Nampula	94.7	84.8	81.8	67.9	0.872	0.756	0.709	0.572
Zambézia	96.2	92.3	87.6	74.7	0.905	0.842	0.764	0.627
Tete	94.5	89.1	85.3	67.5	0.872	0.792	0.709	0.550
Manica	89.1	69.9	75.6	49.7	0.794	0.595	0.624	0.387
Sofala	86.0	70.8	61.6	46.3	0.765	0.607	0.522	0.363
Inhambane	83.1	81.5	60.3	43.5	0.724	0.673	0.495	0.329
Gaza	79.4	52.3	47.1	22.8	0.660	0.406	0.366	0.169
Maputo Province	73.3	37.9	17.6	7.1	0.593	0.274	0.130	0.052
Maputo City	18.4	12.7	2.8	0.7	0.127	0.087	0.019	0.004

Note: The Multidimensional Poverty Incidence (H) and the Multidimensional Poverty Index (M0) are computed using the Alkire-Foster method.

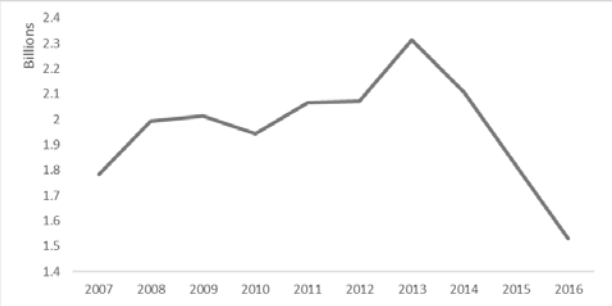
Source: DEEF (2016)

Starting with the second half of 2015, the poverty reduction trend may have temporarily thwarted or even reversed due to the deep economic crisis that hit the country. As described, a few factors contributed to weaken the economy, such as a reduction in the prices of some of the most important exported goods (coal and gas, for example), and a weak international demand resulting from the economic crisis in Europe, South Africa, and other key trading partners. However, it is likely that the factor that most contributed to the intensification of the effects of the crisis was the issue of the state-guaranteed hidden debt: this refers to three loan and two bond issues, which amounted to about US$ 2 billion, emitted by three state-owned companies (EMATUM, PROINDICUS and MAM) controlled by the security services, SISE. The loans and bonds were agreed in secret in 2013/14 and were guaranteed by the government. This issue has also raised many doubts about their validity, and both the Administrative Court and a special parliamentary commission denounced that the guarantees were granted without Parliament's consent, as required by the Constitution, and were thus likely unlawful and unconstitutional (MNRC, 2017).[3]

As a consequence: (i) the International Monetary Fund suspended its support to the country; and (ii) foreign aid and direct state budget support by development partners—which were already on a downward trajectory—were further reduced, creating additional problems for public finances and reducing fiscal space (Figure 1).

[3] The five loans were organized by the banks Credit Suisse and VTB - two issues of public bonds for EMATUM and three loans for MAM and PROINDICUS (MNRC, 2017a).

Figure 1: Net official development assistance and official aid received (current US$), 2007–16



Source: WDI (2018).

At the macroeconomic level, GDP growth experienced a first slowdown in 2015 and a second one, relatively bigger, in 2016. The 3.8 per cent GDP growth observed in 2016 is below the average of previous years. The GDP growth rate between the last quarter of 2015 and the last quarter of 2016 only reached 1.1 per cent (INE, 2017). Table 3 shows GDP growth rates from 2007 onwards.

Table 3: GDP annual growth rate, 2007–16 (per cent)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GDP growth	7.4	6.9	6.4	6.7	7.1	7.2	7.1	7.4	6.6	3.8

Source: WDI (2018).

At the same time, the official exchange rate between Metical and US Dollar increased significantly to reach 63.1 MZN/USD, which is more than double the average value of 2014 (Table 4). As a result, the price of imported goods also increased, causing a significant increase in the consumer price index (CPI) at national level. Indeed, Mozambique is strongly dependent on imported goods, even those of first necessity (UNSD, 2017). Official data from the National Statistics Institute show the CPI from January 2014 to December 2016 (Table 5). Compared to the average CPI observed during the IOF 2014/15 period (August 2014 to August 2015), the consumer price index in December 2016 was higher by approximately 40 per cent (INE, 2017).

Table 4: Official Exchange rate (MZN/USD), period average, 2007–16

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Exchange rate	25.8	24.3	27.5	34.0	29.1	28.4	30.1	31.4	40.0	63.1

Source: WDI (2018).

Table 5: Consumer Price Index (January 2014 = 100)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	100.00	100.39	101.30	101.42	101.03	100.50	100.46	99.90	99.74	99.87	100.23	100.94
2015	102.79	104.39	104.45	103.43	102.34	101.87	101.97	102.18	102.46	104.60	106.52	111.59
2016	114.55	117.11	118.66	121.31	121.04	121.96	123.05	124.62	128.00	131.30	135.10	139.78

Source: Authors' calculations based on data contained in INE (2017), rescaled to have January 2014 as base.

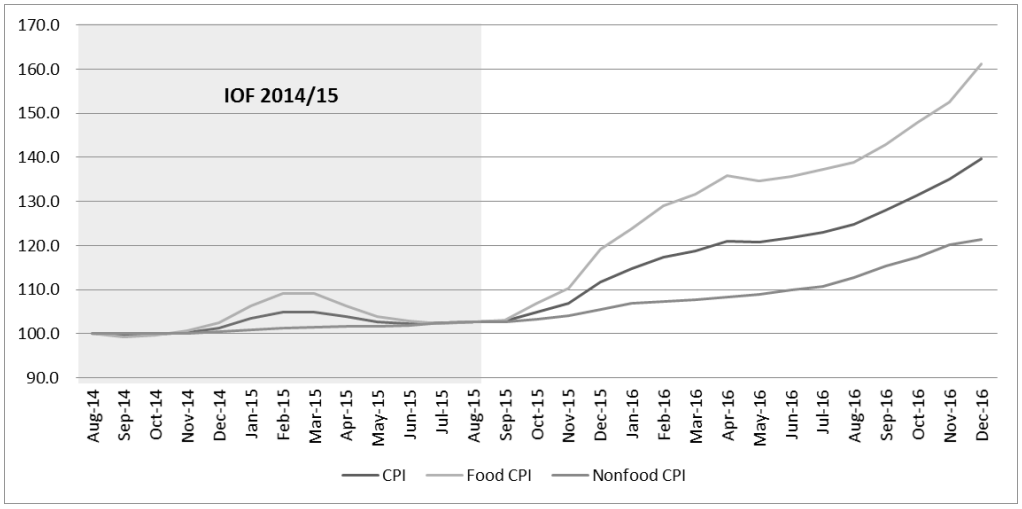
A more in-depth analysis of the prices of different commodities suggests that the prices of food products, and in particular basic food products, increased even more compared to the prices of non-food products, as shown in Figure 2.[4] It can be noted that the difference between the food price index and both the overall and non-food price indexes increases in the last months of 2015

[4] The consumer price index for food and non-food products presented in Figure 2 is calculated for the period August 2014–December 2016, with the value of the index in August 2014 set as 100.

and even more during 2016. At the same time, the prices for basic food products increased in all regions and urban/rural areas of the country. In order to analyse this point, we used the disaggregated consumer price index data and calculated a specific price index for six macro-regions: Rural North, Urban North, Rural Center, Urban Center, Rural South and Urban South. The basket of goods used for each macro-region is constituted by the 15 food products most consumed by the poor in each region, for which prices are available in the CPI database[5]. The share of each product in the composition of the index depends on the relative importance of that product in each region/area and is calculated based on the IOF 2014/15.

Figure 3 displays the price index constructed using the 15 basic food products most consumed by the poor, which increased between 55 and 70 per cent compared to the IOF period. The same trends are observed when we analyse the poverty lines for each spatial domain, that is, the estimated cost of acquiring a basic food basket based on the consumption patterns of the poor and on the prices faced by the poor in each region (Figure 4).[6] In this case the variability is greater, but the increase in the price index of the local basic food baskets continues in the band 55–70 per cent. This implies that the cost of purchasing basic food baskets, which is reflected in the poverty lines, may have increased more than the overall CPI, as recorded by the inflation registered over the same period. Moreover, it can be noted that poverty lines have increased in all regions and areas of the country (Figure 4). As a consequence, we expect that many households who could buy or produce for their own consumption a basic food basket of approximately 2150 kcal/person/day and purchase a set of basic non-food products in 2014/15, would not be able to do so in 2015/16 due to the prevailing prices in this period, particularly in the final months of 2016.

Figure 2: Consumer Price Index, general and disaggregated into food and nonfood (August 2014 = 100)

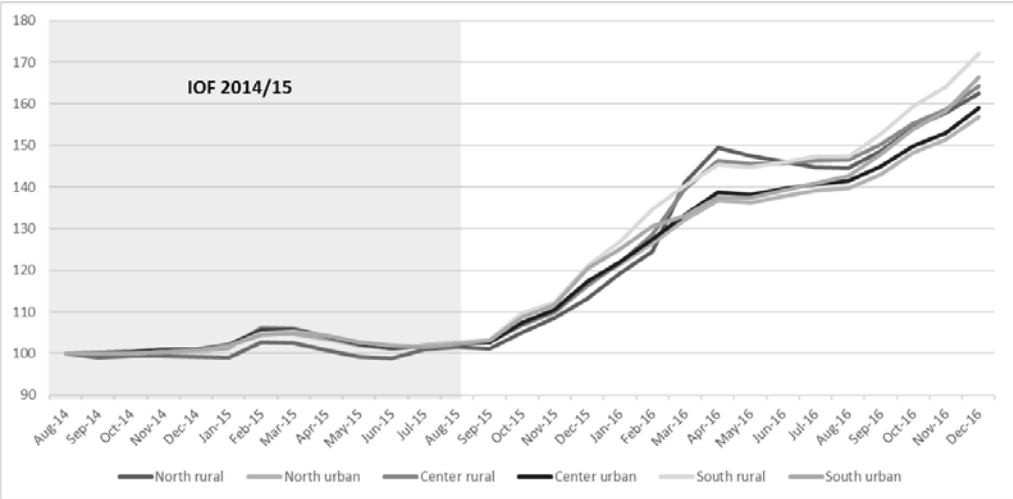


Source: Authors' calculations based on CPI and IOF 2014/15 data.

[5] The group of these goods is constituted by: rice in grain, maize flour; cassava flour; wheat bread; live chicken; fresh, chilled or frozen fish; horse mackerel, fresh, chilled or frozen; dried fish (excluding cod); oil; peanuts (shell and kernels); tomato; dry butter beans; dried cowpea beans; dried *nhemba* beans, *boer* beans; fresh cassava.

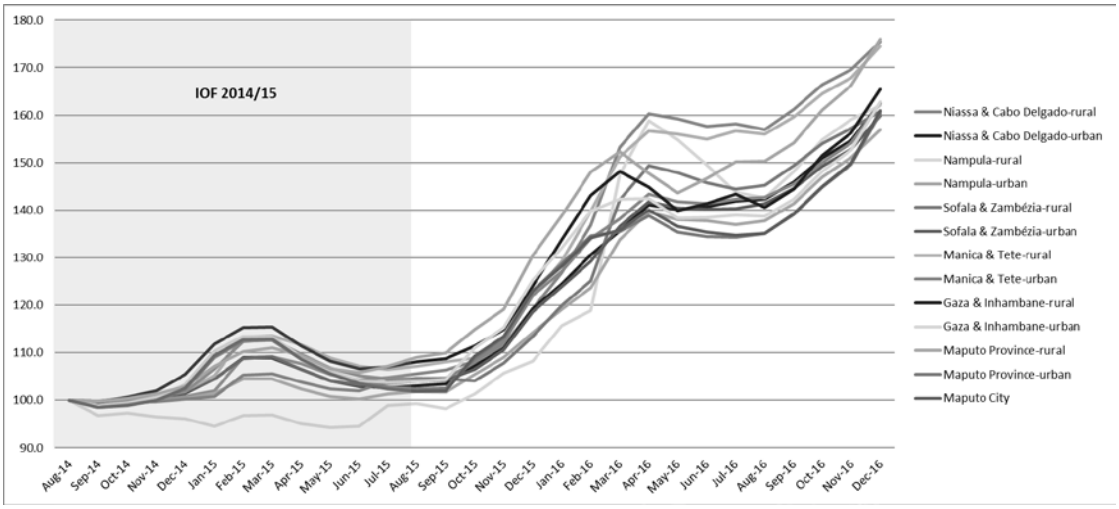
[6] The definitions of basic food basket and spatial domain used in 2014/15 in Mozambique are found in DEEF (2016).

Figure 3: Price index based on the 15 food products most consumed by the poor in the six macro-regions of the country (August 2014 = 100)



Source: Authors' calculations based on CPI and IOF 2014/15 data.

Figure 4: Price index based on the region-specific basic food baskets (August 2014 = 100)



Source: Authors' calculations based on CPI and IOF 2014/15 data.

In the following sections, we present some estimates of the impact of higher prices on households' real consumption and poverty incidence at national, urban/rural and provincial level. Not having household data available for 2016, we will use simulation methods to evaluate the possible impact. The methods used are described in detail in section 4.

3 Data

The present study uses two data sources: i) The CPI at the national level, broken down by product; and ii) the Household Budget Survey for 2014/15 (IOF 2014/15). The two sources of data are provided by the National Statistics Institute (INE).

The official national CPI for Mozambique is constructed from monthly price data for specific products collected in the main cities in the country (Nampula, Beira and Maputo). The price indices used in this study were constructed from the official national CPI based on the monthly price data for the years 2014–16. The disaggregated price data can be used to build price indices for different product groups (non-food, food, staple foods, etc.).

The IOF 2014/15, like the three previous Household Budget Expenditure Surveys, conducted in 1996/97, 2002/03 and 2008/09, is an inquiry that mainly aims to provide the elements for measuring household consumption and poverty in Mozambique over a given period. The IOF 2014/15 contains data for a random sample of about 11,000 households. This sample is representative for the population of Mozambique as a whole, for the population of rural and urban areas and for each of the eleven provinces, including Maputo City. The survey contains detailed information on general household characteristics, employment, daily expenditure and own consumption, possession of durable goods, housing conditions, offers and transfers received and paid, revenues from various sources as well as less frequent expenses. Data collection took place over a period of one year between August 2014 and August 2015. Contrary to previous surveys where each household was surveyed only once a year, in the IOF 2014/15 each household was surveyed three times, in the first, second and fourth quarters. As discussed earlier, based on data from the IOF 2014/15, Mozambique's Ministry of Economy and Finance produced estimates of consumption and multidimensional poverty in the country (DEEF, 2016).

4 Methodology

Several simulation procedures are used to estimate the impact of rising prices on households' real consumption and incidence of poverty. They are based on a set of assumptions that can influence the final results, sometimes significantly. In general, if the increase in domestic prices, particularly of basic food commodities, is not accompanied by an increase in household incomes in at least the same proportion, this leads to a reduction in real consumption and possibly an increase in the incidence of poverty.

In the simulations, we used food and non-food poverty lines that were constructed based on the following assumptions: (i) the set of products forming the basic food baskets for each spatial domain remains unchanged compared to the one defined in 2014/15;[7] ii) the relative proportions for each product in each basic basket also remain unchanged; iii) the increase in the price of each food product contained in the basic baskets is obtained from the disaggregated CPI; iv) the price increase of each product is related to the average value of the index for the period January-December 2016 and not only to the values assumed in the last months of the year, so as not to overstate the effect of price growth; v) the increase in the value of non-food consumption is obtained from the average CPI for non-food goods for the period January-December 2016.

The new food, non-food and total poverty lines are constructed based on the hypotheses indicated and are presented in Table 6.[8] Looking at Figure 4 and Table 6 it can be noted that the simulated

[7] The limited timeframe between the IOF 2014/15 period and the period used as the basis for the simulations may justify this approach.

[8] The poverty line in each spatial domain is equal to the sum of the food poverty line and the non-food poverty line.

poverty lines are much higher than the poverty lines computed for the period 2014/15 (between 55 per cent and 70 per cent higher).[9]

Table 6: Original and simulated poverty lines

	Original poverty lines (IOF 2014/15)			Simulated poverty lines (2016)		
Spatial domain	Food PL	Nonfood PL	Total PL	Food PL	Nonfood PL	Total PL
Niassa & Cabo Delgado-rural	22.4	7.3	29.6	35.1	8.1	43.2
Niassa & Cabo Delgado-urban	23.0	10.6	33.6	32.8	11.9	44.7
Nampula-rural	14.9	4.8	19.7	21.8	5.4	27.2
Nampula-urban	18.7	8.0	26.7	25.9	9.0	34.9
Sofala & Zambézia-rural	15.1	4.5	19.7	21.9	5.1	27.0
Sofala & Zambézia-urban	18.7	8.2	26.9	26.6	9.2	35.7
Manica & Tete-rural	18.2	6.3	24.5	28.3	7.1	35.3
Manica & Tete-urban	23.0	10.9	34.0	33.0	12.3	45.3
Gaza & Inhambane-rural	18.6	9.6	28.2	27.2	10.7	37.9
Gaza & Inhambane-urban	21.0	11.7	32.7	30.0	13.1	43.2
Maputo Province-rural	24.5	13.1	37.6	37.5	14.7	52.2
Maputo Province-urban	26.9	14.8	41.7	37.4	16.6	54.0
Maputo City	25.2	15.0	40.2	35.2	16.9	52.0

Source: Authors' calculations based on CPI and IOF 2014/15 data.

In the design of the simulations, we used two levels of decomposition of the nominal per capita consumption of households, C_{ir} with $i = 1, \dots, N$ to identify each household and $r = 1, \dots, R$ to identify the different regions (province and rural/urban) for which it is possible to calculate different price indices.

The first simulation (Sim1) is based on a rather simplistic hypothesis that allows us to evaluate the effect of price rises in the worst possible case, that is, it considers the nominal value of total household consumption unchanged, but introduces the increase in prices, as described in section 2. In this simulation, we do not further decompose households' per capita consumption. We can also write:

$$\frac{\delta C_{ir}}{\delta p_r} = 0 \qquad (1)$$

with p_r denoting the regional price index. Therefore, the value of nominal consumption in 2016 is assumed to be equal to the nominal consumption value in the period 2014/15, while prices are updated to the values of 2016. Implicitly, Simulation 1 assumes that households perfectly adjust their consumption so as not to increase their expenditure in nominal terms, thus reducing real consumption of goods and services per capita.

In the second simulation (Sim2), in order to better analyse which components are most affected by the rise in prices and which are less affected or unaffected at all, we try to distinguish between the different components of consumption. The hypothesis used for this simulation is that the value of self-consumption increases by the same magnitude as the prices of basic foodstuffs, that is, the value of self-consumption is not affected by changes in food prices. However, we hypothesize that the value of consumption relative to purchases of food and non-food goods does not change, in relation to the period of IOF 2014/15, thus continuing to be affected by the rise in prices.

[9] Clearly, this approach does not take into account possible substitution effects that may have triggered changes in the composition of basic food baskets and thus may overestimate the increase in poverty lines and their effect on real consumption and poverty rates.

Therefore, in this case we decompose the nominal per capita consumption of households,

$$C_{ir} = C\_al_{ir} + C\_nal_{ir} \quad (2)$$

with C_al_{ir} denoting Food Consumption, whose price index is p_al_r, and C_nal_{ir} to denote Non-Food Consumption, whose price index is p_nal_r.

We decompose consumption at a second level of decomposition

$$C_{ir} = C\_al_{ir} + C\_nal_{ir} = [ac_{ir} + ob\_al_{ir}] + [bd_{ir} + ob\_nal_{ir}] \quad (3)$$

with the Consumption of Food Products decomposed into Own Consumption (ac_{ir}) and Consumption of Other Food Products (ob_al_{ir}) acquired at the market, and the Consumption of Non-Food Products decomposed into Consumption of Durable Goods (bd_{ir}), described below in more detail, and Consumption of Other Non-Food Products (ob_nal_{ir}).

We assume here that

$$\frac{\delta ac_{ir}}{\delta p\_al_r} = 1 \quad (4)$$

$$\text{and, } \frac{\delta ob\_al_{ir}}{\delta p\_al_r} = \frac{\delta C\_nal_{ir}}{\delta p\_nal_r} = 0 \quad (5)$$

In this simulation, the households that most consume from their own production and are more self-sufficient are less affected by price variations. Implicitly, we assume that, despite rising prices, households are able to ensure the consumption of food products that they do not buy on the market while perfectly adjusting the consumption of other goods so as not to increase expenditure, expressed in nominal terms.

Simulation 3 (Sim3) is based on Sim2, but it distinguishes in greater detail the expenditures that are or are not affected by the rise in prices. In particular, we assume that the components of consumption relative to own consumption, receipts in kind, house rent and use value of durable goods are not affected.[10] Purchases of food and non-food items continue to be affected. In more detail, we have that: (i) the value of consumption relative to own consumption and receipts in kind increases by the same magnitude as the prices of basic food products; (ii) the value of consumption for purchases of food and non-food items is fixed; (iii) the value of consumption relative to house rent and use value of durable goods increases by the same magnitude as that of non-food products.

Thus, we assume that

$$\frac{\delta ac_{ir}}{\delta p\_al_r} = \frac{\delta bd_{ir}}{\delta p\_nal_r} = 1 \quad (6)$$

$$\text{and, } \frac{\delta ob\_al_{ir}}{\delta p\_al_r} = \frac{\delta ob\_nal_{ir}}{\delta p\_nal_r} = 0 \quad (7)$$

[10] It is assumed here that the consumption of this type of goods is rigid in the short term. People who, given the rise in price of non-durable goods, could have preferred to reduce consumption of durable goods owned to buy more non-durable goods, likely did not manage to do it, because it is difficult to implement this strategy with an imperfect market and in the short term.

Going from simulation 1 to simulation 3, we increasingly assumed that households were able to accommodate price increases without having to reduce all consumption categories, given the increase in poverty lines. As a consequence, we expect that poverty rate estimates obtained from simulation 1, 2 and 3, respectively, should reduce in severity. Due to the greater detail introduced in Simulation 3, we consider this simulation as our preferred simulation scenario.[11] The results of simulations Sim1-Sim3 are presented in the next section.

5 Results

Tables 7, 8, and 9 show the results of Sim1-Sim 3 simulations on real consumption, poverty rate and poverty gap, respectively. On average, the simulated increase in the value of households' real consumption is relatively small. However, as shown in Table 6, the costs of basic consumption baskets, as reflected in the poverty lines, increased between 7 and 15 Meticais per day per person. Consequently, some households that, in 2014/15, could buy, or produce for own-consumption, a basic basket of sufficiently high value to provide for about 2,150 kcal/person/day, together with the acquisition of a set of basic non-food goods, would no longer be able to do so in 2016. This translates into higher simulated poverty rates in 2016 when compared to those reported for the 2014/15 period.

Table 7: Simulation of the impact of the increase in prices on real consumption (Meticais/person/day)

	Real Cons IOF14	Real Cons Sim1	Real Cons Sim2	Real Cons Sim3	Difference Sim3-IOF14
National	47.09	47.09	51.37	53.21	6.12
Urban	82.30	82.30	83.31	88.77	6.47
Rural	30.78	30.78	36.57	36.73	5.95
Niassa	32.70	32.70	39.20	40.28	7.58
Cabo Delgado	43.36	43.36	49.88	48.68	5.32
Nampula	28.06	28.06	31.62	32.55	4.49
Zambézia	26.29	26.29	30.69	31.20	4.91
Tete	41.25	41.25	48.15	47.68	6.43
Manica	41.19	41.19	46.96	47.74	6.55
Sofala	38.91	38.91	42.00	43.16	4.25
Inhambane	45.79	45.79	49.58	51.96	6.17
Gaza	42.99	42.99	46.07	48.19	5.20
Maputo Province	111.28	111.28	113.00	120.43	9.15
Maputo City	181.73	181.73	181.89	196.94	15.21

Source: Authors' calculations based on CPI and IOF 2014/15 data.

[11] Annex 1 presents an additional simulation procedure based on an approach developed by Deaton to examine the distributional impact of rising food prices (Deaton, 1989).

Table 8: Simulation of the impact of the increase in prices on the poverty rate

	Poverty rate IOF14 (%)	Poverty rate Sim1 (%)	Poverty rate Sim2 (%)	Poverty rate Sim3 (%)	Difference Sim3-IOF14 (pp)
National	46.1	64.8	55.8	55.3	9.2
Urban	37.4	50.1	48.8	46.5	9.1
Rural	50.1	71.6	59.0	59.4	9.3
Niassa	60.6	80.3	70.0	68.6	8.0
Cabo Delgado	44.8	67.1	58.0	60.3	15.5
Nampula	57.1	74.7	65.5	65.4	8.3
Zambézia	56.6	73.4	63.5	63.0	6.4
Tete	31.8	60.1	43.7	46.6	14.8
Manica	41.0	64.2	51.7	51.3	10.3
Sofala	44.2	62.6	53.8	52.6	8.4
Inhambane	48.6	65.0	58.3	56.7	8.1
Gaza	51.2	66.4	61.2	59.1	7.9
Maputo Province	18.9	33.2	31.8	28.7	9.8
Maputo City	11.6	22.0	21.9	19.0	7.4

Source: Authors' calculations based on CPI and IOF 2014/15 data.

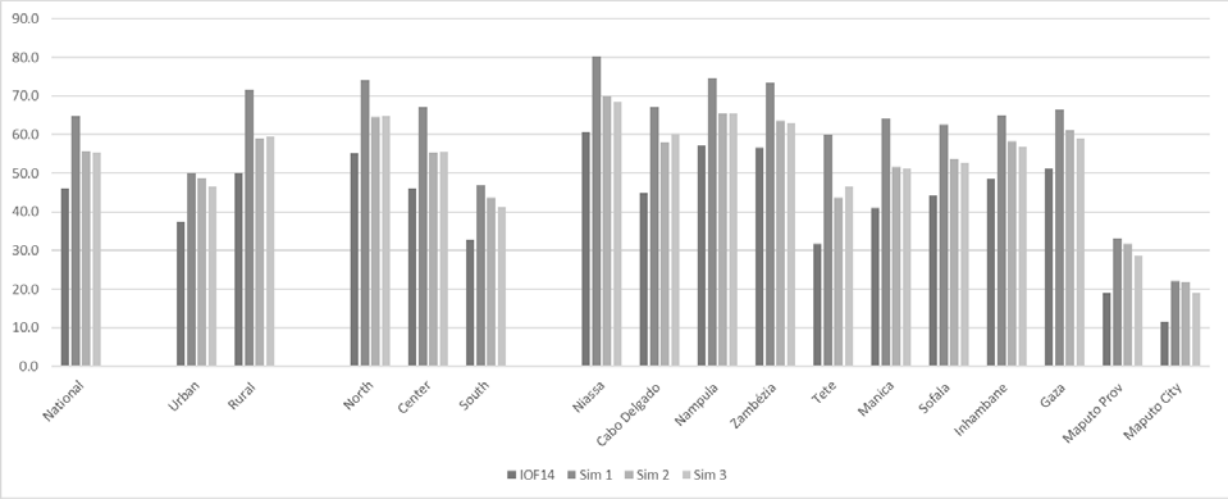
Table 8 shows that even in the least penalizing simulation (Sim3) the estimated national poverty rate increases by 9 percentage points. The increase is slightly higher in urban areas (9.8) than in rural areas (8.3) (last column in Table 8). The provinces of Cabo Delgado, Tete and Manica display a greater increase in poverty. Nevertheless, in all provinces the predicted increase in the poverty rate is higher than 6 percentage points. As expected, the simulated poverty gap is also higher in 2016, when compared to the 2014/15 period, both in urban and rural areas (Table 9).

Table 9: Simulation of the impact of the increase in prices on the poverty gap

	Poverty gap IOF14	Poverty gap Sim1	Poverty gap Sim2	Poverty gap Sim3	Difference Sim3-IOF14
National	0.167	0.275	0.215	0.213	0.046
Urban	0.146	0.217	0.202	0.191	0.045
Rural	0.177	0.302	0.221	0.224	0.047

Source: Authors' calculations based on CPI and IOF 2014/15 data.

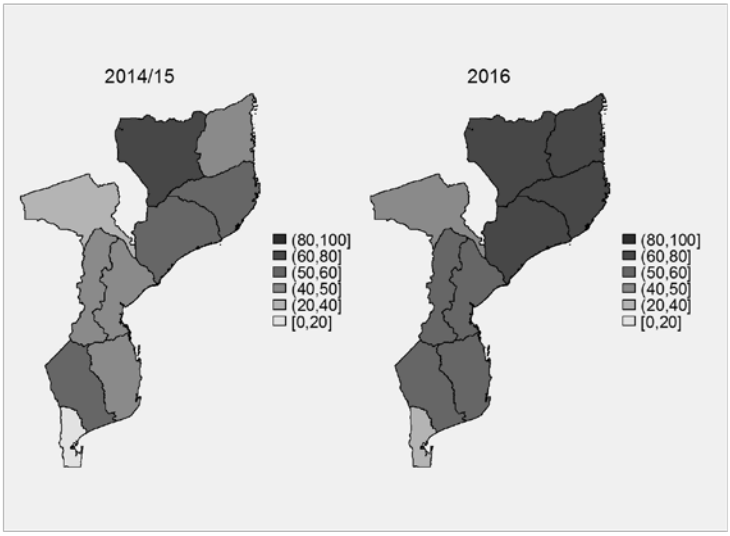
Figure 5: Simulated poverty rates at national, urban/rural, regional and provincial level



Source: Authors' calculations based on CPI and IOF 2014/15 data.

In Figures 5 and 6 we graphically plot the effects of rising prices on the poverty rate at the national, urban/rural, regional (north, center, south) and provincial levels. Our preferred simulation (Sim3) is used as a reference and represented in the map of Figure 6. It can be seen in Figure 5 that the first simulation, Sim1, has the most pessimistic results, when comparing with Sim2 and Sim3 simulations, with registered differences of more than 10 percentage points.

Figure 6: Original (2014/15) and simulated (2016) poverty rates, provincial level



Note: In the map labelled 2016 the results from our preferred simulation, Sim3, are presented.

Source: Authors' calculations based on CPI and IOF 2014/15 data.

As mentioned in the previous section, in Annex 2 we reproduce simulations 1 to 3 with a small change. We add to the simulations the expected effect of a possible wage increase between 2014/15 and 2016. The results are qualitatively and quantitatively similar, with a reduction in simulated poverty rates between 0 and 4 percentage points.

6 Conclusions

The Fourth National Poverty Assessment, based on the Household Budget Survey (IOF) 2014/15, showed a substantial reduction in consumption and multidimensional poverty between 1996/97 and 2014/15 in Mozambique. However, the economic crisis may have reversed this positive trend and may have brought many households into a state of poverty. Indeed, it is most likely that the greatest effect of the economic crisis on a large part of the population was the rise in prices of imported goods, due to the rapid and significant depreciation of the national currency, which caused domestic prices to rise by 30–40 percentage points between August 2014 and December 2016. In addition, food prices, particularly those of basic food commodities, have increased much more than non-food prices, which may have disproportionately affected poorer and more vulnerable households. We estimate that the purchasing cost of basic baskets reflected in poverty lines may have increased between 55 per cent and 70 per cent between 2014/15 and December 2016, exceeding the inflation recorded in the period. This increase reached all areas of the country. Using data from the CPI and the IOF 2014/15, we simulate the impact of rising prices on actual consumption by the households and the poverty rate at the national, urban/rural and provincial levels, using various assumptions. Our results derived from three alternative simulations show that a high number of households that, at the price levels experienced in 2014/15, were able to buy or produce for own-consumption a basic food basket of about 2150 kcal/person/day and acquire a

set of basic non-food items, may not do the same when facing the price levels in force in 2016, particularly in the final months of the year. We estimate that the poverty rate at the national level may have risen to 55–60 per cent of the population, from 46.1 per cent in 2014/15. The increase can be estimated at approximately 8 percentage points for rural areas and around 10 percentage points for urban areas, with a provincial increase of between 6 and 15 percentage points, with Cabo Delgado, Tete and Manica being the provinces where the increase in poverty may have been greatest. Estimates of the impact of rising prices on poverty rates are slightly lower when an increase in wages is considered as increasing minimum wages—at a mean of 6 per cent a year—but are not qualitatively different.

Estimating the impact on real household consumption and the incidence of poverty at various levels is essential for a more complete assessment of the microeconomic impact of the 2015/16 crisis and to better analyse the vulnerability of Mozambican households in different areas of the country to sudden price changes. The results of this study can inform policy makers on possible mitigation measures for the effects of sudden price rises, but also on the microeconomic impacts of macroeconomic decisions that affect the confidence of international organizations and development partners in the economy and institutions of the country.

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Annex 1: Alternative simulation method

In this Annex, we present a simulation (Sim_D) that uses an alternative approach, developed by Deaton (1989), to examine the distributive impact of rising food prices. This approach analyses household's elasticity of living cost in relation to changing prices. Based on this approach, (net) sellers are expected to have a negative elasticity, while (net) buyers have a positive elasticity. A general increase in product prices can benefit households that produce and sell more than they buy, as well as harm households that buy more than they produce and sell. This approach has been widely used, mainly in papers that sought to assess the effect of food price changes, in several countries (see for example Barret and Dorosh (1996), Budd (1993), Klytchnikova and Diop (2006), Wodon et al. (2008), Wodon and Zaman (2010), and Simler (2010)).

Deaton's approach can be summarized by the following equation:

$$\delta w_{ir} = \delta p\_al_r[(PR_{ir} - CR_{ir}) + \eta L_{ir}] \quad (8),$$

Or alternatively:

$$\frac{\delta w_{ir}}{\delta p\_al_r} = [(PR_{ir} - CR_{ir}) + \eta L_{ir}] \quad (9)$$

where δw is the welfare variation, expressed in terms of household i's consumption or income; δp_al_r is the variation in food prices; *PR* is a food production ratio that can be approximated to the ratio of self-consumption to total consumption; *CR* is a food consumption ratio, that is, the ratio between food consumption and total consumption; η is the wage elasticity in relation to changes in food prices; *L* is the proportion of consumption in total consumption that results from wages.

Taking into consideration that good quality wage data are not available, partly because of the high prevalence of the informal sector in Mozambique, the last part of equation (8) on the proportion of consumption that results from wages was not considered in the simulation. Thus, the equation used in the present study for the simulation (Sim_D) is expressed as:

$$\delta w_{ir} = \delta p\_al_r[(PR_{ir} - CR_{ir})] \quad (10),^{12}$$

Or, alternatively, following our previous notation:

$$\delta C_{ir} = \delta p\_al_r \left[\left(\frac{ac_{ir}}{C\_al_{ir}} - \frac{C\_al_{ir}}{C_{ir}}\right)\right] \quad (11)$$

The interpretation of the equation can be summarized as follows: (i) more self-sufficient households are less affected by rising food prices; (ii) households with higher ratios of food consumption to total consumption are more affected by rising food prices.

[12]This is quite common in sub-Saharan African Countries (Wodon & Zaman, 2010). In Annex 2, we attempt to calculate the potential growth of wages due to rising food prices using the average increase in minimum wages that occurred between 2014/15 and 2016 as a reference. In addition, we assume that the proportion of consumption in the total consumption due to wages is equal to the total consumption times the ratio between the number of household members in working age (between 15 and 64 years) and the total household size.

The poverty incidence estimates, obtained with the methodology presented here, are very similar to those obtained in Simulation 1 (Sim1), as shown in Table A1.

Table A1: Simulation of the impact of the increase in prices on the poverty rate, including the approach proposed by Deaton (1989) (Sim_D)

	Poverty rate IOF14 (%)	Poverty rate Sim1 (%)	Poverty rate Sim2 (%)	Poverty rate Sim3 (%)	Poverty rate Sim_D (%)
National	46.1	64.8	55.8	55.3	64.8
Urban	37.4	50.1	48.8	46.5	47.2
Rural	50.1	71.6	59.0	59.4	73.0
Niassa	60.6	80.3	70.0	68.6	80.4
Cabo Delgado	44.8	67.1	58.0	60.3	68.8
Nampula	57.1	74.7	65.5	65.4	74.4
Zambézia	56.6	73.4	63.5	63.0	73.8
Tete	31.8	60.1	43.7	46.6	63.0
Manica	41.0	64.2	51.7	51.3	64.8
Sofala	44.2	62.6	53.8	52.6	60.9
Inhambane	48.6	65.0	58.3	56.7	64.4
Gaza	51.2	66.4	61.2	59.1	66.3
Maputo Province	18.9	33.2	31.8	28.7	30.8
Maputo City	11.6	22.0	21.9	19.0	19.6

Source: Authors' calculations based on CPI and IOF 2014/15 data.

Annex 2: Including the effect of wage growth in the simulations

As introduced, this annex reproduces all the simulations described in previous sections with the addition of the effect of an increase in wages between 2014/15 and 2016. First, we attempt to calculate the potential growth of wages that was due to rising prices. To achieve this, we use the average increase in minimum wages between 2014/15 and 2016 as a reference. The average increase in minimum wages for the different occupational categories was approximately 6 per cent, in the period considered, thus this increase was used as potential wage growth. Given that a very small percentage of workers in Mozambique works in the formal sector (approximately 10 per cent of the labor force), considering a general increase in wages of 6 per cent might be overestimating the actual growth and underestimating the effect of the increase in prices on real consumption. We also assume that the proportion of consumption on total consumption due to wages is equal to the total consumption times the ratio between the number of household members in working age (between 15 and 64 years) and the total size of the household, meaning that the increase in consumption due to the increase in wages is weighted by the number of people in working age in the household. Table A2 shows the original poverty rates (IOF 2014/15) and the simulated poverty rates for 2016 using the three approaches described in section 4, taking into account wage growth over the considered period. The differences between original estimates and those obtained with our preferred approach, Sim3, are also shown. As expected, the estimates of the impact of increased prices due to the economic crisis on poverty rates are slightly lower in this case, though they are not qualitatively different compared to those shown in Table 8.[13] The original estimates and those obtained using our preferred approach, Sim3, at provincial level are represented in the map in Figure A1.

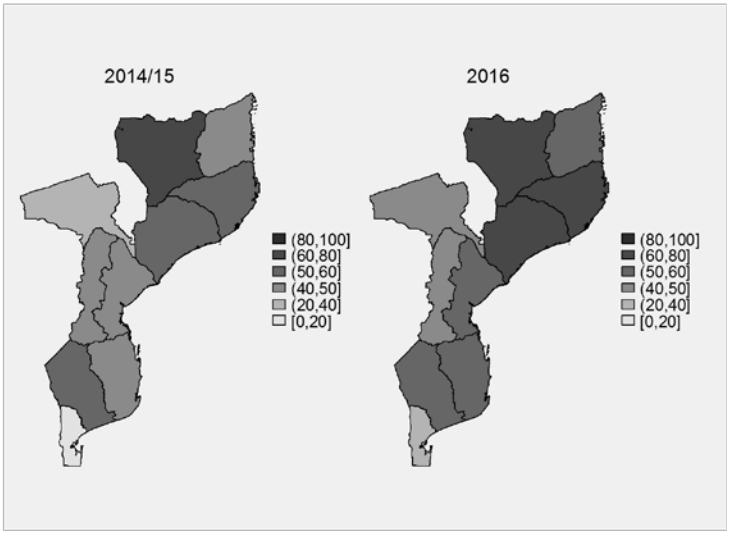
Table A2: Original (2014/15) and simulated (2016) poverty rates, taking into account the wage growth occurred in the period under analysis

	Poverty rate IOF14 (%)	Poverty rate Sim1 (%)	Poverty rate Sim2 (%)	Poverty rate Sim3 (%)	Difference Sim3-IOF14 (pp)
National	46.1	62.5	54.6	53.8	7.7
Urban	37.4	48.2	47.8	45.1	7.7
Rural	50.1	69.2	57.7	57.9	7.8
Niassa	60.6	77.8	69.1	67.5	6.9
Cabo Delgado	44.8	65.0	56.9	58.8	14.0
Nampula	57.1	72.9	64.6	63.9	6.8
Zambézia	56.6	70.2	61.3	60.9	4.3
Tete	31.8	57.8	42.3	45.0	13.2
Manica	41.0	62.2	50.8	50.0	9.0
Sofala	44.2	60.4	53.3	51.6	7.4
Inhambane	48.6	62.6	56.7	55.0	6.4
Gaza	51.2	64.5	60.2	58.0	6.8
Maputo Province	18.9	31.7	31.0	27.7	8.8
Maputo City	11.6	20.2	21.0	17.8	6.2

Source: Authors' calculations based on CPI and IOF 2014/15 data.

[13] As in the main analysis, in this analysis we obtained more pessimistic results in the first simulation and more optimistic in the second and third simulations, with differences sometimes higher than 10 percentage points between the first and third simulation.

Figure A1. Original (2014/15) and simulated (2016) poverty rates, taking into account the wage growth occurred in the period under analysis



Note: In the map labelled 2016 the results from our preferred simulation, Sim3, are presented, taking into account the wage growth occurred in the period under analysis (2015–16).

Source: Authors' calculations based on CPI and IOF 2014/15 data.

Annex 3: Considering an alternative price source

To perform a robustness test, we used the Agricultural Market Information System (SIMA) database as an alternative price variable to the CPI. The SIMA database, despite having a broader number of markets from rural and urban areas, is only available for a smaller number of products. In addition, the products for which we have a larger number of observations are limited to: beans, groundnuts, white maize in grain, maize flour, oil, rice in grain, yellow sugar and wheat flour. The prices recorded for these products in the SIMA database are in almost all cases lower than those from CPI, with two important exceptions, beans and maize flour. The average difference in percentage of the CPI price for each product is shown in Table A3. Not having a disaggregation by product as precise as in the case of the CPI, it is not possible to simulate with the same precision how much a basic basket would cost in 2016 using the SIMA data. However, the prices from SIMA suggest that in the local markets the prices of the most important food products could be lower by about 20 per cent compared to the prices for the same products found in the markets of larger cities. Nonetheless, the evolution of food prices observed in the SIMA data was similar to that registered in the CPI and the increase was even more pronounced when compared to August 2014 (equal to 100 in both cases). Figure A2 clearly shows the similarity between the two indices and the sudden rise in the SIMA index and SIMA prices starting from December 2015. This might suggest that the increase in prices due to the devaluation of the national currency was first transmitted to main urban areas, where the CPI is recorded, and then after a few months it was transmitted to all the other main rural and urban markets in the country, where the SIMA is recorded.

Table A3: Mean difference (in percentage) and correlation index between CPI and SIMA prices for SIMA products with largest number of observations

Product	(P_CPI - P_SIMA) / P_CPI	Correlation P_CPI-P_SIMA
Beans	-53.5%	0.791
Groundnut	25.6%	0.902
White maize in grain	23.2%	0.930
Maize flour	-1.0%	0.881
Oil	30.1%	0.846
Rice in grain	37.2%	0.908
Brown sugar	3.4%	0.923
Wheat flour	33.1%	0.934

Source: Authors' calculations based on CPI and SIMA data.

Figure A2. Price indices constructed using CPI and SIMA prices for SIMA products with largest number of observations

Source: Authors' calculations based on CPI and SIMA data.