

How Vulnerable are Arab Countries to Global Food Price Shocks?*

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Abstract

This paper presents new estimates of pass-through coefficients from international to domestic food prices by country in the Middle East and North Africa (MENA). The estimates indicate that, despite the use of food price subsidies and other government interventions, a rise in global food prices is transmitted to a significant degree into domestic food prices in many MENA countries, although cross-country variation is significant. In nearly all countries, domestic food prices are highly downwardly rigid. The finding of asymmetric price transmission suggests that not only international food price levels matter, but also food price volatility. High food pass-through tends to increase inflation pressures, where food consumption shares are high. Domestic factors, often linked to storage, logistics, and procurement, have also played a major role in explaining high food inflation in the majority of MENA countries.

Keywords: food prices; pass-through effects; inflation; Arab world; Middle East and North Africa

JEL: C22; E31; E37.

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1. Introduction

There is a belief that households in the Middle East and North Africa¹ (MENA) should be largely insulated from fluctuations in global food prices. The region stands out among other developing regions for its extensive use of price subsidies and controls (Ortiz *et al.*, 2011). In addition, governments in MENA employ other policies aimed at managing and regulating food consumption, production and trade.² These include production subsidies, import protection cuts, and build-up of food reserves.

At the same time, high and volatile international food prices continue to be a major concern in the MENA region, and some have even cited them as a contributing factor in the Arab Spring (Breisinger *et al.* 2011; Zurayk, 2011). Food prices rose substantially during the second half of the 2000s, and even though prices plunged during the global economic and financial crisis, they recovered rapidly in 2010 before coming down somewhat in 2011 (Figure 1). At present, the aggregate food price index is above the levels observed in the mid-2000s, and prices of certain food items remain high (World Bank 2012a).

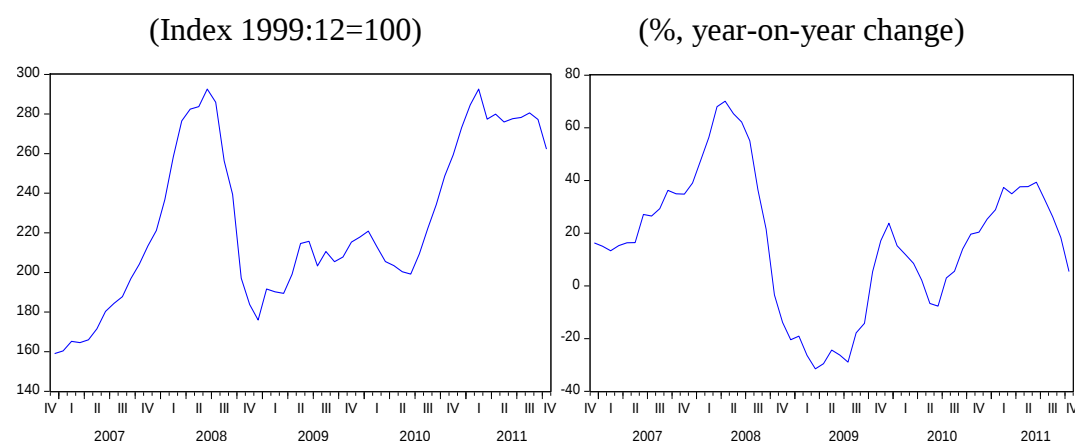
High international food prices feature prominently in public policy discussions in the Middle East and North Africa for a number of good reasons. Dependence on imported food is substantial and likely to grow in the future. Using data from the United States Department of Agriculture (USDA) this paper shows that the region meets through imports about half of its wheat and barley consumption requirements, 40 percent of its rice consumption, and nearly 70 percent of its corn consumption (Table 1). The region is the largest wheat importer in the world, and wheat prices increased by 70 percent in the second half of the 2000s. With expected high population growth rates and climate change that is likely to raise the frequency of draughts and water scarcity, MENA's import dependence will only grow going

¹ In this paper we use interchangeably the terms "MENA" and "Arab world." The definition of MENA corresponds to the operational definition of the Middle East and North Africa region of the World Bank, which includes most members of the Arab League and Iran. We also refer to three main subgroups in MENA: the oil importing economies which include Egypt, Tunisia, Morocco, Jordan, Lebanon, Djibouti, and the West Bank and Gaza; the oil exporting economies of Algeria, Iran, Iraq, Syria, and Yemen; and the GCC economies comprised of UAE, Saudi Arabia, Qatar, Oman, Bahrain, and Kuwait.

² Ortiz *et al.* (2011) have a list of policy interventions by country and developing region.

forward. Finally, high malnutrition rates in the developing parts of the region suggest that a large number of households are highly vulnerable to food price shocks.

Figure 1. World Food Prices and Inflation, 2006:12-2011:10



Source: World Bank, Development Prospects Group (DECPG).

The economics literature provides little empirical insight into how much international food price shocks impact on domestic prices in individual MENA countries. The exception is a working paper by Albers and Peeters (2011) presenting food price transmission effects for a few countries in the Mediterranean region. Also, Crowley (2010) finds that commodity prices exhibit a strong and mostly significant impact on domestic inflation for a cross-section panel of countries in MENA and Central Asia. Limited access to data has been a key reason for the absence of empirical work on MENA countries. This paper, therefore, fills a void by presenting new estimates of food pass-through coefficients from international to domestic prices for all MENA countries, using a data base collected from various sources throughout the region.

As international food prices increased significantly in recent years,³ nearly all countries experienced an increase in their domestic food prices. Still, the question concerning the extent to which international food prices affect domestic food prices requires an empirical investigation. Domestic price levels can be affected not only by world food prices movements, but also by a number of country-specific factors, including food price policies, such as price controls and subsidies, trade and production policies, domestic supply chain issues, food stock management,

³ International food prices, measured by the World Bank food price index, increased by 76 percent from December 2006 to April 2011.

infrastructure, weather patterns, and exchange rates, among many others. For these reasons, food dependency ratios will not reveal the extent to which international food price movements are transmitted to domestic food prices.

Importantly, with substantial increases in international food prices in the 2000s and fast-growing domestic food demand due to high population growth rates, fiscal and inflationary pressures have grown as well. Fiscal pressures vary by country and reliable data is generally patchy, though estimates suggest that most MENA countries may be spending several percentage points of their GDP on food subsidies.⁴ These are costly and, if targeting is poor, arguably not the most effective way of protecting vulnerable populations. Recognizing this dilemma, over the past two decades, countries in the MENA region have attempted to reform their food subsidy systems. Some governments have been more successful than others in cutting subsidies and improving targeting. Measures such as self-targeting, increasing prices by stealth, subsidy rationing and replacing subsidies with cash transfers, sometimes succeeded in reducing the government's fiscal burden. But many other reforms fell short or needed to be reversed after public pressure. The result has been partial reforms, with all countries still offering at least some food price subsidies, while social assistance schemes have in general not adequately channelled sufficient resources to the needy.

During political transitions, distributional and public policy challenges are exacerbated in countries dependent on imported food. A World Bank (2011a) report found that many MENA governments responded to discontent with economic and social problems at the onset of the Arab spring by extending food and fuel subsidies. Countries that increased food subsidies and/or imposed price controls during the first half of 2011 include Bahrain, Kuwait, Oman, UAE, Algeria, Yemen, Jordan, Egypt, Tunisia, and Morocco (World Bank, 2011b).

High international food prices can complicate macroeconomic management. Subsidy costs take away fiscal resources that can be used to finance growth-enhancing investments. Because of the high food shares in the consumption basket for many MENA countries,⁵ and second-round effects, high domestic food inflation can have

⁴ In 2009 food subsidies ranged from 0.8 percent of GDP in Jordan to 3.5 percent of GDP in Iraq (World Bank 2011a). See also Albers and Peeters (2011).

⁵ Food consumption shares are close to 0.6 in low-income MENA (e.g. Yemen and Djibouti), between 0.35 and 0.45 in middle-income MENA (Morocco, Algeria, Lebanon, Jordan, Syria, Egypt, Tunisia, Iraq) and below 0.25 in high-income MENA (Saudi Arabia, Bahrain, Kuwait, Qatar, UAE).

long-lasting effects on overall (headline) inflation, in particular for countries with less firmly anchored inflation expectations (Walsh, 2011). Food inflation can also be transmitted to core inflation through higher inflationary expectations and workers' demands for higher wages. It has been shown that in MENA food inflation exhibits strong short-run effects on non-food inflation (IMF, 2011).

Tight supplies in relatively thin global food commodity markets put countries with high food dependency ratios at risk of disruptions in procurement, shortfalls in food availability, and food inflation (Famine Early Warning Systems Network, 2011). Within these countries, food inflation is a particular threat to the urban poor, allocating a large share of their expenditures to food. Even relatively modest price increases can deprive them of adequate access to food.

This paper aims to assess the magnitude of risks stemming from high international food prices and volatility by country. We provide country estimates of international food price pass-through to domestic food prices in MENA and identify the contribution of other factors – internal and external – to domestic food price fluctuations. As we show, the pass-through estimates vary significantly because of individual country characteristics, including exchange rate and food subsidy policies.

Our empirical results indicate that global food price shocks are a risk for almost all MENA countries. Yet, the exposure to food price shocks varies significantly by country. We find that the full transmission process of international food prices into domestic markets takes about one year. The estimated pass-through coefficients indicate that, on average, a 1 percent increase of world food prices can increase domestic food prices by some 0.2-0.4 percent. The pass-through effects are notably higher for Egypt, Iraq, Djibouti, the UAE, and West Bank and Gaza. By contrast, Algeria and Tunisia appear less affected.

Another important finding is that international price transmission is highly asymmetric. An increase in world food prices is typically transmitted into domestic food markets, but a decline in world food prices rarely transmits at the same degree. Thus, the finding of asymmetric price transmission suggests that not only international food price *levels* matter, but also food price *volatility*.⁶ For countries with high food dependency ratios, limited fiscal space, and expected volatility in

⁶ In a recent article, Barret and Bellemere (2011) argue that in the popular policy debate there is confusion over the meaning of price volatility. They claim that the core problem for most developing countries is the high food global price level, and not so much volatility.

commodity markets, this phenomenon arguably poses significant future challenges. Government interventions including food price subsidies and controls, along with political insecurity in the region, may have contributed to a sluggish market response to downward movements in world food prices. However, this paper does not identify systematically the causes of the asymmetric food price transmission process. They are complex and should be an area for future research.

Following next is section 2 which documents the sources for the MENA food time-series price data and presents statistics that explore MENA's potential exposure to food price shocks, including dependency ratios by food commodity. Section 3 reviews the empirical literature on food price pass-through effects, with the aim of establishing benchmarks and informing the empirical methodology. Section 4 details the econometric approach, while section 5 presents pass-through coefficients for 18 MENA countries. It shows also food price transmission dynamics and decompositions of pass-through estimates into approximate sources. Section 6 concludes with a summary.

2. What Do the Data Tell Us?

Historic and current price data for MENA are scarce and for most countries not readily available. For the 18 individual countries, monthly food consumer price data are compiled from various sources. The primary data sources are the national statistical offices, either directly, or collected over time by World Bank country economists. The food consumer price data are complemented with historical information from the International Labor Organization (ILO) and several updates provided by national statistical offices themselves.

Efforts were made to ensure data accuracy. Specifically, we compared trend and annual growth consistency of different time-series from 1998–2011. The data were further corroborated with general market information from various press releases, field documentation from USDA, and country updates by World Bank economists. In some cases, such as Djibouti, Jordan, Lebanon, and Tunisia, the level data in different series show small divergences from original series due to rebasing, yet the effects on annual growth rates are negligible. A small number of missing monthly observations were interpolated for the Gulf Cooperation Council (GCC) countries and Algeria. Preference was always given to the original data provided by the national statistical offices. The two exceptions are Lebanon, where the main data

source is information collected by World Bank staff, and Iran, where we use food price data compiled by the Central Bank.⁷ To our knowledge there is no consistent information on food prices in Libya, which is hence omitted from the analysis.⁸ For some countries food prices refer to urban or capital centers. Overall, because of the great emphasis on consistency checks with other than official sources, we believe the food price dataset provides accurate information.

Food inflation rates for eighteen MENA countries are presented in the Annex, Figures 1A-C. We provide data for almost all MENA economies for the period from December 2006 to October 2011. The beginning of this period is commonly regarded as the start of the first global food price shock. In nearly all countries food inflation registered a peak in 2008, yet there are substantial differences in food inflation patterns across the Arab world, reflecting idiosyncratic factors at the domestic level. In general, domestic food inflation in MENA remained lower than global food inflation, and in most Arab economies food inflation remained positive even during the period when international food inflation turned negative. This fact is consistent with asymmetric transmission of international food price fluctuations to domestic markets in the Arab world – a hypothesis investigated in the second part of this paper.

As a first attempt to understand the exposure of the MENA countries to global food shocks, we present ratios of net imports to domestic consumption of key food commodities, together with their respective import and consumption shares, by country (Table 1A) and country groupings (Table 1B). The ratios of net imports to domestic consumption are indicative of the dependency on foreign imports to satisfy domestic demand for grains, edible oils, meat, and sugar. The analysis covers grain and non-grain imports; the latter account for approximately half of all food imports in developing MENA (Table 1B). In the GCC their share is just under 30 percent.

Dependency ratios, presented in Table 1A, are calculated as:

$$D_i = \frac{M_i}{C_i}, \quad (1)$$

where M_i denotes the net imports of food product i and C_i is the domestic consumption of food product i , with i corresponding to grains, edible oils, meat, and sugar. Dependency ratios (D_i) are aggregated across the four food groupings for a

⁷ Food prices from Iran's national statistical office and annual growth rates are much lower than those reported by the Central Bank.

⁸ Only the CPI is available in the International Financial Statistics (IFS) database until November 2010.

particular country by computing the ratio of net total imports over total food consumption of the four food groups. Dependency ratios across country groupings are then aggregated using simple averages. The analysis looks at the most important food products for MENA countries which are grains, edible oils, sugar, beef, and poultry.

In all developing MENA countries, except Lebanon, grains account for the largest share in total food consumption, while in high-income GCC meat has the highest weight in the consumption basket (Table 1A). Dependence on food imports in general is high across MENA except in Iran, and nearly complete (around or above 90 percent) in all GCC economies, except Saudi Arabia where it is 80 percent. Thus, in the absence of policies to soften the impact of world food price fluctuations, the pass-through effects from world to domestic prices should be largest in the GCC economies, as well as in some other countries, such as Yemen, Iraq, and Jordan.

To gauge the first-round effects of a sharp increase in key food prices we also compute the corresponding increase in the import bill as a share of the 2010 GDP and as a share of international reserves, excluding gold.⁹ The analysis relies on USDA data for supply and demand of individual food commodities, World Bank international commodity prices, International Monetary Fund (IMF) data on international reserves, and World Bank data for the 2010 GDP estimates by country.

The assessment of vulnerability considers increases in international grains, oils, meat, and sugar prices from June 2010 to July 2011 relative to the same period in the previous year. Over this period wheat prices surged nearly 30 percent, corn prices surged 53 percent, sorghum rose 32 percent, and barley prices rose 27 percent. The increase in rice prices was more modest, at 7 percent. The increase in edible oil prices was also significant, with sunflower seed oil prices up 54 percent, rapeseed oil prices up 50 percent, soybean oil prices up 40 percent, and palm oil prices up 46 percent. Sugar prices were up 39 percent, while beef prices rose 22 percent. Only the prices for olive oil and poultry declined during this period.

⁹ The assumption is that import prices are the prices prevailing in major international markets for each commodity, expressed in US\$, and that demand and supply do not respond to changes in prices.

Table 1A. Food Dependency Ratios, Import, and Consumption Shares for 2010

Country / Food Item	Net Imports as a Share of Consumption	Commodity Import Shares	Commodity Consumption Shares	Country / Food Item	Net Imports As a Share of Consumption	Commodity Import Shares	Commodity Consumption Shares
Algeria				Lebanon			
Grains	68%	52%	52%	Grains	87%	39%	32%
Oils	88%	22%	18%	Oils	38%	7%	8%
Meat	33%	7%	15%	Meat	56%	38%	49%
Sugar	89%	19%	15%	Sugar	100%	16%	11%
Food	69%	100%	100%	Food	70%	100%	100%
Bahrain				Morocco			
Grains	100%	28%	25%	Grains	51%	57%	61%
Oils	n/a	n/a	n/a	Oils	59%	24%	21%
Meat	88%	62%	65%	Meat	n/a	n/a	n/a
Sugar	100%	10%	9%	Sugar	57%	19%	18%
Food	92%	100%	100%	Food	54%	100%	100%
Egypt				Oman			
Grains	39%	54%	62%	Grains	91%	26%	24%
Oils	78%	27%	14%	Oils	93%	27%	18%
Meat	37%	10%	13%	Meat	88%	37%	45%
Sugar	37%	9%	11%	Sugar	85%	10%	12%
Food	44%	100%	100%	Food	89%	100%	100%
Iran				Saudi Arabia			
Grains	19%	32%	46%	Grains	85%	35%	34%
Oils	80%	28%	11%	Oils	95%	12%	10%
Meat	23%	24%	34%	Meat	57%	33%	46%
Sugar	61%	17%	9%	Sugar	151%	20%	11%
Food	31%	100%	100%	Food	80%	100%	100%
Iraq				Syria			
Grains	71%	56%	58%	Grains	51%	53%	62%
Oils	100%	9%	7%	Oils	6%	7%	19%
Meat	62%	20%	25%	Meat	n/a	n/a	n/a
Sugar	104%	15%	11%	Sugar	126%	40%	19%
Food	75%	100%	100%	Food	56%	100%	100%
Jordan				Tunisia			
Grains	97%	42%	35%	Grains	68%	58%	63%
Oils	68%	17%	20%	Oils	-73%	15%	22%
Meat	25%	27%	34%	Meat	n/a	n/a	n/a
Sugar	98%	14%	11%	Sugar	104%	27%	16%
Food	67%	100%	100%	Food	43%	100%	100%
Kuwait				United Arab Emirates			
Grains	101%	25%	26%	Grains	100%	18%	22%
Oils	100%	3%	3%	Oils	82%	19%	19%
Meat	86%	67%	66%	Meat	87%	24%	51%
Sugar	100%	6%	6%	Sugar	82%	40%	8%
Food	91%	100%	100%	Food	89%	100%	100%
Yemen							
Grains	84%	54%	55%				
Oils	100%	8%	7%				
Meat	43%	10%	20%				
Sugar	104%	27%	18%				
Food	81%	100%	100%				

Source: Calculations using USDA data collected by Cristina Savescu.

Table 1B. Food Dependency Ratios, Import, and Consumption Shares for 2010 (cont'd.)

Country / Food Item	Net Imports as a Share of Consumption	Commodity Import Shares	Commodity Consumption Shares	Country / Food Item	Net Imports As a Share of Consumption	Commodity Import Shares	Commodity Consumption Shares
Oil Exporters				GCC			
Grains	44%	46%	51%	Grains	89%	28%	30%
Oils	72%	18%	12%	Oils	91%	14%	14%
Meat	30%	15%	31%	Meat	69%	34%	49%
Sugar	87%	21%	12%	Sugar	132%	25%	10%
Food	49%	100%	100%	Food	83%	100%	100%
MENA				Oil Importers			
Grains	48%	44%	51%	Grains	46%	53%	59%
Oils	69%	19%	15%	Oils	60%	24%	16%
Meat	42%	18%	29%	Meat	38%	10%	20%
Sugar	78%	19%	12%	Sugar	53%	13%	12%
Food	53%	100%	100%	Food	48%	100%	100%

Source: Calculations using USDA data collected by Cristina Savescu. Note: 'Oil exporters' denotes the developing oil exporters.

The impact on the import bill of these price increases in the MENA region is estimated at 0.6 percent of GDP, and 1.4 percent of international reserves, with grains making the largest contribution, followed by edible oils, sugar, and meat (Table 2). Oil importers are hardest hit by the increase in food prices. The increase in the import bill is estimated to be 1.2 percent of GDP, with half of the increase attributed to the impact of higher grain prices. This is consistent with the high share of grains in the import basket (Table 1B).

The expected increase in the import bill of the developing oil exporters as a result of higher food prices is estimated at 0.8 percent of GDP and 2.3 percent of international reserves. Increases in prices of edible oils and sugar account for more than half of the increase in the import bill. Dependency on imported edible oils and sugar is high; therefore, despite smaller shares in the import basket, these two groups have a large effect on the import bill.

The GCC countries are expected to be least impacted by the higher food prices at the macro level as they have small populations and high per capita incomes. The overall impact on the GCC is estimated to be 0.3 percent of GDP and 0.5 percent of international reserves, with the largest shock coming from the increase in sugar prices, reflecting a surge in prices of sugar and high sugar import dependency (Table 1B). In these countries, sugar is used not only for domestic consumption, but also as intermediate input into processed food exports.

Table 2. Impact of Changes in International Food Prices on the Import Bill, 2010

		% of 2010 GDP	% of international reserves
MENA			
	Food	0.62	1.44
	Grains	0.27	0.63
	Oils	0.17	0.40
	Meat	0.04	0.09
	Sugar	0.14	0.32
GCC economies			
	Food	0.25	0.45
	Grains	0.07	0.12
	Oils	0.06	0.12
	Meat	0.02	0.04
	Sugar	0.09	0.17
Developing oil exporters			
	Food	0.78	2.28
	Grains	0.33	0.98
	Oils	0.22	0.61
	Meat	0.05	0.14
	Sugar	0.19	0.55
Oil importers			
	Food	1.15	4.39
	Grains	0.59	2.32
	Oils	0.35	1.23
	Meat	0.05	0.24
	Sugar	0.15	0.59

Source: World Bank for international commodity prices and 2010 GDP, IMF for international reserves and USDA for import demand.

Dependency ratios give important insights into MENA's overall exposure to price shocks. It shows that, from a macroeconomic perspective, the impact of high international food prices on GDP and international reserves is sizable for most developing MENA countries, mainly because of the big role of grain imports for domestic consumption. This finding is consistent with MENA's high grain import dependency, the high grain import share, and the large increase in world grain prices compared with world meat prices. International prices of oils and sugar jumped, in some cases, by more than the prices of grains but their lower share in imports implies a smaller effect on the import bills.

This analysis gives an idea about the relative importance of different food commodities on macroeconomic indicators such as aggregate imports, yet it ignores second-round effects and may heavily misrepresent the impact on consumer prices,

which can vary significantly due to individual country characteristics and policies. To what degree international food price fluctuations are transmitted into MENA markets, is analyzed in the following sections.

3. Perspectives on Food Price Pass-Through

The empirical literature on the transmission of international food price shocks is abundant. It features studies that apply different econometric methodologies to isolate the effect of various factors on domestic price levels. Studies typically present multi-country analyses which include both developed and developing economies, but most countries in MENA other than Egypt have been omitted due to difficulties with obtaining price data.

Anderson and Tyers (1992) use error-correction models to compute short and long-run transmission elasticities for changes in border prices relative to domestic producer prices for 30 countries and 7 agricultural commodities for the period 1961–1983. They find average pass-through coefficients of about 0.3 for most countries. Quiroz and Soto (1995) estimate an aggregate agricultural pass-through elasticity for 78 countries between 1966 and 1991. They find much lower transmission for most countries, and no transmission in the long run. For the developing countries they present a mixed picture. In about one third of the developing countries, there is no transmission even in the long-run, while in the remaining it can take years to transmit a world price shock to domestic prices. In comparison, Mundlak and Larson (1992) note high transmission elasticities for world prices and exchange rates for 58 countries (1968–78), but as argued by Quiroz and Soto (1995), this might be due to a spurious regression problem, which they corrected in their own study. A number of other papers (Baffes and Gardner 2003; Hazell *et al.* 1990; Sharma 2003) find mixed evidence of the effects of world food price fluctuations on domestic producer prices in the developing countries. More recent analysis includes Anderson (2010), who uses error-correction models, and the IMF (2011), which relies on Vector Auto-Regressions (VAR). Interestingly, despite different time periods, countries, and methods, they find average pass-through coefficients in the order of 0.3 for most countries. Ferrucci *et al.* (2010), who use a VAR-methodology, also find that international commodity prices are the main determinant of producer and consumer food price inflation in the Euro area.

Studies rarely explain the choice of methodology. However, some papers shed some light on this issue. Fackler and Goodwin (2001) and Barret (2001) acknowledge that most empirical tests for food markets reject the law of one price. Failure of empirical tests to support the law of one price for food markets are believed to stem from problems with measurement, especially of transport and transaction costs, policy and market factors. Yet, this implies that long-run, co-integration or error-correction parameters may yield insignificant results. Adam (2011) summarizes these points by presenting the relationship between the export parity price, the import parity price and domestic food prices:

$$(1 - c_x)(1 - t_x)Ep^W \leq p \leq (1 + c_m)(1 + t_m)Ep^W, \quad (1)$$

where c and t denote transport costs and tariffs on exports x and imports m ; E is the nominal exchange rate, p^W is the international price of food, and p is the domestic price of food. The higher the costs associated with trade across borders are, the greater the wedge between domestic and world prices of food, and the greater the influence domestic market conditions will have on domestic prices, implying lower pass-through from world food to domestic food prices. In the case of MENA, where most of the countries are consistent net importers, the domestic prices will follow closely the import parity price, modified here to reflect the presence of subsidies s used widely in the MENA region:

$$\frac{(1 - c_x)(1 - t_x)Ep^W}{1 + s} \leq p \leq \frac{(1 + c_m)(1 + t_m)Ep^W}{1 + s}. \quad (2)$$

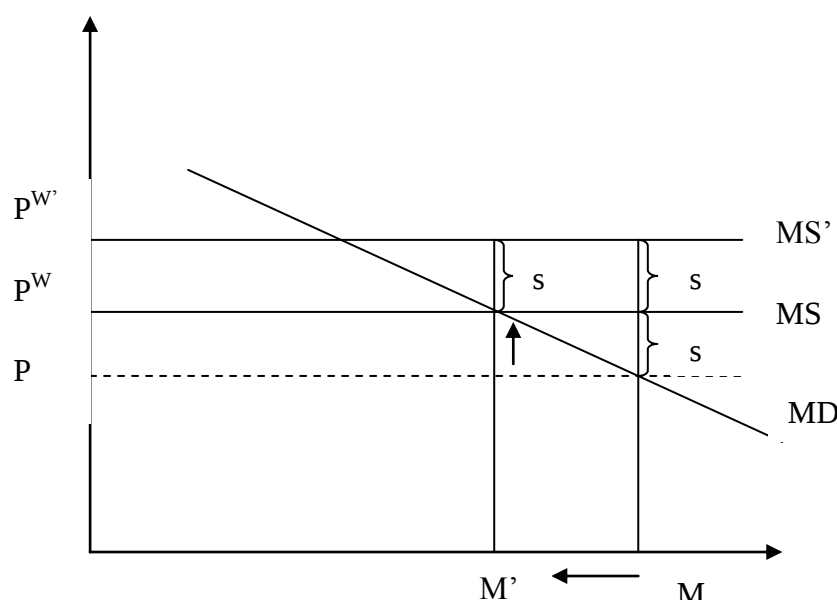
Price subsidies can be used to insulate completely domestic prices from world food price and exchange rate fluctuations, but when international food prices are increasing at a rapid pace this means that subsidies will also have to increase rapidly in order to keep domestic prices stable. This is not always possible, especially in countries with limited fiscal space and high import food dependency. Take for example the case of MENA's oil importing countries where fiscal deficits have grown from an average of about 4 percent of GDP in 2008 to 7.5 percent of GDP in 2011, while government debt has declined, but has remained above 70 percent of GDP since 2008. In such a country it would be difficult to accommodate escalating subsidy costs that absorb the difference between international and domestic food prices.

Empirical information on subsidies from developing MENA supports this view. As mentioned earlier, food subsidy data is patchy, but for a few countries there

is information on the cost of subsidies as a share of GDP in 2007 and 2009. During the period 2007–2009, national food prices increased substantially,¹⁰ but food subsidies mostly declined or stagnated, except in Egypt where they increased.¹¹

We illustrate this situation on Figure 2 assuming that a country is a price taker in international food markets and faces a perfectly elastic import supply curve.¹² We assume also that the objective of the government is to keep domestic prices and imports of food as stable as possible via price subsidies on imported food.¹³ If there is a shock to the world food price, resulting in a jump in the world price from P^W up to $P^{W'}$, the government will have to double the subsidy paid per unit of imported food in order to keep imports at levels prevailing at the old international prices P^W .

Figure 2. Impact of Subsidies on Domestic Food Prices



As discussed above doubling of subsidies will be difficult in countries with limited fiscal space, implying that domestic prices P might move up. In our example, the

¹⁰ Food CPI increased by 20 percent in Jordan, 44 percent in Egypt, 21 percent in Syria, and 8 percent in Morocco between 2007 and 2009.

¹¹ According to World Bank data, during the period 2007–09, food subsidies declined as a share of GDP from 1.8 percent to 0.8 percent in Jordan, and from 2.1 percent to 1.4 percent in Syria. Food subsidies remained at 0.7 percent in Morocco, and increased from 1.3 percent to 2.0 percent in Egypt.

¹² Note the analysis does not change if we assume that the country can affect prices and is facing an upward sloping import supply curve.

¹³ Commitment to price stability is signaled by the prevalence of price controls in MENA on certain types of food products. Price controls can be viewed as flexible subsidies that accommodate perfectly fluctuations in the price. According to Ortiz *et al.* (2011), Algeria, Morocco, Jordan, and Djibouti use also price controls on certain food products. Some of these use both price controls and price subsidies.

domestic price P moves up to the previous international food prices P^W , and domestic import demand moderates from M to M' . In this case the fiscal burden associated with the subsidy remains unchanged, but the domestic food price increases by the amount of the subsidy s .

If the world food price P^W falls down to the domestic price P , then the government might decide not to pay the subsidy s per unit of imported food. This will have the effect of keeping the domestic food price stable at P , and food consumption at M . In this case government interventions related to prices subsidies might have an asymmetric effect on domestic prices. Under asymmetric transmission, increases in world food prices will be accumulating and pushing food price levels up. Volatility in global food prices would, therefore, be especially harmful, even in countries with extensive subsidy programs.

In general, the reasons behind the asymmetric transmission of prices are often complex (Meyer and Cramon-Taubadel, 2004), and associated with a number of factors.¹⁴ There is evidence that adjustment issues at the wholesale or retail level of distribution might be causing domestic prices to be downward sticky. Uncertainty of whether food price shocks are permanent or transitory, along with political uncertainty in some MENA countries, might also exacerbate market reluctance to respond to food price signals. Non-competitive practices in the domestic and/or international market will also contribute to the asymmetric response. In fact, Morisset (1998) finds that declines in world commodity prices are either not transmitted or transmitted only imperfectly to domestic consumer prices in developing countries, precisely because of suspected uncompetitive practices.

Thus, it is unclear *a priori* to what extent world price fluctuations are transmitted to domestic food prices in MENA. Moreover, it is likely that the effects are rather short-run. The main factors that could impact on the pass-through from world to domestic food prices will be exchange rates, transport and distribution costs, as well as domestic market distortions, including food subsidies. The world average pass-through effect are probably in the order of about 0.3, from what we believe are the most credible empirical studies.

¹⁴ Albers *et al.* (2011) provide evidence of non-linearity of international food price transmission into domestic prices for a number of Mediterranean countries in the MENA region.

4. Econometric Approach

As a baseline model for the calculations of the pass-through effects, we consider the following simple autoregressive model that explicitly focuses on the short-run correlations between international and domestic food prices:

$$\Delta p_t = \alpha + \sum_{i=1}^k \beta_i \Delta p_{t-i} + \sum_{i=1}^k \gamma_i \Delta p_{t-i}^W + \varepsilon_t, \quad (3)$$

where Δp is the annual percentage change of the domestic food consumer price index, Δp_{t-i} represents lagged annual percentage changes of the domestic food prices, and helps account for domestic factors and expectations, and p_{t-i}^W is the annual percentage change of the World Bank's international food price index, which is calculated from food prices measured in current US\$. The pass-through from an international food price shock to inflation denominated as θ , can be obtained by inverting the equation as follows (de Gregorio *et al.*, 2007):

$$\theta = \frac{\sum_{i=1}^k \gamma_i}{1 - \sum_{i=1}^k \beta_i} \quad (4)$$

The logic behind equation (4) is to discount for the effects of domestic inflation, including inertia or expectations. For example, in the case of strong domestic factors or expectations driving inflation ($\beta \approx 1$) the role of world food price transmission would be small. On the other hand, if there are insignificant domestic factors ($\beta \approx 0$) then the pass-through can be measured by simply summing up the coefficients.

In addition to world food prices, exchange rate shocks are important in determining inflation. If the domestic currency depreciates (appreciates), international food price increases will have a stronger (weaker) pass-through effect. This is a significant consideration, because some of the inflationary effects could be due to currency movements, rather than changes in world food prices. We also take advantage of findings on food price transmission (Meyer and Cramon-Taubadel 2004; Peltzman, 2000; Vavra and Goodwin, 2005), and consider increases or decreases in commodity prices as separate variables. This allows us to determine whether the transmission is asymmetric and the extent of asymmetry. Therefore, the baseline model in equation (3) is transformed into a threshold regression, which controls for

lagged growth rates in the domestic exchange rate, Δe_{t-i} , and allows studying asymmetric food price transmission:

$$\Delta p_t = \alpha + \sum_{i=1}^k \beta_i \Delta p_{t-i} + \begin{cases} \sum_{i=1}^k \gamma_i^p \Delta p_{t-i}^W + \sum_{i=1}^k \delta_i^p \Delta e_{t-i} & \text{if } \Delta p_{t-1}^W \geq 0 \\ \sum_{i=1}^k \gamma_i^n \Delta p_{t-i}^W + \sum_{i=1}^k \delta_i^n \Delta e_{t-i} & \text{if } \Delta p_{t-1}^W < 0. \end{cases} \quad (5)$$

To facilitate a consistent interpretation across MENA countries, we derive estimates of the 6 and 12-month pass-through effects from cumulative impulse response functions.¹⁵ The coefficients show the models' predicted adjustment of domestic food prices to changes in world food prices, controlling for the exchange rate and domestic factors. In most countries, the food price pass-through effects fade out after about one year. Our pass-through coefficients are, therefore, identical to those that can be directly obtained from equation (4).

When estimating the models, we use monthly data from December 1998 to mid-2011 for most countries, allowing for lags. The cumulative lag structure is chosen to minimize the Akaike Information Criterion (AIC) and by lag exclusion tests. The optimal lag length is found to be $k = 12$. In some country cases (Lebanon, Djibouti, Yemen, Syria, Iraq, Oman, Qatar, and the UAE) we use less lags because of the short time series. For these countries, the results are sensitive to outliers. Hence, we selectively employ impulse dummies to correct for extreme jumps in domestic food prices (i.e. due to religious holidays, specific national events, or weather effects). We also use time trends when significant to capture other unknown exogenous factors on domestic prices. Because we estimate the model in annual growth rates, we explicitly control for seasonal factors.

5. Empirical Results

Pass-Through Coefficients

The dynamics and the magnitude of the food price pass-through largely vary by country (Table 3). International food price shocks are a risk for many Arab countries despite food subsidies that are widely believed to shield consumers from increases in

¹⁵ Impulse response functions allow us to trace out the time path of the effect of structural food price shocks from the autoregressive model. Accumulated impulse response functions compute the cumulative sum of the shock over time.

domestic food prices. The average pass-through effect for the region as a whole is 0.25, only slightly lower than the ‘average’ estimate of the effect in the literature (0.3). The slightly lower average effect is consistent with the high prevalence of policies intended to cushion consumers and limit movements in domestic food prices in nearly all MENA countries.

Table 3. Food Price Pass-Through Coefficients

Country and group		6-month food price pass-through		12-month food price pass-through	
		World price increase	World price decrease	World price increase	World price decrease
GCC countries	Bahrain	0.050 (0.057)	0.057 (0.036)	0.349 (0.113)	0.051 (0.034)
	Kuwait	0.107 (0.081)	0.016 (0.029)	0.279 (0.128)	0.020 (0.029)
	Oman	0.341 (0.142)	0.079 (0.063)	0.213 (0.130)	0.075 (0.074)
	Qatar	0.286 (0.125)	0.182 (0.085)	0.355 (0.161)	0.220 (0.099)
	Saudi Arabia	0.144 (0.278)	0.033 (0.024)	0.266 (0.232)	0.023 (0.021)
	UAE	0.355 (0.178)	0.298 (0.143)	0.413 (0.202)	0.315 (0.163)
	Developing oil exporters	Algeria	0.065 (0.077)	0.066 (0.048)	0.059 (0.072)
Iran		0.103 (0.081)	0.003 (0.026)	0.282 (0.116)	0.052 (0.043)
Iraq		0.122 (0.131)	0.062 (0.083)	0.497 (0.158)	0.055 (0.100)
Syria		0.163 (0.097)	0.052 (0.053)	0.261 (0.114)	0.100 (0.067)
Yemen		0.393 (0.161)	0.147 (0.177)	0.311 (0.166)	0.234 (0.192)
Oil importers	Djibouti	0.583 (0.180)	0.037 (0.078)	0.464 (0.183)	0.129 (0.106)
	Egypt	0.336 (0.124)	0.041 (0.032)	0.441 (0.140)	0.034 (0.031)
	Jordan	0.219 (0.102)	0.054 (0.047)	0.392 (0.118)	0.130 (0.069)
	Lebanon	0.080 (0.172)	0.145 (0.096)	0.180 (0.209)	0.132 (0.093)
	Morocco	0.044 (0.063)	0.061 (0.050)	0.394 (0.121)	0.052 (0.042)
	Tunisia	0.070 (0.092)	0.004 (0.022)	0.058 (0.092)	0.005 (0.025)
	WBG	0.475 (0.123)	0.015 (0.034)	0.658 (0.134)	0.017 (0.040)

Note: Bootstrapped standard errors in parenthesis; bold numbers indicate significance at the 5 percent level or better.

The strongest pass-through effects are found in the West Bank and Gaza (WBG), Djibouti, Iraq, Egypt, and the United Arab Emirates (UAE). In these countries the pass-through coefficients are above 0.4, indicating high vulnerability to world food price shocks. The large majority of countries have food price pass-through coefficients in the order of 0.2-0.4. This indicates some degree of vulnerability to

international food price increases for virtually most of the MENA countries. Only Algeria and Tunisia have low pass-through coefficients.

To get a sense of robustness of our estimates, we use Monte Carlo simulation (1,000 iterations) and bootstrap standard errors for the 6 and 12-month food price pass-through coefficients, shown in Table 3. For many countries, including Bahrain, Kuwait, Qatar, UAE, Iraq, Syria, Egypt, Jordan, Morocco, and WBG, the estimated 12-month pass-through elasticities are statistically significant at the 5 percent level. For other countries, the pass-through coefficients are not significant, possibly due to limited price transmission (i.e. policy interventions in the cases of Algeria and Tunisia) or relatively short time-series rendering the coefficients insignificant (i.e. Lebanon, Djibouti and Yemen).

We also tested the robustness of the results to the choice of the food price index. We used the FAO world food price index, which is an alternative to the World Bank's food price index. Both indices are similar, but the FAO index shows higher peaks in 2011. The main effect of using the FAO index is to increase the standard errors of the coefficients, while preserving the pass-through coefficients. Using disaggregated world price index data for cereal, from the FAO and World Bank, produces lower pass-through coefficients than those obtained from aggregated indices. This result is consistent with a lower share of cereal than total food consumption in household expenditures.

The market exchange rates vis-à-vis the euro work best because even in oil-producing MENA countries, a significant share of food imports is denominated in euro. The nominal effective exchange rate, which is a trade-weighted average of the nominal exchange rate, might not be a good proxy for import prices because it also contains export data. Nevertheless, the type of exchange rate choice does not impact significantly the size of the pass-through coefficients.

As it is visible in Table 3, a decline in international food prices does not transmit into domestic food markets and virtually in all MENA countries prices are highly downward-sticky.¹⁶ Commodity price volatility is thus having an asymmetric effect on domestic prices: only price increases are transmitted, whereas consumers do not benefit from a decline in food prices. These results are consistent with the findings

¹⁶ The UAE and Yemen are the only exceptions.

of FAO (2009) and Moghaddasi (2009),¹⁷ and food subsidies might play a role, as illustrated in Figure 1.

Dynamics of Food Price Transmission

In MENA the dynamics and the magnitudes of the food price pass-through vary by country. The transmission takes about one year to reach full impact, but in many cases is already apparent after about 3–6 months. The percentage change in domestic food prices to a 1 percent increase in international food prices by individual MENA countries is described below.

In the developing oil importing countries of the region, the pass-through effects appear relatively pronounced, but the speed of transmission varies across countries (Figure 3). Djibouti, one of the poorest countries in the region with a fragile food security situation, shows the strongest pass-through effects both in terms of magnitude and transmission speed. Similarly, the food price transmission in the West Bank and Gaza appears to be very strong, reaching above 0.6 percent after 12 months.

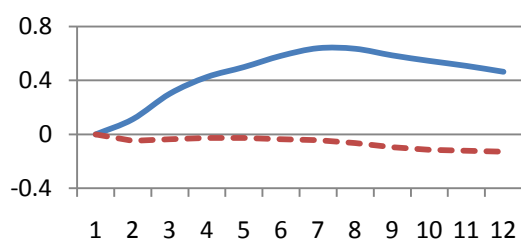
In Egypt, the food price pass-through is significant and visible after a few months and after about 10 months it reaches its peak. A 1 percent increase in international food prices increases the domestic price of food by more than 0.4 percent. The relatively high levels of food inflation are also due to domestic factors, such as pressure from growing demand and unfavorable weather events (Figure 6).

In Jordan, food price transmission starts to pick-up after about 6 months, and the overall effect after one year is similar to that in Egypt. A 1 percent increase in world food prices increases the domestic prices by approximately 0.4 percent. The relatively slow transmission can be explained by the combined effect of a number of government interventions, such as consumer price subsidies and controls, release of grain reserves, and tax reductions of several agricultural inputs, including fuel. Without these measures the pass-through effect would be much stronger given Jordan's near complete dependency on imports of grains, sugar, meat, and edible oils.

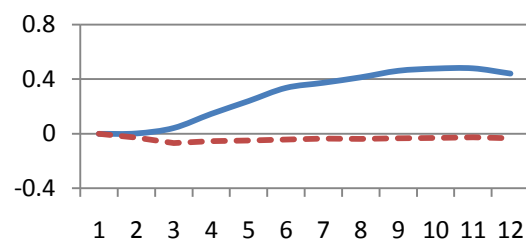
¹⁷ FAO (2009) finds that in Iraq changes in the wholesale price are not met with proportional changes in retail price. Moghaddasi (2009) reports similar findings for Iran.

Figure 3. Oil Importers' Food Price Pass-through Dynamics

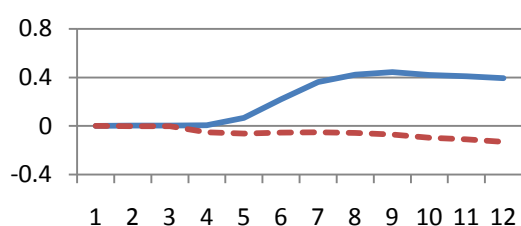
Djibouti



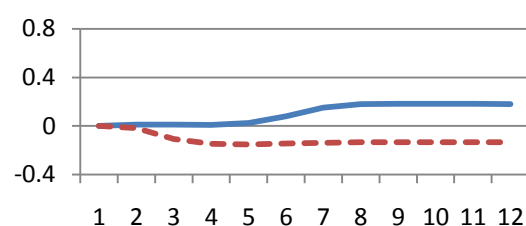
Egypt



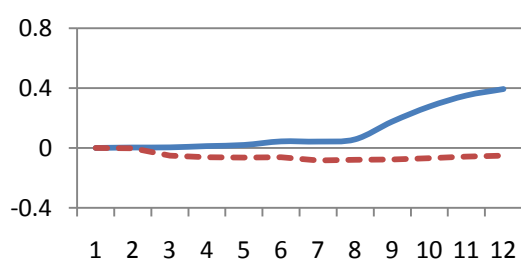
Jordan



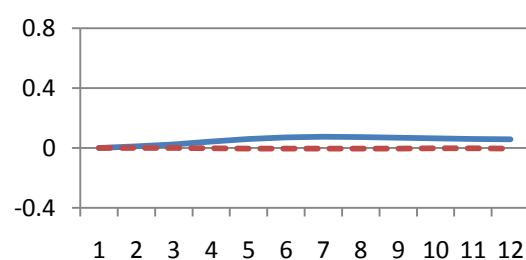
Lebanon



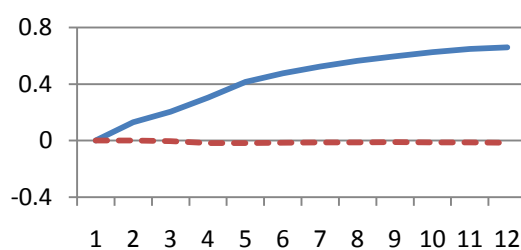
Morocco



Tunisia



West Bank and Gaza



Note: The figure shows the percentage change in domestic food prices for a 1 percent increase (shown as a solid line) and for a 1 percent decrease (shown as a dashed line) in world food prices over a 12-month window based on impulse response functions.

In Morocco, food price transmission typically builds up after about 8 months, reaching magnitudes similar to those observed for Egypt and Jordan. A 1 percent

increase in world food prices lifts domestic prices by some 0.39 percent. The delay in transmission can be attributed to a number of factors, including the government's decision to use subsidies to regulate domestic food prices, suspension of customs duties on cereal imports, suspension of local tax collection targeting fresh food traded in wholesale markets, and price control operations to contain price increases resulting from speculation.

In Lebanon, a 1 percent increase in world food prices translates into a 0.3 percent increase in the prices of domestic foodstuff. High government subsidies for food and fuel (Albers and Peeters, 2011) help explain the relatively slow and mild pass-through effects. In Tunisia, the food price pass-through is small – a 1 percent increase in international food prices increases the domestic price of food by only 0.06 percent. Price controls and food subsidies seem to undermine effectively the transmission of international food prices into domestic prices.

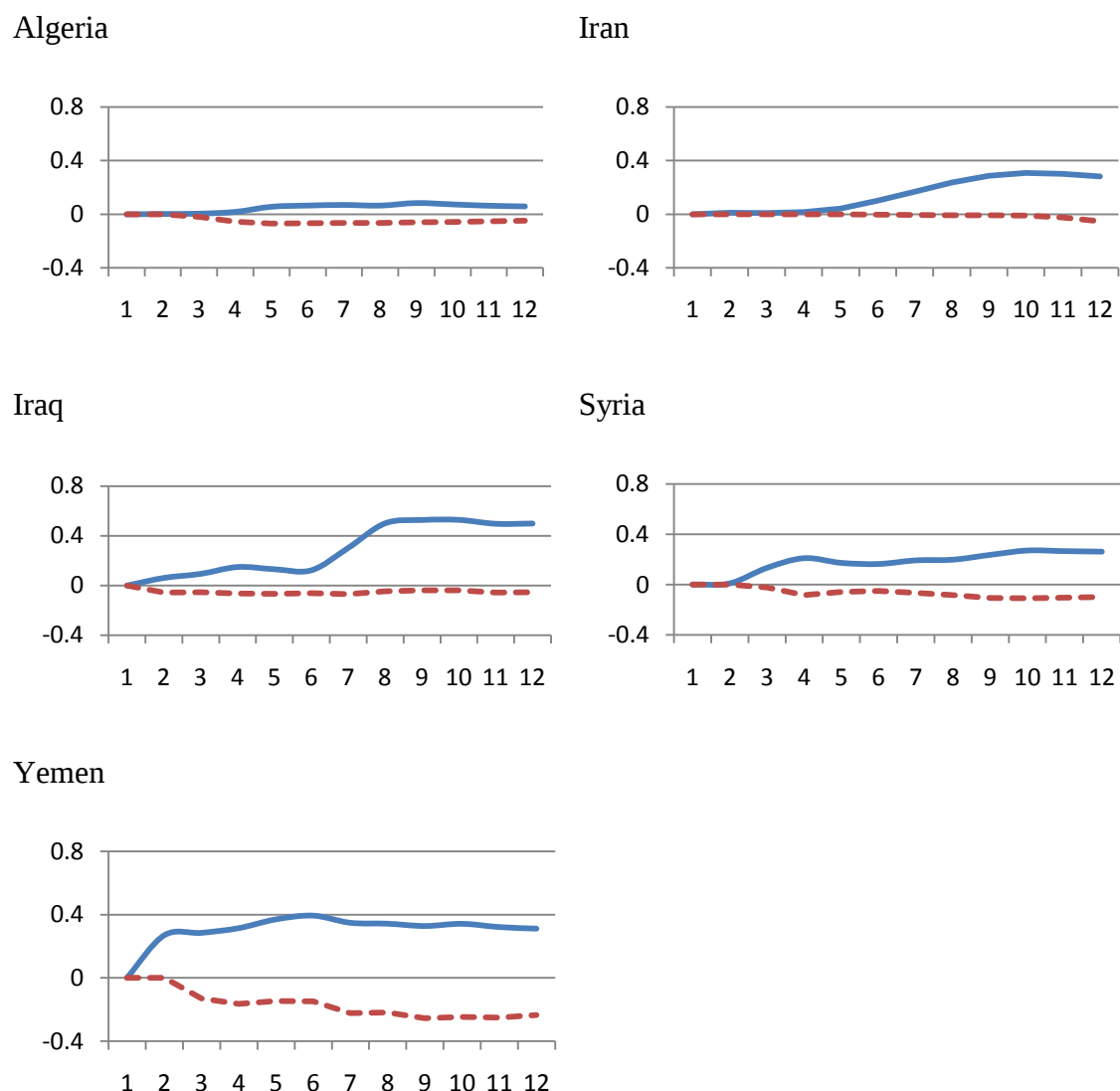
In the developing oil exporting countries of MENA, the pass-through effects are diverse, and range from small in Algeria to large in Iraq (Figure 4). In Algeria, rising international food prices have little overall effect on domestic prices. Algeria's food price controls and other government interventions effectively protect the consumers from food price shocks.

In Iran, food price transmission is gradual and reaches its peak after 10 months. A 1 percent increase in international prices translates into a 0.3 percent increase in domestic food prices. Several factors affect the magnitude of the pass-through. A more significant agricultural sector, which implies lower food import dependency relative to other MENA countries, has the effect of weakening the price transmission, while reform of the national subsidy system has the effect of strengthening the pass-through.¹⁸

In Iraq, food price transmission occurs in a step-wise fashion. Pass-through is relatively slow during the first 6 months, but becomes quite significant after 12 months. Eventually, a 1 percent increase of world food prices increases domestic prices by almost 0.5 percent. The stepwise effects might be explained by the fact that Iraq is a net food importer, which partly relies on a food ration system.

¹⁸ In December 2010, the Government of Iran removed widespread subsidies on oil products, electricity, water, gas, bread, and other basic products.

Figure 4. Developing Oil Exporters' Food Price Pass-through Dynamics



Note: The figure shows the percentage change in domestic food prices for a 1 percent increase (shown as a solid line) and for a 1 percent decrease (shown as a dashed line) in world food prices over a 12-month window based on impulse response functions.

In Syria the pass-through is relatively fast, but appears less pronounced than in other countries because domestic policies encourage domestic production and regulate food prices. The transmission has occurred primarily through the prices of corn and sugar (Table 1A). Syria is quasi self-sufficient in wheat production and the government controls the domestic price of wheat.

Similarly, in Yemen, the pass-through is relatively fast. Yemen is among the ten countries in the world with the highest rates of food insecurity, thus explaining the rapid transmission. The high pass-through reflects grains and sugar price

developments (Table 1). In Yemen a decline in world food prices appears to transmit into the domestic market.

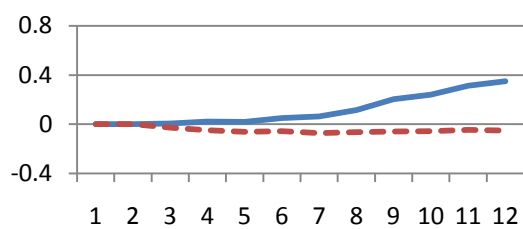
In developed MENA, the world food price pass-through to domestic prices is slower relative to the speed of transmission in the developing MENA countries (Figure 5). In Bahrain, Kuwait, Qatar, and Saudi Arabia, pass-through effects become visible after about 7 months. By contrast, in Oman pass-through effects appear after just 3 months. The relative slow transmission is consistent with the fact that these countries have fiscal space to support stable food price through subsidy programs and other measures. Without such policies transmission would be much quicker and stronger given complete dependence on imports of grains and other major commodities. In all GCC countries, except UAE, the food price pass-through effects are below 0.4 percent. In UAE the pass-through effects are relatively fast and stronger than the GCC average. UAE is also among the few countries where a world food price decline transmits rapidly into the domestic market.

The data suggests that most Arab countries have been affected by the food prices increases since the 2006 global food crisis. Figure 6 plots the accumulated increase in food prices since December 2006 until mid-2011. The figure shows that, with the exception of Morocco, all countries experienced an increase in their domestic food prices by more than 20 percent, but Djibouti and Egypt registered extreme food price increases.

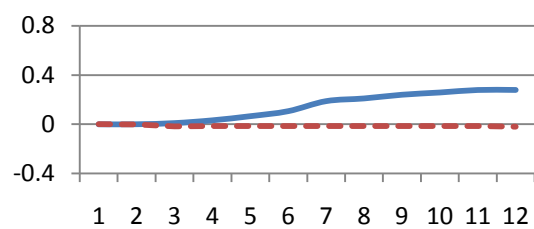
Rising world food prices have been a major factor behind the increase in domestic food prices. The graph shows that the increase in world food prices typically explains some 20–30 percent of the variation in domestic prices. International prices have been a particularly strong driver of food inflation in Iraq and West Bank and Gaza, where they accounted for over 50 percent of food inflation, followed by Egypt, Djibouti, and the United Arab Emirates, where they contributed some 40 percent to food inflation. Exchange rate depreciation has played a minor role in most countries, except for Tunisia and Yemen, where the nominal exchange rate has depreciated by more than 8 percent vis-à-vis the US dollar and by more than 14 percent vis-à-vis the euro since 2006.

Figure 5. GCC Food Price Pass-through Dynamics

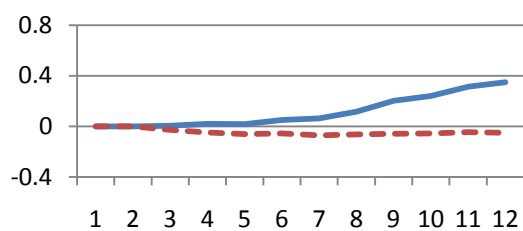
Bahrain



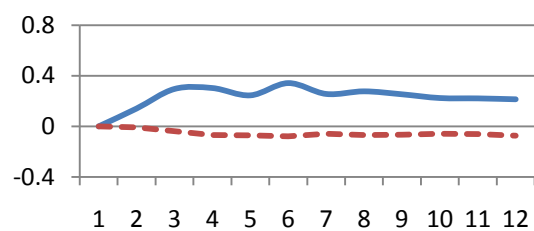
Kuwait



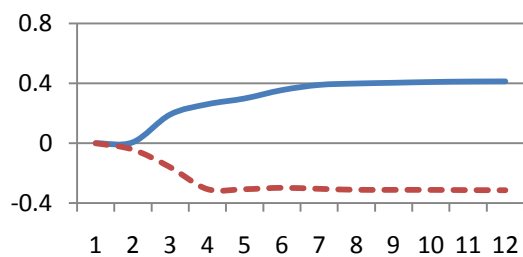
Qatar



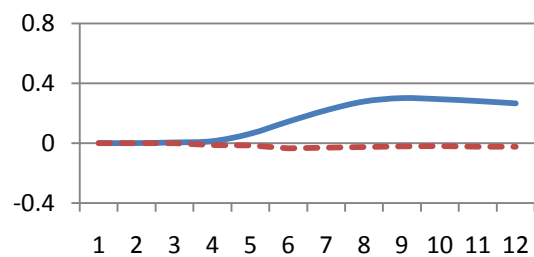
Oman



UAE

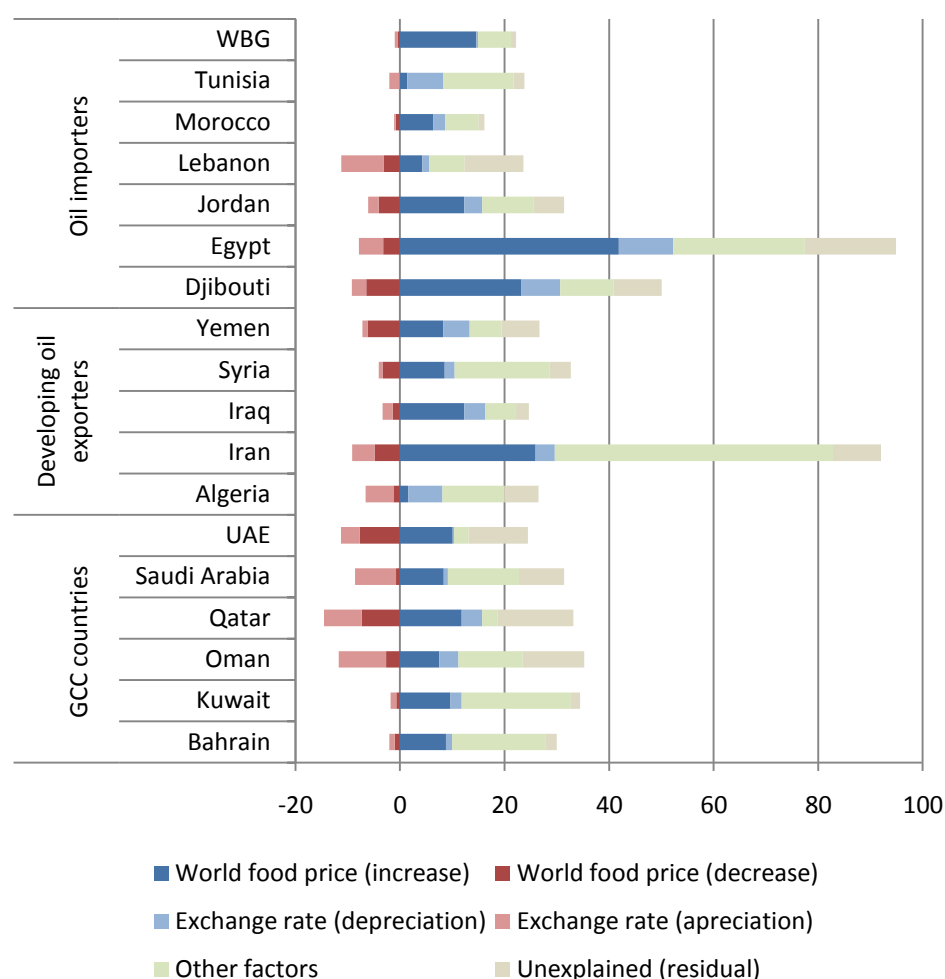


Saudi Arabia



Note: The figure shows the percentage change in domestic food prices for a 1 percent increase (shown as a solid line) and for a 1 percent decrease (shown as a dashed line) in world food prices over a 12-month window based on impulse response functions.

Figure 6. Decomposition of Accumulated Domestic Food Price Increases since December 2006 (% change)



Note: The figure shows accumulated percentage increase in domestic food prices from December 2006 to mid-2011. The increase in domestic food prices is then decomposed into the effects of world food prices, the domestic exchange rate, and other factors using variance decomposition.

Domestic factors, notably inflexible procurement and poor logistics, have also played a major role in explaining domestic food inflation in nearly all MENA countries. A recent World Bank (2012b) study finds that countries could generate significant cost savings by improving the efficiency of the wheat import supply chain. Evidence suggests that it takes on average 4 times longer and costs 3.5 times more to import wheat in an Arab country than in the Netherlands. However, there are significant differences in supply chain performance across the MENA region, with some countries having bottlenecks at the port, while others having inefficient inland transportation systems.

6. Concluding Remarks

This paper presents estimates of food price pass-through coefficients for eighteen MENA economies. Our estimates suggest that food price shocks are transmitted to various degrees into domestic markets, but on average a 1 percent increase of world food prices increases domestic food prices by some 0.2–0.4 percent. The magnitude of the estimates appears to be in line with the empirical evidence for other countries. Pass-through effects are notably higher for the West Bank and Gaza and Iraq, where world food price increases accounted for over 50 percent of food inflation, followed by Egypt, Djibouti, and the United Arab Emirates, where they contributed 40 percent to food inflation. Algeria and Tunisia, on the other hand, appear less affected than any other countries in the region. Overall, our results dispel the widespread belief that the MENA region has been insulated from global food price increases because of high government subsidies and other policies. Rather, our findings suggest that global food inflation is an important source of inflationary pressures in the region.

The results point toward some challenging policy choices in the Arab countries. Cumulative food price increases since 2006 have been substantial due to the asymmetric price transmission process,¹⁹ which implies that not only high global food price levels but also price volatility is of concern. Because of the high food shares in the consumption basket of many MENA countries and second-round effects, high domestic food inflation can have long-lasting effects on overall (headline) inflation, in particular for countries with less firmly anchored inflation expectations. Furthermore, fiscal pressures, associated with high food and other subsidies, have increased since the onset of the Arab spring, and could intensify further, in the event international food prices resume their upward climb.

Yet, external factors are not the only source of domestic food price inflation in the region. Equally important are domestic factors which for about half of the countries in the region have contributed more than 50 percent of the cumulative increase in domestic food prices since the end of 2006. Domestic factors have been particularly important in Iran, all of the GCC countries, Syria, Algeria, Tunisia, and Lebanon.

The findings finally support the view that countries could reduce food price pressures to some degree by tackling domestic issues. Policies aimed at improving

¹⁹ Only in Qatar, the UAE and Lebanon declines in world food prices have been transmitted to domestic markets to a greater extent than elsewhere in MENA.

procurement, logistics, stockpiling, and planning practices and strategic investments in domestic market infrastructure may help to reduce domestic food prices in the medium-run (Lampietti *et al*, 2011). Such measures would need to be country-specific and depend on the local cost-build-up of imported food commodities. Country-specific identification of major infrastructural bottlenecks may, therefore, be advantageous. Other areas may include an assessment of the role of regional trade, overall supply chain efficiency, and instruments of modern price risk management – all of which could help to smoothen supply and cereal stock shortages.

This paper looks at aggregate food price pass-through effects only. We do so because of data limitations, but also because we are interested in the question of countries' vulnerability to global food price shocks in general. For a more in-depth understanding of pass-through effects, one would need to go beyond aggregate food price analysis, and estimate these effects by commodity and country. Thus, there should be efforts to collect more systematically domestic commodity price data. For a few MENA countries, we had only short time series, which arguably lowers the precision of the pass-through estimates. Finally, in countries where pass-through effects are large, in-depth country studies might be beneficial to disentangle more effectively the role and nature of different domestic factors of food inflation.

References

- Adams, C. 2011. "On the Macroeconomic Management of Food Price Shocks in Low-income Countries." *Journal of African Economies* 20(1): 63-99.
- Albers, R. and M. Peeters. 2011. "Food and Energy Prices, Government Subsidies and Fiscal Balances in South Mediterranean Countries." *Economic Papers* 437. Brussels: European Commission, Directorate General for Economic and Financial Affairs.
- Anderson, K. (ed.) 2010. *The Political Economy of Agricultural Price Distortions*. Cambridge and New York: Cambridge University Press.
- Anderson, K. and R. Tyers. 1992. *Disarray in World Food Markets*. New York: Cambridge University Press.
- Barret, C.B. and M.F. Bellemere. 2011. "Why Food Price Volatility Doesn't Matter." *Foreign Affairs*, July 12.
- Barrett, C.B. 2001. "Measuring Integration and Efficiency in International Agricultural Markets." *Review of Agricultural Economics* 23(1):19-32.
- Baffes, J. and B. Gardner. 2003. "The Transmission of World Commodity Prices to Domestic Markets Under Policy Reforms in Developing Countries." *Policy Reform* 6(3):159-180.
- Breisinger, C., O. Ecker, and P. Al-Riffai. 2011. "Economics of the Arab Awakening: From Revolution to Transformation and Food Security." *IFPRI Policy Brief* 18. Washington DC.
- Crowley, J. 2010. "Commodity Prices and Inflation in the Middle East, North Africa, and Central Asia. *IMF Working Paper* WP/10/135. Washington DC: International Monetary Fund.
- De Gregorio, J., O. Landerretche, and C. Neilson. 2007. "Another Pass-Through Bites the Dust? Oil Prices and Inflation." *Working Papers Central Bank of Chile* 417. Santiago: Central Bank of Chile.
- Fackler, P. L. and B. K. Goodwin. "Spatial Price Analysis." In *Handbook of Agricultural Economics*, edited by Bruce L. Gardner and Gordon C. Rausser, pp. 971-1024. Amsterdam: Elsevier.
- Famine Early Warning Systems Network. 2011. *Executive Brief: Food Price Trends in the Middle East and North Africa*. Washington DC: United States Agency for International Development.

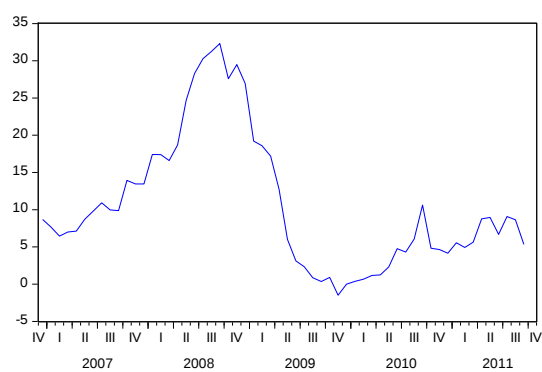
- FAO. 2009. *Iraq Food Prices Analysis*. UN Food and Agricultural Organization: Inter-Agency Information and Analysis Unit. Processed.
- Ferrucci, G., R. Jiménez-Rodríguez, and L. Onorante. 2010. "Food Price Pass-Through in the Euro-Area: The Role of Asymmetries and Non-Linearities." *Working Paper Series* 1168. Frankfurt: European Central Bank.
- Hazell, P.B., M. Jaramillo and A. Williamson. 1990. "The Relationship Between World Price Instability and the Prices Farmers Receive in Developing Countries." *Journal of Agricultural Economics* 41(2):227-241.
- IMF. 2011. *World Economic Outlook*. Washington DC: International Monetary Fund.
- Lampietti, J., S. Michaels, N. Magnan, A. McCalla, M. Saade, N. Khouri 2011. "A Strategic Framework for Improving Food Security in Arab Countries." *Food Security* 3: S7-S22.
- Meyer, J. and S. Cramon-Taubadel. 2004. "Asymmetric Price Transmission: A Survey." *Journal of Agricultural Economics* 55(3): 581-611.
- Morisset, J. 1998. "Unfair Trade? The Increasing Gap between World and Domestic Prices in Commodity Markets during the Past 25 Years." *World Bank Economic Review* 12(3): 503-526.
- Moghaddasi, R. 2009. "Price Transmission in Agricultural Markets: An Iranian Experience." *American-Eurasian Journal of Agriculture and Environmental Science* 6(1): 70-75.
- Mundlak, Y. and D. Larson. 1992. "On the Transmission of World Agricultural Prices." *World Bank Economic Review* 6(3): 399-422.
- Ortiz, I., J. Chai, and M. Cummins. 2011. "Escalating Food Prices: The Threat to Poor Households and Policies to Safeguard a Recovery for All." *Social and Economic Policy Working Paper*. New York: United Nations Children's Fund
- Peltzman, S. 2000. "Prices rise faster than they fall." *Journal of Political Economy* 108(3): 466-502.
- Quiroz, J. and R. Soto. 1995. *International Price Signals in Agricultural Prices: Do Governments Care?* Washington, DC: GERENS and ILADES/Georgetown University..
- Sharma, R. 2003. "The Transmission of World Price Signals: Concepts, Issues, and Some Evidence from Asian Cereal Markets." In *Agricultural Trade and Poverty: Making Policy Analysis Count*, pp. 119-139. Paris: Organisation for Economic Co-operation and Development.

- Vavra, P. and B.K. Goodwin. 2005. "Analysis of Price Transmission Along the Food Chain." *OECD Food, Agriculture and Fisheries Papers* 3. Paris: Organisation of Economic Cooperation and Development.
- Walsh, J.P. 2011. "Reconsidering the Role of Food Prices in Inflation." *IMF Working Paper* WP/11/71. Washington DC: International Monetary Fund.
- World Bank. 2011a. *Middle East and North Africa: Facing Challenges and Opportunities*. Economic Developments and Prospects Report, May 2011.
- World Bank. 2011b. *Middle East and North Africa: Investing for Growth and Jobs*. Economic Developments and Prospects Report, September 2011.
- World Bank, 2012a. *Food Price Watch*. Washington DC.
- World Bank, 2012b. *The Grain Chain: Food Security and Managing Wheat Imports in Arab Countries*. World Bank. Processed.
- Zurayk, R. 2011. *Food, Farming, and Freedom: Sowing the Arab Spring*. Charlottesville, VA: Just World Books.

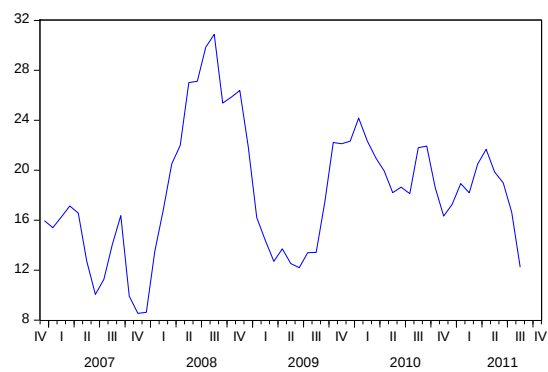
Annex

Annex Figure 1a. Food Inflation by Country, 2006:12-2011:10 (% , year-on-year)

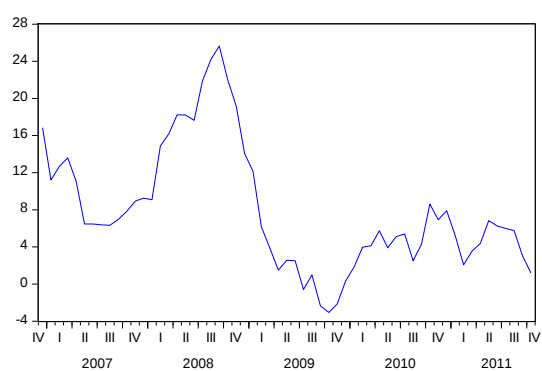
Djibouti



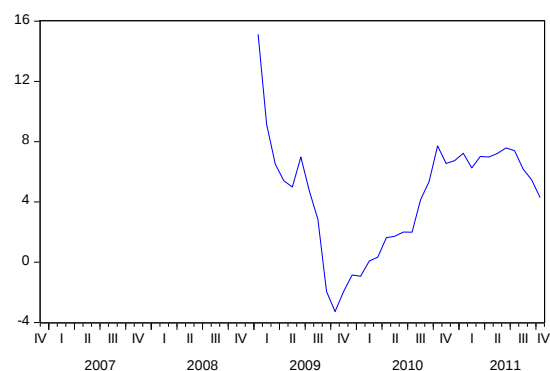
Egypt



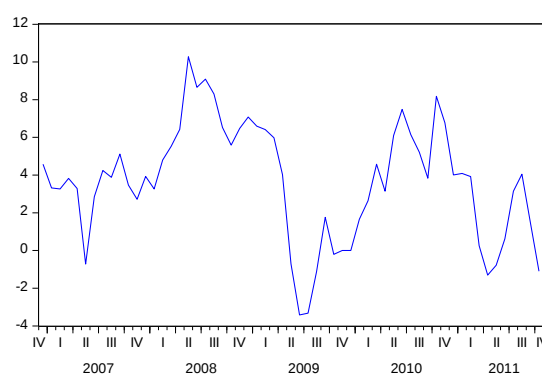
Jordan



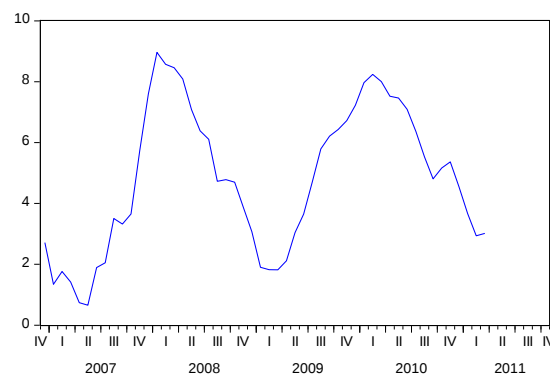
Lebanon



Morocco



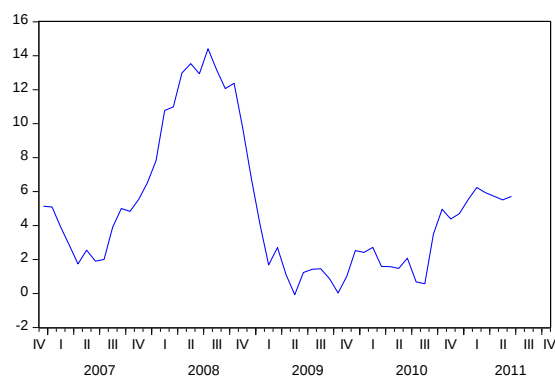
Tunisia



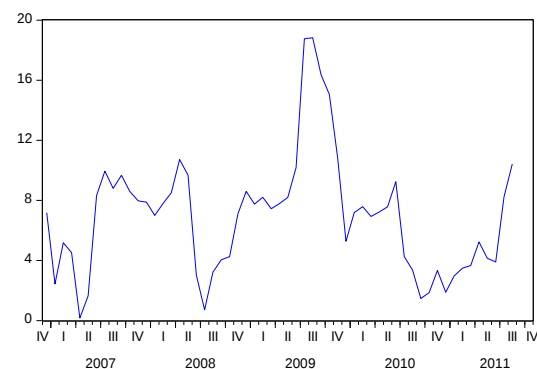
Source: National Agencies, ILO and World Bank.

Annex Figure 1b. Food Inflation by Country, 2006:12-2011:10 (% , year-on-year)

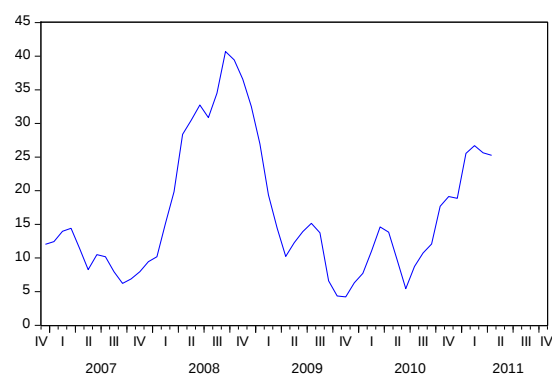
West Bank and Gaza



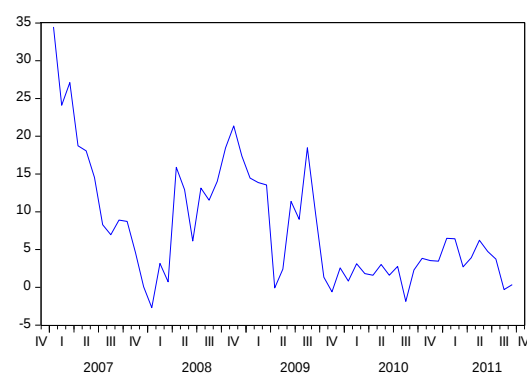
Algeria



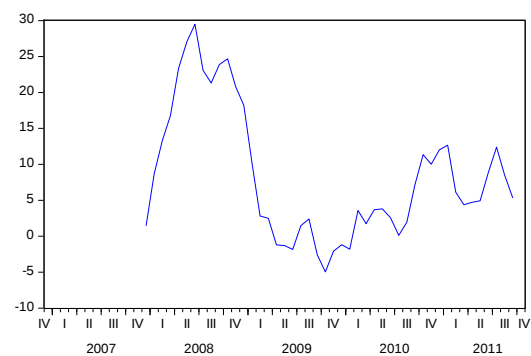
Iran



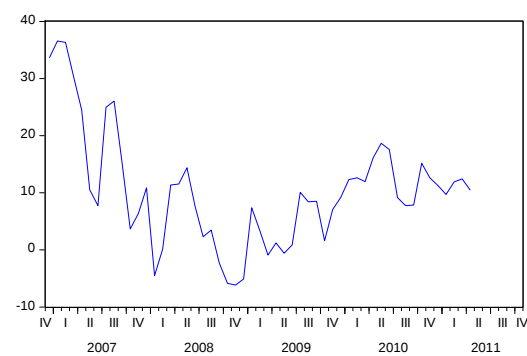
Iraq



Syria



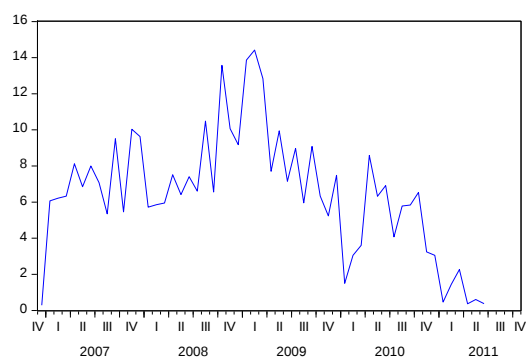
Yemen



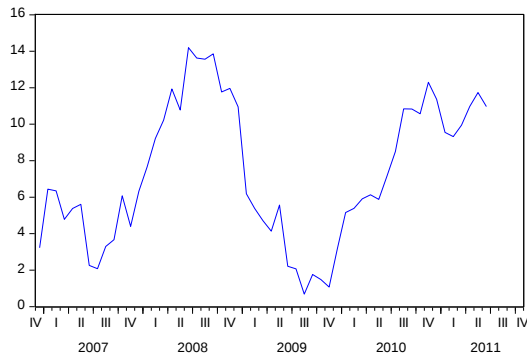
Source: National Agencies, ILO and World Bank.

Annex Figure 1c. Food Inflation by Country, 2006:12-2011:10 (% , year-on-year)

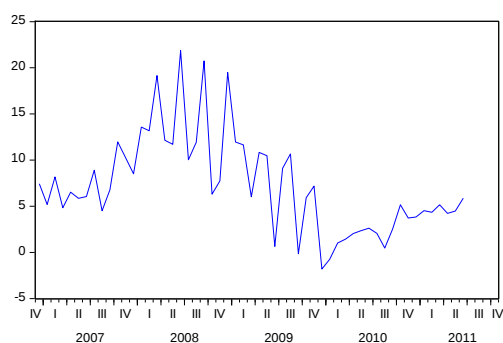
Bahrain



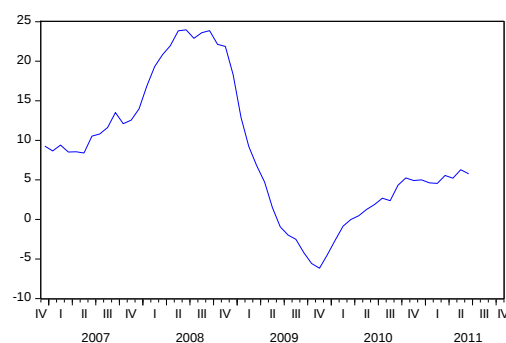
Kuwait



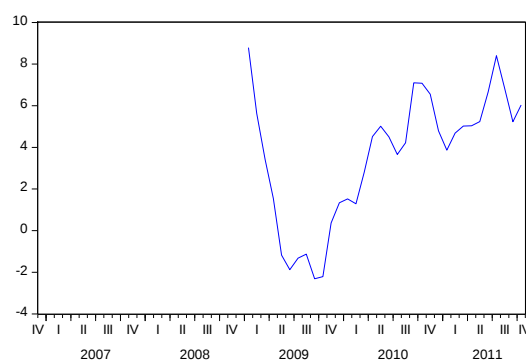
Qatar



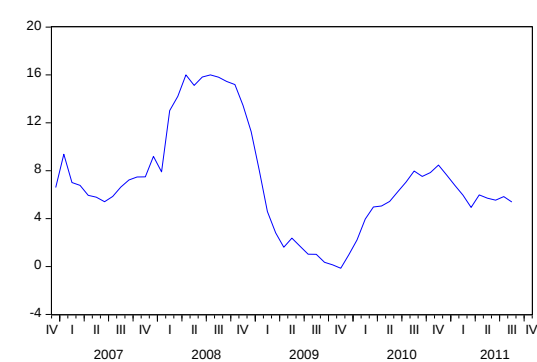
Oman



UAE



Saudi Arabia



Source: National Agencies, ILO and World Bank.