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Varied nutritional impact of the global food price crisis

Alessandro De Matteis*

University of East Anglia, UK

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Abstract

Two crises among the worst experienced since the start of the modern era have marked the global scene during recent years. The first crisis was characterized by a sudden and dramatic rise in food prices and developed into the second one which was mainly of a financial nature. Food price rises typically erode the purchasing power of those at the lower end of the income scale in particular, working therefore as a driver of economic and social inequalities. This paper assesses the implications of the surge in international food price in terms of food availability and access to food in low- and middle-income countries. The estimation of long-term elasticities has revealed a varied perspective, characterized in some cases by a worsening food deficit even in conditions of improved food availability.

Keywords: food price crisis, access to food, poverty, undernourishment
JEL Classification Codes: G01, I30, O10

1. Introduction

The steep rise in food prices experienced during the recent few years has led to economic difficulties for the poor and contributed to increasing the poverty gap in many countries, working as a driver of economic and social inequality (Ivanic *et al.*, 2011). At least 33 countries saw violent food riots, demonstrations, or social unrest as a result of rising food prices. These dramatic events raised a great deal of interest in soaring food prices on the global market and their impact on the welfare of citizens in developing countries. A rise in food prices may impact on poverty differently according to the predominance of net food sellers or consumers among the poor (FAO *et al.*, 2011). A recent analysis has even found evidence that in the long run higher food prices may reduce poverty and inequality (Headey, 2014). Therefore, although the causes of food inflation and its impact on poverty have been extensively researched (Ivanic and Martin, 2008; De Janvry and Sadoulet, 2010; Ivanic *et al.*, 2011), the discussion is still open. In particular, there is a dearth of research on its effect on

* E-mail: a.de-matteis@uea.ac.uk.

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food security and particularly on calorie intake (Brinkman *et al*., 2010; Tiwari and Zaman, 2010). The aim of this article is to contribute to filling this gap by considering the nutritional implications of the food price crisis.

In their review of the literature von Braun and Tadesse (2012) claim that a rising medium-term price trend has triggered dramatic short-term price spikes and increased volatility. Regional studies have probed the extent to which international price volatility is transmitted to regions and countries. For example, Minot (2013) estimates that the average volatility of African grain prices is almost double international volatility. Lanchovichina *et al*. (2012) have looked at the transmission of higher food prices to countries in the Middle East and North Africa and estimate that on average a one percent increase in world prices increases domestic food prices by some 0.2 – 0.4 percent, with a certain amount of cross-country variation.

Consumption smoothing is a typical reaction to price rises; however the ability of the poorest groups to trim the negative effect of high food prices on food consumption is limited, as they are already spending a large share of their income on food (Tiwari and Zaman, 2010; Helbling and Roache, 2011; Skoufias *et al*., 2011). As a consequence, the crisis generated by the rise in food prices may also lead to long-term, irreversible nutritional damage, especially among children. Robles and Torero (2010) estimated important reductions in calorie intakes at both the national level and within vulnerable households across several Latin American countries. In all countries, poorer households that were already consuming at levels below the calorie adequacy threshold showed greater reductions in calorie intakes. This reduction in calorie consumption is likely to be combined with even bigger reductions in diet quality, inducing long-term health effects that are especially detrimental to already vulnerable populations. Green *et al*. (2013) investigate the impact of higher food prices in a systematic review of the literature, estimating that a one percent increase in cereal prices results in a 0.61 percent reduction in cereal consumption in low-income countries versus a 0.43 percent reduction in high-income countries. Anriquez *et al*. (2013) analyzed the short-term effect of staple food price increase on household undernourishment in eight countries and found out that food price spikes not only reduce food consumption, but also reduce diet diversity. Tiwari and Zaman (2010) looked at the effect of price volatility on undernourishment rates in all developing regions. Assuming a partial (80 percent) price transmission from international to national markets, they suggest that the dramatic rise in food prices in 2008 may have increased the total global undernourished population by some 63 million.

Very often global food price increases are not passed on to local markets on a one-to-one basis. Factors such as import dependency, the availability of domestic substitutes, and trade restrictions, tariff and price subsidies determine the rate of price transmission from global to local markets (De Janvry and Sadoulet, 2010). In addition to various forms of social protection targeting the most vulnerable groups, authorities can take different measures to contain price transmission and counter its impact. These measures include the reduction in duties applied to essential food commodities, the introduction of a single composite levy instead of customs duties and other applicable taxes on essential food items at the point of importation, and the imposition of a maximum retail and wholesale price for different categories of food commodities. Nevertheless, even when such measures are able to protect the local economy by reducing the degree of transmission from global to local food prices, their effectiveness is reduced in case of high exposure on the global market. This is inevitably the case in countries with a high domestic cereal (and food, more generally) deficit. Since such countries are forced to rely on cereal imports to fill their domestic supply gap, they are in a weak position to avoid any direct or indirect consequences of any price rises occurring on the international scene. Even if their set of measures to contain price transmission is reasonably successful, high prices on the global market may require a reduction in the quantities that can be imported, particularly in the case of countries with a stringent national budget as is the case of low income food deficit (LIFD) countries.[1] Such cases of reduced food availability induced by a global price rise which is not reflected in a domestic price rise – or where the price transmission is reasonably contained – may be less evident but not less dramatic in terms of their nutritional implications.

The present study takes the lead from the case just described and considers the nutritional consequences of the global rise in food prices. Attention is focused on the experience of LIFD countries compared to that of other low income and middle income countries.

2. Methodology

In order to optimize the analysis of individual countries and take account of their characteristics and contexts, this study follows a time-series approach. In order to study the interdependence of price time series between the dependent variable in country *i* and the food price in the domestic and international markets respectively, we can refer to a linear relationship of the type:

$$y_{it} = \theta_1 + \theta_2 \, p_{it} + \theta_3 \, p_{jt} + u_t \tag{1}$$

where:

y_{it} represents the dependent variable referred to country *i* at time *t*;

p_{it} represents the food price prevalent in country *i* at time *t*;

p_{jt} represents the food price prevalent on the international market at time *t*;

u_t represents the error term.

Once the condition of stationarity of the series and their co-integration are verified, the use of vector autoregression models allows to analyse the interaction of several time series through the use of the Error-Correction Model:

$$\Delta y_t = \mu + \alpha\theta' p_{t-1} + \sum_{i=1}^{n-1} \Gamma_i \Delta p_{t-i} + u_t \tag{2}$$

where:

Δy_t is the difference between y_t and y_{t-1};

Δp_t is the difference between p_t and p_{t-1}, where p_t is a multi-dimensional vector whose components are the food prices prevalent on the domestic (*i*) and international (*j*) markets at time *t*;

α is the speed of adjustment matrix;

θ is a matrix whose columns are linearly independent co-integrating vectors with $\theta' p_{t-1}$ representing the long-run equilibrium errors.

[1] The classification of a country as LIFD, used for analytical purposes by FAO, is traditionally determined by three criteria. First, a country should have a per capita gross national income below the historical ceiling used by the World Bank to determine eligibility for assistance or financing. The second criterion is based on the net food trade position of a country averaged over the preceding three years for which statistics are available. Third, the self-exclusion criterion is applied when countries that meet the above two criteria specifically request to be excluded from the LIFD category. In 2001 an additional factor was introduced to avoid countries changing their LIFD status too frequently. This factor, called ‘persistence of position’, postpones the exit of a country from the list until the change in its status has been verified for three consecutive years. See www.fao.org/countryprofiles/lifdc/en/

The number of linearly co-integrating relationships, *r*, lies between 0 and K-1, where K is the number of dependent variables. Furthermore, *r* is the rank of $\alpha\theta^{'}$.

Since our analysis is focused on the influence of international food prices on food availability in country *i*, our parameter of interest is θ_j. In particular, we are interested to know how much change in y_i can be ascribed to a change in p_j. Therefore, estimates of θ_j for individual countries are tested against the Granger causality test and are retained only if clear causality from p_j to y_i is confirmed.

3. Data

The data used in this study are drawn from the FAOSTAT dataset published by the Food and Agriculture Organization (FAO). Estimates of caloric supply and of food deficit have been used as dependent variables. They reflect two dimensions of food security: while the former, average dietary energy supply (DES), is an indicator of food availability, the latter, depth of food deficit (FD), is an indicator of access to food.[2] The independent variables, domestic and international food price indices, again reflect access to food.[3] Finally, to take into account their different exposure to the global food market, countries have been arranged according to their cereal import dependency ratio (CID) which is within the stability dimension of food security.[4]

The variables DES and FD are expressed as number of kilocalories per person per day and therefore we can use a logarithmic transformation to interpret the results as elasticities. The same applies to the price indices.

Data availability informed the sample selection. The countries in the sample are grouped as LIFD and non-LIFD. The group of LIFD countries is composed of: Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Chad, Congo, Cote d'Ivoire, Egypt, Ethiopia, Gambia, Ghana, Indonesia, Kenya, Laos, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mongolia, Mozambique, Nepal, Nigeria, Philippines, Rwanda, Senegal, Sierra Leone, Sri Lanka, Tanzania, Togo, Uganda, Yemen, Zambia and Zimbabwe. The non-LIFD group is composed of: Argentina, Armenia, Bolivia, Botswana, Brazil, Chile, China, Colombia, Ecuador, Gabon, India, Iran, Jordan, Kazakhstan, Korea, Malaysia, Mexico, Morocco, Namibia, Pakistan, Paraguay, Peru, Saudi Arabia, South Africa, Swaziland, Syria, Thailand, Tunisia, Turkey, Uruguay, Venezuela and Viet Nam. Descriptive statistics for all variables are in Table A.1 in the Appendix.

Data are expressed as annual averages, and this study covers the period 1991–2013. Data on the CID ratio remain fairly stable over time, and in this case the CID values for 2005 are used to summarize countries' cereal import dependency.

[2] DES is an estimate of the national average energy supply. FD is an estimate of the average intensity of food deprivation of the undernourished and measures how many calories would be needed to lift them from this status, everything else being constant. See FAO, 2014.

[3] The domestic food price level index is calculated by dividing the food purchasing power parity by general purchasing power parity, thus providing an index of the price of food in the country relative to the price of the generic consumption basket. It allows the comparison of the relative price of food over time and across countries. See FAO, 2014.

[4] The CID ratio is estimated as the ratio between cereal imports and the algebraic sum of cereal production and cereal imports minus cereal exports. See FAO, 2014.

4. Findings

Values of θ_j are presented in Table 1, and for ease of visualization they are reported in Figures 1 and 2 for DES and FD respectively. Countries are grouped as LIFD and non-LIFD and in both cases are arranged according to their CID reference value.

Countries whose data do not satisfy the Granger causality test between international prices and the dependent variable have been dropped. This does not necessarily mean that in such countries international prices have not influenced the local supply of or access to food. It means rather that in such cases any relationship between food price and food availability and access was mainly of a national or local nature. In other words, even if any domestic rise in food prices was originally induced by the global rise in food prices, it had developed its own national dynamics due to the peculiarities of the domestic environment.

Table 1. Influence of international food prices on dietary energy supply and food deficit

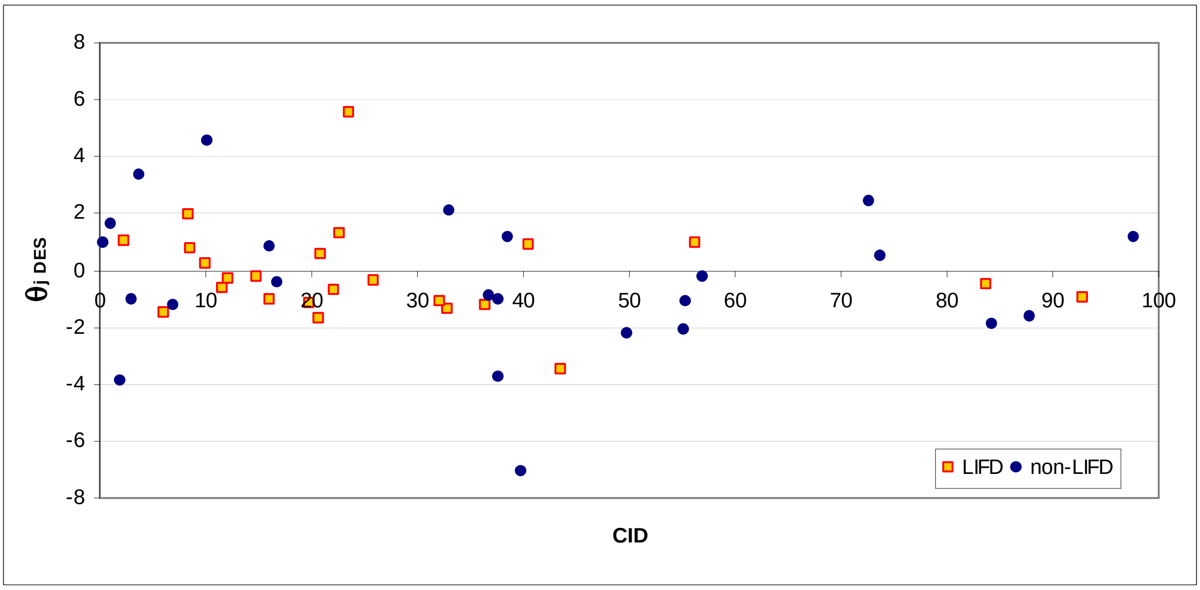
LIFD							*non-LIFD*						
country	CID	$\theta_{j\ DES}$		$\theta_{j\ FD}$			country	CID	$\theta_{j\ DES}$		$\theta_{j\ FD}$		
Congo	92.9	-0.96	*	2.23	**		Jordan	97.7	1.14	**	-5.46	**	
Yemen	83.7	-0.49	***	3.04	***		Botswana	87.9	-1.61	***	9.52	***	
Mongolia	69.8	…		7.60	***		Malaysia	84.2	-1.90	***	…		
Senegal	56.3	0.99	**	…			Swaziland	78.0	…		-5.98	**	
Mozambique	43.6	-3.47	***	2.26	***		Korea	73.8	0.49	**	-10.35	***	
Sri Lanka	40.6	0.93	***	2.16	***		Saudi Arabia	72.7	2.41	**	…		
Ghana	36.5	-1.26	***	9.97	***		Tunisia	56.9	-0.24	*	…		
Egypt	32.8	-1.39	**	73.81	***		Colombia	55.4	-1.07	***	3.28	***	
Cameroon	32.2	-1.12	**	6.76	***		Armenia	55.1	-2.12	***	19.89	***	
Burundi	27.2	…		10.42	***		Peru	49.9	-2.19	***	11.96	***	
Zimbabwe	25.9	-0.35	**	…			Venezuela	39.8	-7.08	***	24.66	***	
Benin	23.5	5.53	**	-8.91	***		Mexico	38.5	1.19	***	…		
Kenya	22.6	1.27	***	-4.73	***		Ecuador	37.7	-1.00	***	4.75	***	
Philippines	22.1	-0.72	***	3.04	***		Chile	37.6	-3.73	***	…		
Rwanda	21.2	…		4.33	***		Morocco	36.8	-0.92	***	…		
Uganda	20.9	0.55	***	6.48	*		Syria	33.1	2.07	**	-32.33	**	
Togo	20.8	-1.71	***	7.44	***		Bolivia	22.9	…		1.30	***	
Sierra Leone	19.8	-1.14	***	3.25	***		Iran	16.8	-0.46	***	-29.67	***	
Zambia	16.1	-1.00	***	5.24	***		Uruguay	16.1	0.85	***	-8.54	***	
Tanzania	14.8	-0.23	*	12.42	***		Thailand	10.2	4.54	***	-23.06	***	
Indonesia	12.2	-0.31	**	3.32	***		Paraguay	8.5	…		-6.41	***	
Madagascar	11.6	-0.62	***	2.34	**		Viet Nam	6.9	-1.21	***	…		
Bangladesh	10.0	0.22	**	…			Turkey	4.0	…		14.00	***	
Burkina Faso	8.5	0.75	***	…			China	3.8	3.34	***	3.00	***	
Malawi	8.4	1.93	**	…			Pakistan	3.1	-1.02	***	9.03	***	
Chad	6.1	-1.47	*	18.09	***		Kazakhstan	1.9	-3.90		-26.22	**	
Laos	2.7	…		6.23	***		India	1.1	1.61		3.33	***	
Cambodia	2.3	1.02	***	2.05	**		Argentina	0.3	0.97		…		

significance: *** = 0.01 ** = 0.05 * = 0.1
Source: Author's analysis of data from FAOSTAT

Figure 1 shows that the influence of international food prices on national food availability is varied. A majority of both LIFD countries (63%) and non-LIFD countries (58%) are below the horizontal axis. This means that the larger share of both groups is penalized by a price increase, at least in terms of food availability. For each country the sign of θ_j depends on whether the country is mainly a food exporter or a food importer, and therefore whether or not it is able to take advantage of an international rise in food prices. It is easy to understand how the former is more likely to be the case of countries within the non-LIFD group.

Figure 1 suggests a negative relationship between CID and the value of θ_j. This supports the hypothesis that cereal import dependency may affect the impact of international food prices on domestic food availability. However, as shown in Table 2, such a link between CID and θ_j is not statistically significant for either group of countries alone or for the two groups combined[5]. In other words, in this case the value of CID is irrelevant with respect to the sign and value of θ_j.

Figure 1. Impact of international food price changes on DES in individual countries



Source: Table 1

Table 2. Relationship between θ_j and cereal import dependency

	DES		FD		
CID	-0.012	-0.012	0.032	0.051	
	(0.011)	(0.012)	(0.093)	(0.089)	
LIFD		0.158		10.217	**
		(0.631)		(4.865)	
constant	0.141	0.042	2.138	-3.935	
	(0.486)	(0.629)	(3.894)	(4.729)	
N. obs.	48	48	43	43	
R^2	0.025	0.026	0.003	0.102	

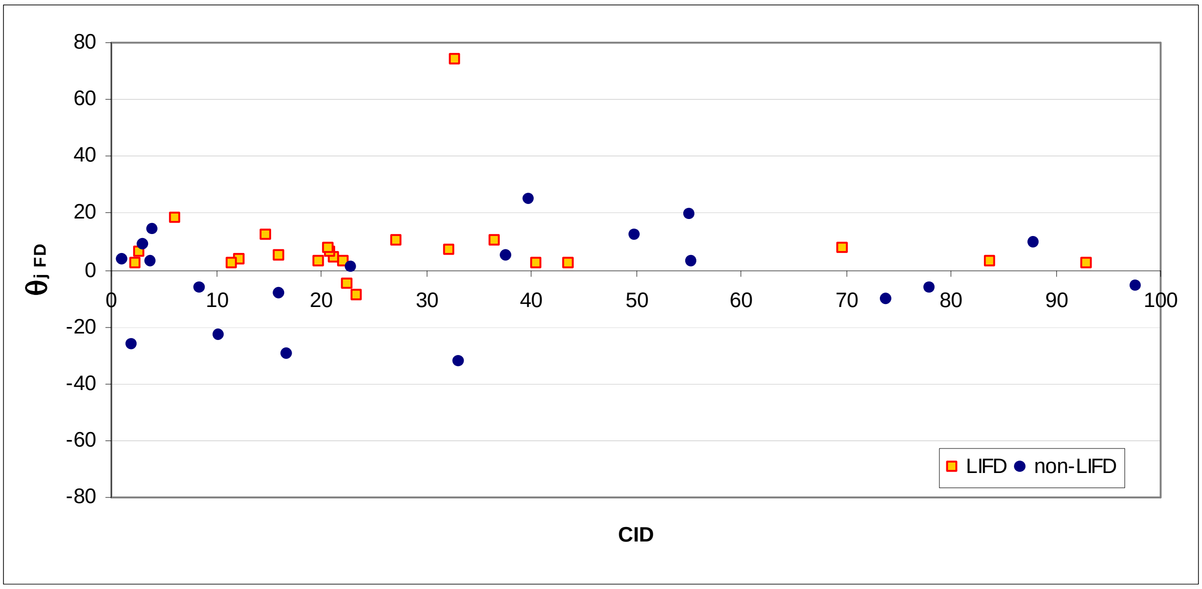
significance: ** = 0.05
standard errors in brackets
Source: author's analysis of data from FAOSTAT

[5] Table 2 is only aimed at assessing the discriminatory power of CID, while the analysis of the determinants of θ_j is beyond the scope of this study.

Figure 2 focuses on the access-to-food dimension of food security. Two ways in which a global price surge can affect access to food can be identified. At the macro level a price surge negatively affects the balance of trade, with consequent reduction of both national and personal income in net importing countries. At the micro level the reduced purchasing capacity due to the reduction in income per capita is worsened by the transmission of the rise in food prices from the international to the domestic scene. This combination reflects the case in LIFD countries well. In fact, while the non-LIFD countries are more or less equally split into two sub-groups according to the sign of θ_j – i.e. with either an increase or reduction of the food deficit – for more than 90% of the countries within the LIFD group an increase of the international food price increases their food deficit. In Table 2 the coefficient of the dummy variable highlights how the impact of any price rise is significantly stronger for LIFD countries than for the other group.

Even in this case, the data do not show a significant relationship between the CID ratio and the value of θ_j. In other words, greater exposure on the global market determined by higher cereal import dependency cannot be associated with any greater impact of a global rise in food prices on the domestic food deficit.

Figure 2. Impact of international food price changes on FD in individual countries



Source: Table 1

5. Conclusions

The repeated surges in food prices experienced since the mid-2000s had different implications for different countries. The main criterion of this variation is countries' different roles on the international scene, mainly with regard to international food trade. Changes in international food prices may be transmitted, at different rates and speeds, to domestic food prices, inevitably affecting local economies and livelihood. Such price changes on the international market can have an impact at the local level even when the rate of transmission is low. For net food-importing countries a price rise makes both the national trade balance and individual purchasing capacity worse, resulting in reduced food availability and access respectively.

This study has assessed the nutritional implications of changes in international food prices in LIFD and other developing countries through the estimation of long-term elasticities of food price changes on food availability and food deficit. The results show that the implications of a surge in international food prices are diverse in both LIFD and non-LIFD countries in terms of domestic food availability. However, almost all LIFD countries are penalized by a surge in food prices in terms of access to food. This means that the global food price surges experienced during the past decade have hit the poorest deciles of population hard, particularly in LIFD countries, independently of any change in national food availability.

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Table A.1. Summary values of relevant variables for individual countries

	DES					*FD*					*CID*					*Price index*				
country	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*
LIFD																				
Bangladesh	22	2306	154.354	2060	2480	22	160	64.353	107	276	18	9.378	1.818	6	12	20	1.545	0.040	1.480	1.620
Benin	22	2473	164.496	2270	2890	22	94	29.563	34	138	18	22.300	8.233	12	37	22	2.308	0.316	1.930	2.970
Burundi	22	1702	70.233	1630	1890	22	499	93.070	312	605	18	18.150	6.539	9	28	18	2.167	0.076	2.040	2.290
Burkina Faso	22	2497	113.145	2330	2660	22	160	28.885	111	192	18	9.322	1.741	7	12	24	1.939	0.114	1.730	2.160
Cambodia	22	2150	220.540	1870	2530	22	202	52.781	102	288	18	3.205	1.116	1	5	20	1.572	0.229	1.210	1.840
Cameroon	22	2249	186.988	2030	2550	22	186	70.232	85	277	18	28.867	4.491	19	34	18	1.939	0.044	1.870	2.020
Chad	22	2006	165.087	1740	2330	22	332	81.205	216	494	18	5.944	1.376	4	9	22	2.433	0.167	2.180	2.730
Congo	22	2106	91.008	1970	2240	22	263	49.281	191	340	18	93.683	1.816	90	96	23	2.380	0.117	2.090	2.560
Cote d'Ivoire	22	2600	85.439	2460	2710	22	112	22.930	76	142	18	47.044	6.902	37	59	23	2.028	0.094	1.910	2.190
Egypt	22	3303	76.044	3150	3430	22	10	1.726	8	13	18	35.650	1.776	32	38	24	1.904	0.085	1.690	2.030
Ethiopia	19	1906	214.924	1550	2240	19	449	95.396	314	623	15	8.667	2.588	5	12	24	1.757	0.114	1.550	2.040
Gambia	22	2391	102.367	2270	2630	22	123	22.115	74	154	18	45.844	6.109	38	55	23	2.563	0.143	2.350	2.790
Ghana	22	2575	329.469	1970	3220	22	110	73.003	18	322	18	25.589	7.709	12	37	24	2.487	0.468	1.720	3.200
Indonesia	22	2497	140.549	2300	2820	22	114	21.672	64	147	18	12.222	2.323	7	15	24	1.662	0.192	1.390	2.000
Kenya	22	2067	69.856	1950	2180	22	209	26.373	166	249	18	23.450	4.987	14	36	23	1.891	0.226	1.610	2.380
Laos	22	2176	137.205	2000	2400	22	272	51.902	195	343	18	2.639	0.652	2	4	17	2.058	0.088	1.930	2.210
Lesotho	22	2355	41.944	2290	2440	22	107	4.780	97	116	18	67.800	7.623	55	85	23	2.181	0.373	1.620	2.710
Madagascar	22	2095	48.963	2020	2200	22	195	19.803	152	231	18	9.411	2.579	6	13	24	2.027	0.056	1.920	2.160
Malawi	22	2154	154.135	1880	2380	22	203	70.411	119	342	18	12.655	6.594	4	29	23	2.224	0.217	1.850	2.620
Mali	22	2345	206.369	2140	2750	22	116	46.208	39	169	18	6.994	2.649	3	11	24	2.062	0.101	1.900	2.260
Mauritania	22	2728	88.583	2560	2870	22	57	8.535	45	76	18	69.716	6.858	53	77	23	2.054	0.109	1.910	2.220
Mongolia	22	2183	180.459	1850	2540	22	293	61.109	188	445	18	45.616	21.332	10	72	16	1.685	0.131	1.490	1.910
Mozambique	22	1985	147.187	1700	2180	22	344	64.258	269	481	18	36.728	12.597	22	61	19	2.018	0.111	1.880	2.220
Nepal	22	2305	102.247	2190	2530	22	153	17.189	112	174	18	1.650	0.869	1	4	23	1.551	0.048	1.490	1.660
Nigeria	22	2610	130.036	2280	2760	22	62	23.011	40	133	18	11.405	4.821	4	20	23	2.539	0.176	2.320	2.880
Philippines	22	2426	116.437	2250	2610	22	130	20.084	96	165	18	22.111	3.477	16	27	24	1.664	0.083	1.550	1.800
Rwanda	22	1953	173.073	1710	2250	22	356	99.801	195	527	18	23.922	8.994	11	47	23	1.653	0.088	1.500	1.780
Senegal	22	2304	85.727	2190	2470	22	141	24.731	94	177	18	49.639	7.058	39	61	23	2.024	0.050	1.910	2.090
Sierra Leone	22	2095	75.198	1990	2260	22	281	36.294	209	333	18	38.155	10.731	20	51	24	2.496	0.575	2.100	4.060
Sri Lanka	22	2339	105.618	2140	2520	22	242	17.467	200	262	18	38.683	2.593	34	44	24	1.742	0.066	1.620	1.860
Tanzania	22	2094	59.325	2020	2210	22	250	26.800	180	291	18	10.800	3.715	4	15	24	2.001	0.170	1.850	2.430
Togo	22	2268	139.213	2010	2530	22	163	41.287	98	255	18	17.961	3.834	11	24	23	2.819	0.873	2.060	4.330
Uganda	22	2259	51.447	2170	2350	22	182	18.412	154	214	18	11.100	5.992	2	21	24	1.694	0.151	1.500	2.090
Yemen	22	2055	27.207	2020	2140	22	199	16.721	168	220	18	77.566	5.366	68	85	24	1.432	0.205	1.130	1.830
Zambia	22	1910	71.546	1810	2030	22	299	48.903	225	374	18	15.978	5.498	5	25	24	1.645	0.138	1.410	1.860
Zimbabwe	22	2055	100.889	1930	2260	22	317	44.324	226	368	18	24.505	11.623	9	52	22	1.836	0.242	1.220	2.120

Table A.1 *(continued)*

	DES					*FD*					*CID*					*Price index*				
country	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard Deviation*	*Min*	*Max*
non-LIFD																				
Argentina	22	3067	107.720	2880	3240	22	13	6.384	6	26	18	0.544	0.322	0	1	24	1.334	0.059	1.230	1.450
Armenia	20	2526	263.947	2220	2930	20	92	59.170	16	163	16	57.594	3.731	51	63	21	1.885	0.146	1.700	2.320
Bolivia	22	2131	79.059	2030	2310	22	196	20.344	140	224	18	26.889	3.872	20	33	24	1.738	0.093	1.570	1.900
Botswana	22	2173	46.740	2100	2300	22	228	28.664	163	265	18	87.800	5.950	78	99	24	1.928	0.066	1.810	2.060
Brazil	22	2984	172.314	2760	3260	22	76	14.389	55	97	18	16.467	2.334	13	21	22	1.312	0.094	1.190	1.560
Chile	22	2830	111.119	2600	2960	22	32	9.449	22	59	18	37.228	8.689	19	53	24	1.444	0.094	1.300	1.640
China	22	2835	162.209	2510	3060	22	102	26.619	75	167	18	3.944	1.251	2	6	23	1.621	0.182	1.420	2.040
Colombia	22	2630	95.419	2420	2810	22	94	14.978	70	135	18	50.700	9.943	26	61	24	1.689	0.082	1.590	1.890
Ecuador	22	2233	57.585	2100	2350	22	134	16.938	106	173	18	32.939	7.647	19	41	24	1.633	0.068	1.500	1.770
Gabon	22	2648	74.382	2520	2760	22	42	6.745	35	56	18	82.155	2.375	78	87	23	2.165	0.131	1.980	2.490
India	22	2291	46.281	2220	2390	22	149	17.298	121	186	18	0.517	0.471	0	2	24	1.623	0.049	1.550	1.700
Iran	22	3137	33.436	3070	3230	22	28	8.652	15	41	18	27.255	6.844	17	41	23	2.408	0.100	2.180	2.620
Jordan	22	2849	175.263	2620	3090	22	35	14.274	19	58	18	96.122	2.341	92	100	24	1.220	0.057	1.110	1.320
Kazakhstan	20	3057	318.931	2400	3390	20	23	33.056	3	104	16	1.422	0.769	0	3	19	1.473	0.230	1.280	2.320
Korea	22	3090	84.992	2970	3240	22	9	2.108	6	13	18	71.861	2.646	65	75	24	1.832	0.092	1.660	2.030
Malaysia	22	2851	57.759	2700	2940	22	19	4.206	11	27	18	79.494	3.327	73	84	24	1.472	0.097	1.280	1.620
Mexico	22	3152	59.091	3060	3230	22	12	9.162	1	24	18	31.172	6.559	22	39	24	1.203	0.047	1.130	1.310
Morocco	22	3126	115.657	2920	3270	22	37	5.378	31	48	18	42.061	9.638	27	60	24	1.598	0.035	1.520	1.690
Namibia	22	2162	102.662	2010	2300	22	95	3.630	90	101	18	68.161	3.621	63	76	24	1.639	0.089	1.490	1.780
Pakistan	22	2376	68.490	2280	2520	22	154	15.469	131	185	18	6.361	3.704	1	11	24	1.904	0.122	1.750	2.180
Paraguay	22	2564	93.225	2400	2700	22	104	27.824	70	159	18	10.422	2.983	5	16	24	1.499	0.122	1.310	1.750
Peru	22	2370	158.098	2120	2670	22	145	36.479	76	212	18	52.594	5.666	45	61	24	1.660	0.107	1.540	2.000
Saudi Arabia	22	3005	118.913	2760	3150	22	15	5.216	8	27	18	69.850	8.787	48	83	23	1.085	0.065	0.970	1.210
South Africa	22	2924	104.996	2810	3180	22	26	5.933	13	34	18	18.767	3.806	13	25	23	1.325	0.120	1.060	1.500
Swaziland	22	2281	98.363	2100	2440	22	143	50.739	92	262	18	61.367	15.705	37	80	19	1.565	0.277	1.170	2.170
Syria	22	3084	96.543	2920	3210	22	22	5.163	17	38	18	23.967	10.664	10	49	23	1.455	0.057	1.360	1.540
Thailand	22	2610	281.289	2130	3010	22	155	102.704	40	353	18	8.167	1.362	6	11	24	1.646	0.132	1.450	1.920
Tunisia	22	3258	72.829	3120	3340	22	5	0.869	3	6	18	57.805	11.884	31	80	24	1.664	0.040	1.590	1.750
Turkey	22	3655	53.160	3580	3770	22	6	1.143	3	7	18	7.889	2.703	4	14	24	1.551	0.212	1.360	1.910
Uruguay	22	2782	45.736	2660	2850	22	32	5.982	25	51	18	22.905	8.085	14	42	24	1.311	0.082	1.210	1.530
Venezuela	22	2580	236.310	2360	3100	22	79	36.153	14	126	18	51.000	6.679	40	58	24	1.677	0.305	1.270	2.290
Viet Nam	22	2382	302.795	1900	2890	22	163	84.730	63	367	18	4.878	1.863	2	8	17	1.683	0.055	1.500	1.750

Source: author's analysis of data from FAOSTAT