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Anna D'Souza

Economic
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July 2011

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Recommended citation format for this publication:

D'Souza, Anna, *Wheat Flour Price Shocks and Household Food Security in Afghanistan,* ERR-121, U.S. Department of Agriculture, Economic Research Service, July 2011.

Photos: Bread in window and man with vegetable cart in Afghanistan, used by permission of Dean Jolliffe, World Bank; background photo: wheat fields in Afghanistan, Shutterstock.

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A Report from the Economic Research Service

www.ers.usda.gov

Wheat Flour Price Shocks and Household Food Security in Afghanistan

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Abstract

To investigate the impact of rising staple food prices on household food security, we use a unique nationally representative household survey from Afghanistan, one of the world's poorest, most food-insecure countries. The econometric framework allows us to control for household, district, and province factors to isolate the effects of the 2008 sudden rise in wheat flour prices on several measures of household well-being related to food security. The results show large declines in food consumption and dietary diversity, but smaller declines in calories consumed. The evidence suggests that households choose to trade off quality for quantity, as they moved toward staple foods and away from micronutrient-rich foods, such as meat and vegetables. Additionally, for urban areas, the evidence suggests that wheat is a Giffen good; that is, as the price of wheat flour increases, demand for wheat products also increases. These findings may provide useful information for domestic and international policymakers and development agencies as they continue to confront the challenges of improving food security in this conflict-affected country.

Keywords: food security, high food prices, nutrition, poverty, Afghanistan

Acknowledgments

The author is grateful to Dean Jolliffe, World Bank, and to the Government of Afghanistan's Central Statistics Organization for granting access to the data for this research as background for poverty assessment done in conjunction with the World Bank. The author also wishes to thank ERS colleagues Cheryl Christensen, Mark Nord, John Pender, and Shahla Shapouri as well as seminar participants at ERS and at the 2010 Agricultural and Applied Economics Association Annual Meeting for comments. This report draws on research first presented as a selected paper, coauthored with Dean Jolliffe, at the 2010 AAEA Annual Meeting. Thanks also to our editor, Priscilla Smith, and our designer, Wynnice Pointer-Napper.

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Summary

What Is the Issue?

With a long history of political instability and conflict, as well as weak infrastructure and mountainous terrain, Afghanistan is particularly vulnerable to economic and natural shocks. During the 2007-08 period of high global food prices, the country experienced rapid increases in the prices of staple foods and other commodities due to a confluence of international and domestic factors. For households that spend the majority of their budgets on food, the high prices led to a severe erosion of purchasing power, disproportionally affecting poor households. In this study, we investigate how increases in wheat flour prices affect measures of household well-being associated with food security in Afghanistan. Identifying food-insecure populations and their coping mechanisms can help national and local governments and aid agencies working in Afghanistan in designing interventions and responding to local needs during future periods of high food prices.

What Were the Study Findings?

- Afghan households coped with the sudden rise in food prices by cutting back on overall food consumption and, to a lesser extent, on calories consumed.
- Households were able to buffer the effects of the wheat flour price shocks on calories consumed by changing the composition of their diets, moving away from micronutrient-rich foods, such as meat, fruits, and vegetables, toward grains.
- The decline in household food security was felt across both rural and urban areas. Urban households made changes that led to large declines in food consumption, but were able to maintain calories by greatly reducing the diversity of their diets and buying cheaper foods. Rural households made changes that led to smaller declines in their food consumption and in the variety of foods they consumed, but relatively larger declines in calories.
- As the price of wheat flour increased, demand for wheat products was relatively steady in rural areas, but rose in urban areas.

The results of this study may be used to inform current policy discussions on food security within Afghanistan and, more generally, within the international development community. The dearth of data and analysis available on consumption patterns and nutrition in Afghanistan poses challenges to political leaders, lawmakers, and humanitarian organizations interested in creating programs and policies to alleviate poverty and food insecurity. Such analysis is particularly crucial in areas of ongoing conflict, which are susceptible to shocks but for which high-quality quantitative data are rare.

How Was the Study Conducted?

We used a unique cross-sectional, nationally representative survey collected by the Government of Afghanistan prior to and during the 2007-08 period of high food and commodity price inflation. The 2007-08 National Risk and

Vulnerability Assessment (NRVA) is a sample of over 20,000 households from all 34 provinces of Afghanistan. It was the first nationally representative household survey in Afghanistan conducted across a 13-month time period and designed to account for seasonal variations in consumption.

The most important implication of the design is that the NRVA provides a comprehensive and representative portrayal of consumption patterns prior to and after the onset of the food price shock, allowing us to calculate measures related to household food security and providing substantial variation in prices for the analysis. Using the household and price data, an ordinary least squares model was used to estimate changes in household well-being related to food security that result from increases in the price of wheat flour, controlling for household and environmental factors.

Introduction

The case of Afghanistan during the 2007-08 period of high food price inflation is used to illustrate the impact of staple food price increases on household food security. Years of political instability and war have led to high rates of poverty and food insecurity in this landlocked nation.[1] From 2007 to 2008, the average price of wheat flour, the staple food, increased by over 100 percent in Afghanistan; we examine the resulting changes in several measures of household well-being related to food security. We also examine differences in the impact of the price shock across households based on location and based on whether a household owned and/or operated agricultural land.

The USDA defines food security as "access by all people at all times to enough food for an active, healthy life" (Nord et al., 2010, p. 2). The United Nations Food and Agriculture Organization uses the following definition: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (UN-FAO, 2006, p. 1). These broad definitions have been linked to four main dimensions: availability, access, utilization, and stability (UN-FAO, 2006). Availability refers to the physical existence of food, which relates to production, stocks, and trade. Access refers to a household's ability to obtain food, which depends on income, prices, and distance to local food markets. Utilization refers to an individual's ability to process nutrients and energy from food, which depends on many factors including dietary diversity and nutrient absorption, intrahousehold allocation of food, and hygienic preparation. The last dimension refers to the stability of the other three dimensions over time.

In this analysis, we concentrate on two dimensions of food security: access and utilization. We use two measures of a household's access to food—the real value of monthly per capita food consumption and per capita daily calorie availability.[2] We also use two measures related to utilization—household dietary diversity and the availability of protein (a key macronutrient).

The relationship between these measures and rising food prices is examined using a unique cross-sectional, nationally representative survey collected by the Government of Afghanistan prior to and during the 2007-08 period of high food prices. The data come from the 2007-08 National Risk and Vulnerability Assessment (NRVA), a sample of over 20,000 households from all 34 provinces of Afghanistan.[3] It is the first nationally representative household survey in Afghanistan conducted across a 13-month time period. It was designed to account for seasonal variations in consumption and well-being and is therefore seasonally representative. The most important feature of the design for this analysis is that the NRVA provides a comprehensive and representative portrayal of consumption patterns prior to and after the onset of the food price shock, allowing us to calculate measures related to household food security and providing substantial variation in prices for the analysis.

From August 2007 to September 2008, the consumer food price index in Afghanistan increased by 40 percent. While the average nominal monetary value of household food consumption remained roughly constant throughout

[1]According to Shapouri et al. (2009), in 2008 Afghanistan had a nutrition gap—the difference between available food and food needed to support a 2,100 per capita calorie intake—of 2 million tons. Only North Korea was estimated to have a larger nutrition gap in that year.

[2]The real value of monthly per capita food consumption is the monetary value of the food acquired by the household—per capita per month—after the value has been deflated using a price index that takes into account geographic and seasonal differences in prices. Calorie availability refers to the calories associated with food acquired by a household; it does not measure actual intake levels.

[3]The Government of Afghanistan has published initial findings in the *National Risk and Vulnerability Assessment 2007-08: a profile of Afghanistan* (2009). The report is being used to monitor progress toward the United Nations Millennium Development Goals (MDG). The reduction of hunger—part of MDG1—is a priority for the Government of Afghanistan and is a target under the Economic and Social Development Pillar of the Afghanistan National Development Strategy (IMF, 2008).

the year, the average real (deflated) monetary value dropped from 1,200 Afghani (the Afghan currency) in fall 2007 to 798 Afghani in summer 2008, reflecting a large decline in household well-being. In other words, the Afghan households surveyed spent approximately the same amount of Afghanis on food during each quarter of the survey, but due to the price increases, the money allowed them to purchase less and less food over the year.[4] The decline in well-being is further reflected in the large increase in the percentage of households with per capita daily calorie availability less than 2,100 calories (commonly used minimum daily energy requirements); over the survey year, this measure increased by 10 percentage points to a striking 34 percent.

[4]Nominal values refer to the actual amount of money spent on food acquired; real or deflated values refer to values that have been adjusted using a price index that takes into account differences in prices over time and across regions so that one gets a sense of how much less food households are able to purchase as a result of the price increases.

Identifying populations who are food insecure or who are vulnerable to food insecurity is an important step in designing well-targeted short-term and long-term interventions (Barrett, 2010). Moreover, declines in overall food security can have potentially serious implications. In particular, low levels of dietary diversity have been statistically linked to poor diet quality and inadequate nutrient availability (Arimond and Ruel, 2004). Micronutrient deficiencies have been linked to multiple negative outcomes for children, as well as adults; these include impaired cognitive development, physical and mental disabilities, child and maternal deaths, and lower productivity (UNICEF/ Micronutrient Initiative, 2009).[5] Young children, lactating and pregnant women, and the chronically ill are particularly susceptible to decreases in nutrient intakes due to their high nutrient requirements (UN-WFP and UNICEF, 2008). Moreover, undernutrition is the leading cause of child mortality worldwide (Caulfield et al., 2004).

[5]See also Grantham-McGregor et al. (2001) for a review of studies on iron deficiency and childhood cognitive development.

This report complements recent studies on the impact of food price shocks on household well-being. The majority of recent studies use household survey data from preshock periods to simulate the short-run effects of price increases on poverty.[6] Ivanic and Martin (2008) and Robles and Torero (2010) analyze data from several low-income countries and find that on average food price shocks increase urban poverty rates more than rural poverty rates. Ul Haq et al. (2008) find similar results using data from Afghanistan's neighboring country of Pakistan.

[6]See Ruel et al. (2009) for a detailed review of the literature on the effects of economic crises on household well-being.

Bouis et al. (2011) examine consumption patterns of rural households in Bangladesh. They find that a 50-percent increase in the price of staple foods would lead to a 10-percent decrease in the quantity of staple foods consumed. And a 50-percent increase in the price of all foods would lead to a 15-percent reduction in energy intake (calories), a 30-percent reduction in iron intake, and a marked shift in expenditures from nonstaples to staples.

In an exception to these simulation studies, Jensen and Miller (2008) use a panel of 1,300 urban poor households in two Chinese provinces to assess the nutritional effects of food price increases. The data were collected between April and December 2006. They find a limited nutritional impact of the price increases, as measured by calorie intake. The authors argue that this is due in part to government policies that stabilized grain prices and in part to household substitution toward cheaper foods.

More recently, de Brauw (2011) provides more direct evidence on the link between food price increases and child health. He examines the impact

of high food prices on child anthropometric statistics using data from El Salvador. He finds that food price inflation is associated with a decline in height-for-age scores in children under 3 years old.

This study is unique in that it provides econometric evidence from actual household data collected during a period of high food prices in a conflict-affected country. Our study informs current policy discussions within Afghanistan and, more generally, within the international development community. Although this study provides valuable insight into the effect of sudden high food prices on an economically vulnerable population, there remains a dearth of data and analysis available on consumption and nutrition in Afghanistan. This dearth poses acute challenges to political leaders, lawmakers, and humanitarian organizations interested in creating programs and policies to alleviate poverty and mitigate food insecurity. These new survey data provide a unique opportunity to calculate indicators of consumption and nutrition and to analyze changes in these indicators over time. Moreover, understanding household coping mechanisms better enables national and local governments to respond to local needs. Such analysis is particularly crucial in conflict areas, which may be most susceptible to food price shocks, but which usually have little quantitative data. The findings may provide valuable information to policymakers and humanitarian agencies as they consider strategies to respond to future periods of high food prices.

Background

Over the past decade, the Afghan economy has experienced strong growth, with real gross domestic product (GDP) growth averaging approximately 10.8 percent per year between 2003 and 2009. But after decades of war and political instability, landlocked Afghanistan remains one of the world's least developed nations and one of the poorest countries in its region. GDP per capita was $350 in 2007 and $457 in 2008, in current U.S. dollars (IMF, 2009). In a country like Afghanistan, though, where the drug economy is large, the official National Income Accounting data are likely to significantly understate GDP. The United Nations Office on Drugs and Crime estimates that in 2007 the farmgate value of opium cultivation was US$1 billion, but this dropped to US$730 million in 2008 (UNODC, 2008). The potential export value in 2007 of opium, morphine, and heroin at border prices in neighboring countries was $4 billion (or, in per capita terms, about $160).

Based on the broader set of development indicators used in the United Nations Development Program (UNDP) human development index (e.g., health, education, living standards) Afghanistan ranks 181 out of 182 countries (UNDP, 2009). And Afghanistan has the highest prevalence of stunting (reduced growth primarily due to malnutrition in childhood) in the world among children under 5 years old (UNICEF, 2009, p.11).[7]

[7]Estimates are based on data from the 2004 National Nutrition Survey.

The Afghan economy is largely based on agriculture; major crops include wheat, rice, maize (corn), barley, vegetables, fruits, and nuts. Approximately 70 percent of cultivated crop area is devoted to wheat and about 15 percent is devoted to rice, barley, and maize (Chabot and Dorosh, 2007). Due to large fluctuations in weather and insecurity, however, wheat production is highly volatile and the country is dependent on its trading partners to meet any shortfalls. In fact, Afghan wheat production has been estimated to be over five times as variable as that of its neighbor, Pakistan (Persaud, 2010). Pakistan is the major supplier of wheat to Afghanistan, mostly in the form of flour, due to close historical ties and a shared 1,600-kilometer border. Estimates of Pakistan's share of the Afghan wheat and flour import market range from 59 percent (Chabot and Dorosh, 2007) to 79 percent (Maletta, 2004).

According to the United Nations World Food Programme, Afghanistan is among the world's most vulnerable countries in terms of absorbing food and fuel price shocks; such countries are heavily dependent on food and fuel imports and have large populations of poor people who spend significant shares of their income on food and often live in a state characterized by food insecurity (Sanogo, 2009). Also, mountainous terrain and poor infrastructure, coupled with weak governance and ongoing conflict, have limited the Afghanistan Government's ability to manage its food distribution and supply networks.

Seasonality also plays an important role in food security in Afghanistan. Temperatures vary dramatically across seasons, with hot summers and frigid winters; and the climate in the highlands varies with elevation. In many cases, severe winter conditions affect transportation, and in high mountainous areas roads are often blocked throughout the winter due to heavy snow accumulation.

International prices of food commodities increased substantially in 2007 and rapidly in early 2008, peaking around May-July 2008. During this period,

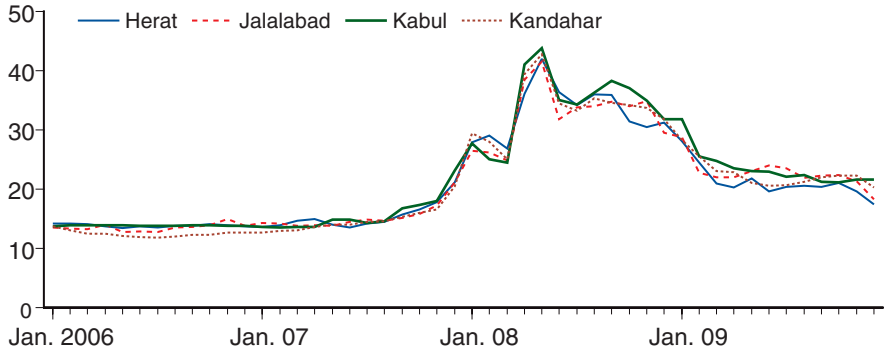
Afghanistan experienced several shocks that led to a disruption of its food supply network, causing prices to soar throughout the country. Due to drought and early snow melt, the 2008 wheat harvest of 1.5 million metric tons was the worst harvest since 2000 (Persaud, 2010). (The harvest period typically falls in the summer months: May-August.) The price impact of the large shortfall in wheat production was magnified by an export ban in Pakistan and rising international food prices. In February 2008, the Government of Afghanistan eliminated import tariffs on wheat and wheat flour (tariffs had been set at 2.5 percent), but due to export bans in Pakistan, Iran, and Kazakhstan, there was little downward effect on prices. Between fall 2007 and summer 2008, the prices of domestic wheat and domestic wheat flour increased by over 100 percent. Figure 1 displays the retail price of wheat flour in four major markets from January 2006 to December 2009.

Total inflation was largely driven by the surge in food prices. Figure 2 presents the Government of Afghanistan's consumer price indices (CPI) for food and nonfood items based on prices from six major urban areas from 2006 to 2009. During the NRVA survey timeframe (August 2007-September 2008), the urban food CPI increased by nearly 60 percent, while the nonfood CPI increased by only 10 percent. Our calculations using the NRVA district price survey data produced similar results. We find a 40-percent national increase in food prices, with a 60-percent increase in urban areas.

Figure 1

Retail wheat flour prices in Afghanistan, 2006-09

Afghani per kilogram

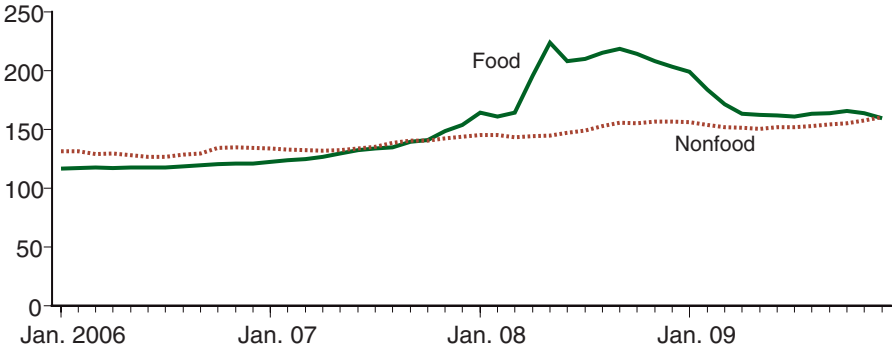


Source: UN Food and Agriculture Organization, Global Information and Early Warning System.

Figure 2

Consumer Price Index in Afghanistan, 2006-09

March 2004 = 100



Source: Government of Afghanistan, Central Statistics Organization.

Household and Price Data

The primary data come from the 2007-08 National Risk and Vulnerability Assessment (NRVA), conducted by the Government of Afghanistan's Central Statistics Organization and the Ministry of Rural Rehabilitation and Development. The survey was administered between August 2007 and September 2008 and covered over 20,000 households (about 150,000 individuals) in 2,572 communities in all 34 provinces of Afghanistan.

The survey was stratified spatially and temporally to ensure that the samples for each quarter reflect the overall composition of the country. The stratification over time is critical to identifying the effects of the wheat flour price increases since the econometric identification hinges on having nationally representative price and household data before and after the price shock. (See appendix 1 for details on survey design.)

The yearlong fieldwork allowed coverage of insecure areas. It is extremely difficult to obtain high-quality household data in conflict-affected countries. The NRVA was able to achieve this task through a process of informally securing permission from local leaders in insecure areas, as well as using a flexible design for field work. In particular, when an area (specifically, a primary sampling unit) was considered too dangerous to interview at the scheduled time, it would not be replaced immediately, but would be reconsidered at a later date within the quarter.

The household data include extensive information on consumption, expenditures, income, assets and credit, and housing characteristics, as well as health and education. A key component is the food consumption section, which asks female respondents about the frequency and amount of consumption of 91 food items over the previous week. The broad coverage of foods, including seasonal varieties, allows for better calculation of calorie and nutrient availability than the smaller number of food items typically included in household surveys.

Another key component of the NRVA is the district market price survey. Data were collected on the prevailing prices of the food items included in the consumption section, as well as domestic and imported grains and fuel. Given Afghanistan's mountainous terrain and poor infrastructure, transportation costs most likely vary greatly across the country, and in particular in remote and insecure areas. In order to create an accurate measure of the value of food consumption, it is necessary to obtain data on prices that households face in their local markets.

The final sample for our analysis consists of 20,491 households in 394 districts in 34 Afghan provinces. Approximately 80 percent of households reside in rural areas; of these households, 6.3 percent are Kuchi or nomadic pastoralists. On average, households have 8.6 members living in about 3.6 rooms, or, in the case of Kuchi populations, tents. The typical household consists of 2.1 men, 2 females, and 4.5 children (under 16). Heads of households are about 45 years old, mostly illiterate, and almost all married.

We create several measures of household well-being associated with food security: real value of monthly per capita food consumption (a key factor used in the assessment of poverty); per capita daily calorie availability; per capita daily

protein availability; and household dietary diversity. We also examine shares of calories and expenditures devoted to various food groups. Here we provide a brief description of the variables used in the analysis. (See appendix 1 for details.)

To calculate the value of total monthly food consumption (in Afghani), we map district price data to quantity data from the household consumption module. Households are asked for the quantity of foods consumed over the past 7 days; these quantities are multiplied by 4.2 to get monthly values. The survey includes foods consumed, regardless of their source (i.e., food bought on the market as well as food produced or obtained through other methods such as food aid and gifts).[8] We convert nominal values to real values using a consumer food price index based on NRVA price data.[9]

Daily per capita calorie availability (in kilocalories) and protein availability (in grams) are calculated by dividing daily total household calorie and protein availability by the effective household size. The effective number of household members incorporates guests eating meals within the home.[10] Food quantities were converted to kilocalories and nutrients using the United Nations Food and Agriculture Organization (FAO) Food Composition Tables for the Near East.[11]

To measure household dietary diversity, we use the food consumption score (FCS), an indicator developed by the UN World Food Programme (WFP).[12] The FCS has been used in field assessments to gauge short-term changes in food security during periods of high food-price inflation (Sanogo, 2009). It is constructed by taking the weighted sum of the frequencies with which households consumed foods within eight food groups over the previous week.[13] The food groups include staples, pulses, vegetables, fruit, meat/fish, milk/dairy, sugar, and oil/fat. The national average is 61. In a country like Afghanistan, where most households consume staples and oil every day, the WFP uses a cutoff of 48 for an acceptable diet. Under this categorization, approximately 80 percent of the population has acceptable diets; however recent work suggests that the cutoff points for the FCS classifications may be too low (Weismann et al., 2009).

Table 1 presents weighted estimates for key variables for the nation, by location and based on whether a household owned and/or operated agricultural land (referred to hereafter as "agricultural household"). In the empirical work, we explore differences between rural and urban areas, as well as differences between households based on access to agricultural land. These categorizations address theoretical distinctions drawn in the literature. (See section, "Estimating the Differential Impact of Wheat Flour Price Increases," in the chapter "Estimating Changes in Household Well-Being as a Result of Wheat Flour Price Increases.") Average monthly nominal per capita total consumption is 1,925 Afghani. About 60 percent of total consumption is spent on food. (By contrast, U.S. households spend about 13 percent of disposable income on food.[14])

As in many developing countries, poverty in Afghanistan is more prevalent in rural areas (World Bank, 2007). Total monthly per capita consumption in rural areas is 44 percent lower than that in urban areas; also rural households spend a larger share (63 percent) of their total consumption on food than do urban households (44 percent). Although average per capita calorie availability is similar across rural and urban areas, rural households have lower

[8]Ideally one would use shadow prices to calculate the value of food produced at home. The survey instrument does not provide enough information to create shadow prices; therefore we use market prices, as is common in the literature. Since not all food items were available in all district markets at all times of the year, we impute the missing elements to obtain a complete price matrix.

[9]We use a Laspeyres price index estimated by quarter for each region. Real consumption is relative to the chosen base: urban areas in the Central region in Quarter 1. The capital, Kabul, is located in the Central region.

[10]Some studies use household size to calculate per capita amounts. In Afghanistan the custom of sharing meals with guests makes it important to account for guests eating meals from the household cooking pot. The effective household size also incorporates information on household members eating outside the home.

[11]Spices, water, and "other" foods do not contribute to total calories. USDA sources were used for a few items that were not available in the FAO tables.

[12]See Weismann et al. (2009) for an evaluation of the effectiveness of the food consumption score in measuring household food security. See World Food Programme (2008) for a general discussion of FCS analysis, as well as recent evidence from several developing countries.

[13]Weights for the food groups range from 0.5 to 4 based on nutrient density. Condiments receive 0 nutritional weight. Frequencies are truncated at 7 for each food group. The measure ranges from 0 to 112.

[14]U.S. Department of Labor, Bureau of Labor Statistics (2009) Available at http://www.bls.gov/news.release/cesan.nr0.htm/.

Table 1

Population statistics by area and household type

	National	Rural[1]	Urban[1]	Agricultural households[2]	Nonagricultural households[2]
Nominal value of monthly per capita total consumption (*Afghani*)	1,925.58	1,675.54	2,931.47	1,752.19	2,159.44
	(1,158.22)	(822.96)	(1,658.50)	(934.17)	(1,370.65)
Nominal value of monthly per capita food consumption (*Afghani*)	1,157.57	1,104.57	1,370.82	1,133.96	1,189.42
	(583.11)	(532.26)	(715.17)	(528.39)	(648.32)
Per capita daily calorie availability (*kilocalories*)	2,600.71	2,577.04	2,695.95	2,586.81	2,619.47
	(973.68)	(952.85)	(1,048.05)	(976.91)	(969.05)
Per capita daily protein availability (*grams*)	141.97	133.67	175.34	140.20	144.35
	(298.27)	(282.72)	(352.08)	(290.08)	(308.98)
Food consumption score	60.95	59.58	66.46	61.59	60.07
	(20.03)	(19.57)	(20.89)	(19.48)	(20.71)
Price of domestic wheat flour (*Afghani per kg*)	25.32	25.52	24.50	25.77	24.70
	(7.40)	(7.57)	(6.60)	(7.57)	(7.12)
Price of vegetable oil (*Afghani per kg*)	4.38	4.39	4.32	4.40	4.36
	(0.18)	(0.18)	(0.16)	(0.18)	(0.18)
Price of domestic rice (*Afghani per kg*)	3.72	3.72	3.69	3.73	3.70
	(0.27)	(0.28)	(0.24)	(0.28)	(0.27)
Price of lamb (*Afghani per kg*)	5.21	5.19	5.27	5.20	5.22
	(0.13)	(0.14)	(0.09)	(0.13)	(0.13)
Price of milk (*Afghani per liter*)	3.27	3.25	3.34	3.25	3.29
	(0.22)	(0.22)	(0.24)	(0.23)	(0.22)
Price of kerosene (*Afghani per liter*)	3.86	3.87	3.84	3.88	3.84
	(0.14)	(0.14)	(0.13)	(0.14)	(0.14)
Age of household head	44.87	44.43	46.63	45.37	44.19
	(13.78)	(13.73)	(13.87)	(13.68)	(13.89)
Dummy for married household heads	0.95	0.95	0.94	0.95	0.94
Dummy for literate household heads	0.32	0.27	0.52	0.30	0.34
Dummy for plateau areas	0.22	0.26	0.07	0.27	0.16
Dummy for mountainous areas	0.39	0.48	0.04	0.49	0.27
Total observations	20,491	16,411	4,080	11,768	8,723
Percentage of full sample	100	80	20	57	43

Note: Estimates are population-weighted means, with standard deviations in parentheses.

[1]Statistical tests of differences in means between rural and urban households show significant differences at a 5-percent level of significance for all variables, with the exceptions of per capita protein availability and per capita calories availability (which is significant at 10 percent).

[2]Statistical tests of differences in means between agricultural and nonagricultural households show significant differences at a 5-percent level of significance for all variables, with the exception of the price of lamb.

Source: 2007-08 National Risk and Vulnerability Assessment.

levels of dietary diversity and protein availability, suggesting varying degrees of micronutrient intake.[15] The rural-urban differences are also observed—though to a lesser degree—between agricultural and nonagricultural households. Approximately 67 percent of rural households and 15 percent of urban households have access to agricultural land. And the vast majority (95 percent) of agricultural households is situated in rural areas.

In the empirical analysis, we include the prices of milk, lamb, rice (domestic), and vegetable oil, as well as the price of kerosene, which is commonly used in cooking. These four food products plus wheat flour make up 80 percent of monthly household expenditure for the relatively poor (20th to 50th percentile of the total consumption distribution). The prices of food and fuel, while statistically different across subpopulations, do not differ by more than 4 percent. The variation in prices over the survey year is driven largely by temporal differences, rather than spatial ones. For example, using ANOVA (analysis of variance analysis), we find that 75-85 percent of the total variation in wheat flour prices is explained by variation over the four quarters of the survey year; in contrast, approximately 5 percent of the total variation can be explained by variation at the province level.[16]

Table 2 displays key variables by quarter for the national sample. With the exception of lamb prices, we observe substantial increases in food and fuel prices. The price of wheat flour more than doubles at the national level, with an increase of 111 percent in rural areas and 80 percent in urban areas.

The repercussions of these price increases can be seen in the inflation-adjusted values of monthly per capita total consumption and food consumption; in contrast, the nominal values show little change.[17] The real value of

[15]Means of per capita calorie availability for rural and urban areas are not statistically different at the 5-percent level of significance.

[16]Prices are aggregated to the stratum level in order to mitigate potential measurement error in district-level prices. Strata are based on urban and rural designation within provinces.

[17]Quarter 1-Central region urban prices are used as the base for deflating nominal values.

Table 2
Population statistics by quarter for full sample

	Quarter 1 (Fall)	Quarter 2 (Winter)	Quarter 3 (Spring)	Quarter 4 (Summer)
Nominal value of per capita total consumption (*Afghani*)	2,017.79	1,902.86	1,876.92	1,914.64
Real value of per capita total consumption (*Afghani*)	2,022.00	1,718.27	1,519.12	1,477.56
Nominal value of per capita food consumption (*Afghani*)	1,196.98	1,123.25	1,129.01	1,182.97
Real value of per capita food consumption (*Afghani*)	1,201.19	961.26	789.41	797.60
Per capita daily calorie availability (*kilocalories*)	2,884.92	2,725.03	2,445.83	2,387.33
Per capita daily protein availability (*grams*)	188.08	219.80	91.60	74.74
Food consumption score	67.88	61.28	57.86	57.69
Price of domestic wheat flour (*Afghani per kg*)	16.16	20.51	30.19	33.05
Price of vegetable oil (*Afghani per kg*)	64.81	76.93	88.90	91.70
Price of domestic rice (*Afghani per kg*)	33.93	33.99	46.16	55.29
Price of lamb (*Afghani per kg*)	182.34	186.20	189.28	180.27
Price of milk (*Afghani per liter*)	23.44	25.66	27.23	30.75
Price of kerosene (*Afghani per liter*)	43.15	45.78	46.83	55.48

Note: Estimates are population-weighted means. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work.

Source: 2007-08 National Risk and Vulnerability Assessment.

monthly per capita food consumption drops by a third, from about 1,200 Afghani to about 800 Afghani. Calorie and protein availability also decline, as does the average level of dietary diversity.

The majority of the Afghan diet is comprised of grains and over 10 percent of calories come from oil or fat, patterns that are typical of low-income countries (UN-WFP, 2008; Bouis et al., 2011). Grains represent 48 percent of food expenditure and 70 percent of calories consumed for the national sample. Wheat is the main staple, with few close substitutes. Most wheat is consumed in the form of naan, local unleavened bread that is prepared by households after purchasing refined wheat flour or whole wheat (Chabot and Dorosh, 2007). Annual per capita wheat consumption is estimated to be about 160 kilograms (FEWSNET, 2007). And the data show that wheat flour contributes 54 percent of total calories to the Afghan diet.

Table 3 displays calorie and food expenditure shares. Urban households devote fewer resources to grains and dairy and more resources to the other food groups than do rural households; shares of total calories follow a similar pattern. The distinctions between agricultural and nonagricultural households are generally similar to those of rural and urban households.

Table 3
Calorie and food expenditure composition

	National	Rural[1]	Urban[1]	Agricultural households[2]	Nonagricultural households[2]
			Calorie shares		
Grain	0.702	0.712	0.663	0.708	0.695
Meat/fish	0.023	0.023	0.022	0.023	0.022
Dairy	0.053	0.058	0.032	0.062	0.041
Oil/fat	0.117	0.110	0.147	0.107	0.131
Vegetable	0.037	0.035	0.047	0.034	0.041
Fruit	0.020	0.017	0.032	0.018	0.022
Sugar	0.046	0.044	0.053	0.045	0.047
			Expenditure shares		
Grain	0.476	0.484	0.446	0.476	0.477
Meat/fish	0.119	0.119	0.120	0.122	0.116
Dairy	0.098	0.108	0.060	0.114	0.077
Oil/fat	0.078	0.078	0.080	0.074	0.083
Vegetable	0.087	0.080	0.116	0.079	0.099
Fruit	0.060	0.051	0.097	0.055	0.067
Sugar	0.036	0.036	0.038	0.036	0.036

Note: Estimates are population-weighted means.

[1]Statistical tests of differences in means between rural and urban households show significant differences at a 1-percent level of significance for all calorie and expenditure shares, with the exception of meat/fish.

[2]Statistical tests of differences in means between agricultural and nonagricultural households show significant differences at a 1-percent level of significance for all calorie shares and all expenditure shares, with the exceptions of grain and sugar.

Source: 2007-08 National Risk and Vulnerability Assessment.

Estimating Changes in Household Well-Being as a Result of Wheat Flour Price Increases

The expectation is that the large increases in wheat flour prices will be associated with reductions in well-being in terms of the value of food consumption, calorie availability, and dietary diversity. In terms of per capita protein availability, it is not clear whether the income or substitution effects will dominate, and thus if the effects of the price increases will be positive or negative. (See box, "The Paradox of Giffen Goods," for a discussion of income and substitution effects.) It is also expected that households will change the composition of their diets, with a general movement toward cheaper, lower quality foods, which should be reflected in the changes in expenditure and calorie shares devoted to various food groups.

The econometric analysis uses ordinary least squares (OLS) estimation techniques.[18] The basic specification is as follows:

$$(1) \quad log(x_h) = \beta_0 + \beta_1\, log(price\ wheat\ flour_{apq}) + \theta log\ (prices_{apq}) + \alpha HH_h + \delta DIST_{dq} + \prod_p + \varepsilon_h$$

where x is a measure of household well-being for household h. Prices denotes a vector of commodity prices for area a (urban or rural), province p, and quarter q. *HH* denotes household-level variables; *DIST* denotes district-level variables for district d and $\prod$ denotes province dummy variables.[19] These control variables are described in detail below. ε denotes a Huber-White robust error term, clustered to take into account the survey stratification.

The coefficient of interest is β_1, which can be interpreted as the price elasticity of the dependent variable with respect to changes in the price of domestic wheat flour.[20] It is not possible to identify separately the price increases due to high international food prices, the domestic drought, or normal patterns of seasonality; therefore the results should be interpreted as elasticities due to overall price changes.

We use the price of wheat flour since households often purchase wheat in the form of flour; the results are robust to using the prices of imported wheat flour, and domestic and imported wheat. Average prices are calculated for rural and urban areas within each province for each quarter in order to minimize potential biases caused by measurement error in prices at the district level.

Estimating the Differential Impact of Wheat Flour Price Increases

During the 2007-08 period of high food-price inflation, governments and international organizations emphasized the vulnerability of urban households, whose members often do not have means to produce their own food (UN-FAO, 2008). Urban households rarely have access to agricultural land and are thus unable to produce their own food from crops or animals, are more dependent on cash income, and are more likely to consume internationally traded staple foods than are rural households (Ruel et al., 2009). Also, as described earlier, several simulation studies have found that poverty rates increased disproportionately in urban areas as food prices rose rapidly.

[18]In this report, we use a reduced-form OLS estimation approach. However, price elasticities can also be estimated using a system of equations, such as the almost ideal demand system used in Banks et al. (1997). Alternatively, one can estimate the price elasticities using quantile regression estimation. OLS estimation provides an estimate of the partial derivative of the dependent variable with respect to wheat flour prices evaluated at the mean of the dependent variable. By contrast, quantile regression estimation allows the derivative to be estimated at various points of the distribution of the dependent variable. Such analysis is the subject of ongoing research, and may be useful for policymakers who are interested in the impact of price increases on more vulnerable households.

[19]A dummy variable refers to an indicator function that is equal to one when certain criteria are met, and equal to zero otherwise. In this case, a dummy variable is created for each province. For example, the dummy variable for Kabul province would equal one for all households that are located in the Kabul province and zero for all households that are located in other provinces.

[20]Price elasticity is defined as the percentage change in the dependent variable for a given percentage change in prices.

The Paradox of Giffen Goods

The concept of a Giffen good dates back to the *Principles of Economics*, by Alfred Marshall (1895), and is named after Robert Giffen (1837-1910), a Scottish statistician and economist. In contrast to the basic "Law of Demand," which states that quantity demanded decreases as price increases, for a Giffen good, quantity demanded increases as price increases. This paradox is driven by the fact that a Giffen good is an inferior good, rather than a normal good. Holding prices constant, as income increases, the demand for a normal good increases but the demand for an inferior good decreases. This characteristic defines the demand curve for a Giffen good through the income effect associated with the price increase. Specifically, the consumer response to a price increase can be decomposed into an income effect and a substitution effect. The income effect refers to the decrease in consumer purchasing power, which, in turn, increases the demand for inferior goods. The substitution effect refers to the change in the relative attractiveness of the good after its price increases; that is, consumers are induced to substitute away from the good whose price increased since it has become relatively more expensive. In the case of a Giffen good, the income effect is larger than the substitution effect; consumers feel poorer and so they purchase more of the inferior good despite the fact that it is relatively less attractive after the price increase. As a result, the demand curve for a Giffen good is upward sloping.

While the conventional example of the Irish potato blight has been discredited (Dwyer and Lindsay, 1984), recent research (Jensen and Miller, 2008) provides real-world evidence of Giffen goods. Jensen and Miller run a field experiment in China in which they provide and then take away subsidies to purchase staple foods. They find strong evidence that rice is a Giffen good among the urban poor in Hunan province. They find weaker evidence that wheat is a Giffen good among the urban poor in Gansu province. However, when looking at the subset of the population among whom such behavior is theorized to be more likely (i.e., poor households that are well off enough to consume more than just staples), they find stronger evidence that wheat is a Giffen good for some households in Gansu province.

Broadly, economic theory and empirical data suggest that urban or landless rural households are more adversely affected by increases in food prices than agricultural rural households are. More specifically, households can be categorized into net buyers and net sellers; the former depend on the market for food, while the latter produce enough food to consume as well as to sell on the market. When food prices increase, purchasing power declines for all households, however net sellers of food are able to benefit from higher selling prices and thus suffer a smaller decline in overall well-being due to the price shock. Since the survey does not include questions on quantities of food produced or sold on the market, we are unable to distinguish directly between net sellers and net buyers. Therefore, we use two proxies for a household's potential to be a net seller. As a broad categorization, we use a dummy for rural households, as most net sellers are situated in rural areas and, additionally, policymakers may be interested in knowing how households in different areas cope with price shocks. As a finer categorization, we use a dummy for access to agricultural land, defined as households that report owning or operating agricultural land. These households are the most likely to engage in home production of food and thus are potential net sellers of food.

To identify differences in the effects of price shocks across rural and urban areas, we add an interaction of the urban dummy and the log of wheat flour prices to the basic specification:

$$(2)\quad log(x_h) = \beta_0 + \beta_1\, log(price\ wheat\ flour_{apq}) + \beta_2[log\ (price\ wheat\ flour_{apq}) \; X\ urban_a] + (\theta log(prices_{apq}) + \alpha HH_h + \delta DIST_{dq} + \prod_p + \varepsilon_h$$

The effect of wheat flour prices on household well-being for rural households is β_1 and for urban households it is $\beta_1 + \beta_2$. The specification of agricultural and nonagricultural households is analogous; the urban dummy is simply replaced with the nonagricultural household dummy.

Control Variables

To isolate the effect of changes in wheat flour prices on household well-being, it is important to control for simultaneous price changes in other important commodities since household decisionmaking is based on relative prices. We include the average prices of milk, lamb, rice, vegetable oil, and kerosene. Average prices are calculated for rural and urban areas within each province for each quarter.

The household-level controls include the following: dummies for consumption quintiles (bottom quintile is excluded); age of household head; dummy for households in which heads are literate; dummy for households in which heads are married. The consumption quintile dummies are intended to proxy for socio-economic status; they are constructed based on real monthly per capita total consumption.[21] As a robustness test, described in appendix 2, household composition variables are included in the regression.

District-level variables include dummies for topography—plateau and mountainous areas (plains areas are excluded)—and a dummy for urban areas. In the regressions examining the differential effects by access to agricultural land, we include a dummy for nonagricultural households instead of the urban dummy; the results are robust to the simultaneous inclusion of both dummy variables. Lastly, we include province dummies to control for observable and unobservable time-invariant province-level factors that could confound the results, for example, differences in the degree of conflict and instability that are present throughout the survey year in certain provinces.

[21]Total household consumption (Afghani per month) consists of expenditures on food, nonfood, durables and rent, following guidelines in Deaton and Zaidi (2002). For nonfood items, we use a nonfood price index developed by the Afghanistan Central Statistics Organization; it accounts for temporal, but not spatial, differences in prices.

The Impact of Higher Wheat Flour Prices on Afghan Households

Increases in the price of wheat flour are associated with declines in several dimensions of well-being related to food security for Afghan households (table 4). A 1-percent increase in the price of domestic wheat flour is associated with a 0.20-percent decline in the real value of monthly per capita food consumption. Given that prices were observed to more than double from 2007 to 2008, the magnitude of this effect is large. The estimates based on calories show, however, that households were able to buffer the impact of the large shock in prices to their energy levels to a large extent. The calorie elasticity is less than half the size of the food consumption elasticity, with a decline in per capita daily calorie availability of 0.07 percent for the same 1-percent increase in prices. This relatively smaller effect on calories reflects changes in dietary composition. A 1-percent increase in the price of wheat flour is associated with a 0.10-percent decline in the food consumption score and a 0.25-percent decline in daily per capita protein availability.

The findings suggest that households were trading off quality for quantity. In particular, they shifted toward lower quality (less micronutrient-rich), cheaper foods, thus allowing them to acquire more food to maintain their calories—to the extent possible—in the face of large declines in purchasing power.

These findings are consistent with Bouis et al. (2011), who use demand estimation techniques to simulate changes in energy and nutrient intake in Bangladesh households resulting from an increase in food prices. Their results demonstrate that in the face of food price increases, expenditure on staple foods increases and expenditure on nonstaple foods decreases. Further, households are forced to sacrifice mineral and vitamins in order to maintain basic energy requirements.

The parameter estimates for the control variables mostly follow a logical pattern. Households with higher levels of overall consumption display higher levels of well-being as measured by the four dependent variables. Urban households, on average, are relatively worse off than rural households; this result is surprising since urban areas are usually richer than rural areas. As we will see below, once we account for differential price effects between these areas, the sign of the coefficient on the urban dummy variable becomes positive for three of the four dependent variables, suggesting that these initial coefficients on the urban dummy suffer from omitted variable bias. The coefficients on the price variables are not consistent across models for the four dependent variables, but, in most cases, the coefficients are negative, as we would expect.[22] The remaining control variables play a smaller role in explaining the dependent variables; most are statistically insignificant or are inconsistent in sign and magnitude across models.

Tables 5 and 6 display the coefficient of interest from regressions that examine the impact of higher prices on expenditure and calorie shares for seven food groups, respectively. The changes in expenditure shares are stark and are consistent with a story of substitution across food groups. Households moved away from higher quality, micronutrient-dense food groups toward grains.

[22]The price of kerosene is an exception; its coefficient is positive and statistically significant for three out of four key dependent variables. This result is counterintuitive and difficult to explain.

Table 4

The impact of higher food prices on household well-being

	Log real value of per capita monthly food consumption	Log per capita daily calorie availability	Log food consumption score	Log per capita daily protein availability
Log wheat flour price	-0.202***	-0.070***	-0.102***	-0.249***
	[0.021]	[0.020]	[0.024]	[0.069]
Urban	-0.163***	-0.153***	-0.043***	-0.181***
	[0.012]	[0.011]	[0.011]	[0.032]
Consumption quintile 2	0.345***	0.222***	0.165***	0.290***
	[0.008]	[0.008]	[0.009]	[0.016]
Consumption quintile 3	0.544***	0.331***	0.248***	0.454***
	[0.008]	[0.008]	[0.009]	[0.020]
Consumption quintile 4	0.756***	0.440***	0.342***	0.695***
	[0.010]	[0.010]	[0.010]	[0.025]
Consumption quintile 5	1.124***	0.596***	0.484***	1.140***
	[0.012]	[0.011]	[0.011]	[0.031]
Log vegetable oil price	-0.058*	0.056	0.019	0.324***
	[0.034]	[0.034]	[0.039]	[0.105]
Log domestic rice price	0.032	-0.085***	0.086***	-0.432***
	[0.022]	[0.021]	[0.023]	[0.097]
Log lamb price	-0.117**	-0.044	-0.029	0.007
	[0.054]	[0.050]	[0.057]	[0.136]
Log milk price	-0.003	-0.074***	-0.018	-0.353***
	[0.026]	[0.025]	[0.025]	[0.063]
Log kerosene price	0.114***	0.118***	-0.098**	0.545***
	[0.043]	[0.042]	[0.045]	[0.119]
Head age	0.051***	0.032*	0.184***	0.206***
	[0.018]	[0.019]	[0.017]	[0.049]
Head married	0.015	-0.040***	0.093***	-0.005
	[0.010]	[0.009]	[0.009]	[0.026]
Head literate	0.011*	0.036***	-0.042***	-0.015
	[0.006]	[0.005]	[0.005]	[0.017]
Plateau	0.003	0.001	0.005	0.022
	[0.013]	[0.011]	[0.014]	[0.028]
Mountainous	0.003	0.002	0.010	0.050*
	[0.012]	[0.012]	[0.013]	[0.029]
Observations	20,491	20,491	20,491	20,491
R^2	0.663	0.421	0.439	0.306

Notes: Each column represents a separate regression; OLS estimates are population weighted. Robust standard errors -in brackets- are clustered by stratum and adjusted for survey design. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work. Consumption quintile 1 is excluded. Plains is excluded topography category.
*, **, and *** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Source: USDA, Economic Research Service.

Table 5
Changes in expenditure shares by food group

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.191***	-0.032***	-0.019***	-0.031***	-0.028***	-0.070***	-0.012***
	[0.011]	[0.009]	[0.007]	[0.004]	[0.004]	[0.007]	[0.002]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.474	0.319	0.261	0.27	0.268	0.285	0.143

See notes for table 4. Each column represents a separate regression; dependent variable is the household expenditure share devoted to the food group listed at top of column. All control variables listed in table 4 are included in the regressions.

Source: USDA, Economic Research Service.

Table 6
Changes in calorie shares by food group

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.042***	0	-0.004	-0.017***	0	-0.020***	-0.002
	[0.008]	[0.002]	[0.004]	[0.004]	[0.002]	[0.003]	[0.002]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.324	0.289	0.287	0.241	0.260	0.233	0.234

See notes for table 4. Each column represents a separate regression; dependent variable is the household calorie share from the food group listed at top of column. All control variables listed in table 4 are included in the regressions.

Source: USDA, Economic Research Service.

The calorie shares results support this story as well, though to a lesser extent, than the expenditure shares results. The price increases are associated with a smaller share of calories coming from fruit and oil/fat and a larger share coming from grains; we observe no significant decline in calorie shares coming from meat/fish or vegetables. The decline in calories coming from fruit is suggestive of a lower intake of micronutrients and vitamins.

Broadly, the findings suggest that households experienced overall reductions in micronutrient availability in addition to the reduction in macronutrient (protein) availability. As mentioned above, such nutritional declines can have serious implications particularly for vulnerable groups like children under 2 years old, pregnant and lactating mothers, and the elderly.

Differential Impact of Higher Wheat Flour Prices

While the repercussions of rising food prices are observed at the national level, the effects vary greatly across rural and urban areas (table 7). Urban areas experienced a much greater decline in the real value of food consumption than rural areas did. For a 1-percent increase in wheat flour prices, the value of real monthly per capita food consumption in rural areas declines by approximately 0.19 percent, while the decline in urban areas is nearly double, at 0.37 percent. (Recall that the effect for urban households is the sum of coefficients on the interaction term and the base term. An F-test of the joint significance of both coefficients is statistically significant at 1 percent.) This evidence is in line with the literature on the food-price inflation of 2007-08 that demonstrated the disproportionate impact on urban areas, in terms of poverty and total consumption.

Table 7

The differential impact of higher food prices on household well-being, by area

	Log real value of per capita monthly food consumption	Log per capita daily calorie availability	Log food consumption score	Log per capita daily protein availability
Log wheat flour price	-0.188***	-0.075***	-0.094***	-0.233***
	[0.021]	[0.020]	[0.024]	[0.070]
Log wheat flour price x urban dummy	-0.178***	0.057**	-0.112***	-0.218**
	[0.034]	[0.028]	[0.029]	[0.100]
Urban	0.425***	-0.340***	0.326***	0.538
	[0.113]	[0.094]	[0.096]	[0.344]
Consumption quintile 2	0.348***	0.221***	0.167***	0.293***
	[0.008]	[0.008]	[0.009]	[0.016]
Consumption quintile 3	0.549***	0.329***	0.251***	0.460***
	[0.008]	[0.008]	[0.009]	[0.020]
Consumption quintile 4	0.763***	0.438***	0.346***	0.703***
	[0.010]	[0.010]	[0.010]	[0.024]
Consumption quintile 5	1.129***	0.594***	0.488***	1.147***
	[0.012]	[0.011]	[0.011]	[0.032]
Log vegetable oil price	-0.037	0.05	0.033	0.350***
	[0.033]	[0.034]	[0.039]	[0.105]
Log domestic rice price	0.033	-0.085***	0.086***	-0.432***
	[0.022]	[0.021]	[0.023]	[0.097]
Log lamb price	-0.109**	-0.047	-0.023	0.017
	[0.053]	[0.050]	[0.057]	[0.137]
Log milk price	0.01	-0.078***	-0.009	-0.337***
	[0.026]	[0.025]	[0.025]	[0.063]
Log kerosene price	0.127***	0.113***	-0.089**	0.561***
	[0.043]	[0.042]	[0.045]	[0.119]
Head age	0.050***	0.032*	0.184***	0.205***
	[0.018]	[0.019]	[0.017]	[0.049]
Head married	0.015	-0.040***	0.093***	-0.005
	[0.010]	[0.009]	[0.009]	[0.026]
Head literate	0.012**	0.036***	-0.041***	-0.013
	[0.006]	[0.005]	[0.005]	[0.016]
Plateau	0.004	0.001	0.005	0.023
	[0.013]	[0.011]	[0.014]	[0.028]
Mountainous	0.004	0.002	0.010	0.050*
	[0.012]	[0.012]	[0.013]	[0.029]
Observations	20,491	20,491	20,491	20,491
R^2	0.665	0.421	0.441	0.306
P-value of F-statistic of joint significance	0.000	0.574	0.000	0.000

See notes for table 4. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

The per capita calorie availability results paint a different story. Rural households experienced a small decline in per capita calorie availability; urban households did not. The coefficients on the log of wheat flour price and its interaction with the urban dummy are not jointly significant at conventional levels. Urban households maintain energy levels, but at the expense of their dietary quality, as measured by dietary diversity.

It is also interesting to note the change in the coefficients on the urban dummy once the interaction variables have been included in the models. Specifically the coefficients in the food consumption, dietary diversity, and protein models become positive, as we would expect. These results are consistent with evidence on the relative wealth of urban areas.

The regression models of dietary diversity, protein availability, and shares of expenditure and calories highlight some differences between rural and urban households. Urban households experienced much larger declines in dietary diversity and protein availability than rural households did, reflecting potentially serious reductions in micronutrient and macronutrient intake. They also exhibited a greater movement, in terms of calorie and expenditure shares, out of higher quality food groups into grains (tables 8 and 9). Urban households reduced calorie shares coming from dairy, vegetables, fruit and sugar;

Table 8
Differential changes in expenditure shares by area

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.187***	-0.032***	-0.018**	-0.032***	-0.029***	-0.068***	-0.011***
	[0.012]	[0.009]	[0.008]	[0.004]	[0.004]	[0.007]	[0.002]
Log wheat flour price X urban dummy	0.051***	-0.003	-0.016**	0.010**	0.01	-0.032***	-0.013***
	[0.015]	[0.009]	[0.007]	[0.004]	[0.008]	[0.011]	[0.003]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.476	0.319	0.261	0.271	0.268	0.287	0.146
P-value of F-statistic of joint significance	0.000	0.002	0.000	0.000	0.031	0.000	0.000

See notes for table 4. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

Table 9
Differential changes in calorie shares by area

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.037***	0	-0.003	-0.016***	0	-0.019***	-0.001
	[0.008]	[0.002]	[0.004]	[0.004]	[0.002]	[0.003]	[0.002]
Log wheat flour price X urban dummy	0.066***	-0.004*	-0.014***	-0.008	-0.005*	-0.019***	-0.015***
	[0.011]	[0.002]	[0.004]	[0.006]	[0.003]	[0.004]	[0.003]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.328	0.289	0.287	0.241	0.261	0.236	0.237
P-value of F-statistic of joint significance	0.000	0.195	0.001	0.000	0.084	0.000	0.000

See notes for table 4. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

whereas rural households only reduced calorie shares coming from oil/fat and fruit. Also, urban households experienced a greater movement into staple foods than rural households did; for a 1-percent increase in the price of wheat flour, urban households increased expenditure and calorie shares on grain by 0.24 percent and 0.10 percent, respectively. The large increase in the expenditure share on grain suggests that the decline in purchasing power for urban households may have pushed them to buy more wheat products despite the large price increases. Below we test this hypothesis by examining the grams of wheat products consumed per capita.

There are a few potential explanations for the observed differences in behavior between rural and urban households. The differences may be driven by preferences for dietary diversity; that is, rural households may have a preference for maintaining the quality of their diet and thus are willing to cope with a small reduction in calorie availability in lieu of a larger reduction in dietary diversity. Alternatively, rural households that engage in home food production may have greater access to an assortment of foods during the period of rising prices, which would make it relatively easier for them to maintain a more diverse diet.

We next turn to the more specific proxy for the net seller/net buyer relationship—whether households have access to agricultural land (tables 10-12). The observed differences are not as stark as those for the rural/urban proxy, though the general patterns are similar. Agricultural households did not experience as large a decline in the real value of food consumption or in dietary diversity as their counterparts, but did experience a slightly larger decline in calorie availability. The impact on protein availability was similar across groups. In addition, changes in dietary composition, based on expenditure and calorie shares, exhibit patterns similar to the national sample, with a general movement out of higher quality food groups toward staples. For some food groups, we observe small statistical differences between households based on access to agricultural land. The main results of this analysis are robust to several empirical tests. (See appendix 2 for details.)

Demand for Wheat Products

Given the importance of wheat in the Afghan diet, we examine changes in the demand for wheat products, as measured by the daily quantity of wheat consumed in grams per capita (table 13).[23] At the national level, we observe no statistically significant change in the demand for wheat products, though the coefficient on wheat flour prices is negative. Considering the price effects based on area, we find, on average, a large positive change in urban areas and no statistically significant change in rural areas. Considering the price effects based on access to agricultural land, we find a decline for agricultural households, but no statistically significant change for nonagricultural households.

The decrease in wheat consumption associated with the price increases for agricultural households is in line with the "Law of Demand"—as price increases, quantity demanded decreases. The effect in urban areas stands in contrast to this fundamental principle, but is in line with the economic incentives and preferences of households. As their purchasing power declined, urban households were forced to make budgetary adjustments. They shifted their consumption toward cheap foods in order to maintain energy levels and

[23]Wheat products include wheat, wheat flour, naan (Afghan bread), and other items derived from wheat.

Table 10

The differential impact of higher food prices on household well-being, by access to agricultural land

	Log real value of per capita monthly food consumption	Log per capita daily calorie availability	Log food consumption score	Log per capita daily protein availability
Log wheat flour price	-0.195***	-0.105***	-0.073***	-0.272***
	[0.022]	[0.022]	[0.025]	[0.074]
Log wheat flour price X nonagricultural HH	-0.074***	0.033*	-0.089***	-0.006
	[0.020]	[0.017]	[0.018]	[0.051]
Nonagricultural HH	0.184***	-0.141**	0.203***	-0.068
	[0.067]	[0.059]	[0.059]	[0.175]
Consumption quintile 2	0.341***	0.218***	0.163***	0.284***
	[0.008]	[0.008]	[0.009]	[0.016]
Consumption quintile 3	0.537***	0.323***	0.244***	0.444***
	[0.008]	[0.009]	[0.009]	[0.020]
Consumption quintile 4	0.738***	0.421***	0.336***	0.672***
	[0.010]	[0.010]	[0.010]	[0.024]
Consumption quintile 5	1.093***	0.565***	0.476***	1.104***
	[0.012]	[0.011]	[0.011]	[0.031]
Log vegetable oil price	-0.024	0.094***	0.015	0.360***
	[0.035]	[0.035]	[0.039]	[0.105]
Log domestic rice price	0.003	-0.112***	0.084***	-0.460***
	[0.023]	[0.021]	[0.022]	[0.097]
Log lamb price	-0.242***	-0.169***	-0.042	-0.128
	[0.053]	[0.051]	[0.056]	[0.133]
Log milk price	0.006	-0.064**	-0.024	-0.347***
	[0.027]	[0.025]	[0.024]	[0.064]
Log kerosene price	0.159***	0.148***	-0.081*	0.584***
	[0.043]	[0.042]	[0.043]	[0.119]
Head age	0.023	0.014	0.156***	0.172***
	[0.018]	[0.019]	[0.017]	[0.049]
Head married	0.016	-0.039***	0.092***	-0.005
	[0.011]	[0.009]	[0.009]	[0.025]
Head literate	0.023***	0.048***	-0.037***	-0.001
	[0.006]	[0.005]	[0.005]	[0.017]
Plateau	0.025*	0.028**	-0.007	0.043
	[0.013]	[0.012]	[0.014]	[0.028]
Mountainous	0.035***	0.038***	-0.001	0.080***
	[0.012]	[0.012]	[0.012]	[0.028]
Observations	20,491	20,491	20,491	20,491
R^2	0.659	0.409	0.451	0.304
P-value of F-statistic of joint significance	0.000	0.001	0.000	0.000

See notes for table 4. Nonagricultural HH dummy is an indicator for households that do not report owning or operating agricultural land. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

Table 11

Differential changes in expenditure shares by access to agricultural land

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.184***	-0.043***	-0.012	-0.032***	-0.024***	-0.065***	-0.012***
	[0.012]	[0.009]	[0.008]	[0.004]	[0.005]	[0.007]	[0.002]
Log wheat flour price X urban dummy	0.021**	0.020***	-0.028***	0.005*	-0.003	-0.012**	0
	[0.009]	[0.007]	[0.007]	[0.003]	[0.004]	[0.006]	[0.002]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.478	0.319	0.265	0.27	0.263	0.286	0.142
P-value of F-statistic of joint significance	0.000	0.01	0.000	0.000	0.000	0.000	0.000

See notes for table 4. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

Table 12

Differential changes in calorie shares by access to agricultural land

	Grain	Meat/fish	Dairy	Oil/fat	Vegetable	Fruit	Sugar
Log wheat flour price	0.029***	-0.002	0	-0.013***	0.002	-0.017***	0
	[0.008]	[0.002]	[0.005]	[0.004]	[0.002]	[0.003]	[0.002]
Log wheat flour price X urban dummy	0.029***	0.004***	-0.015***	-0.002	-0.005***	-0.008***	-0.004***
	[0.006]	[0.002]	[0.004]	[0.004]	[0.002]	[0.002]	[0.002]
Observations	20,491	20,491	20,491	20,491	20,491	20,491	20,491
R^2	0.326	0.289	0.289	0.235	0.259	0.235	0.234
P-value of F-statistic of joint significance	0.000	0.389	0.001	0.002	0.236	0.000	0.022

See notes for table 4. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

Table 13

Changes in wheat consumption

	Log per capita daily wheat consumption		
Log wheat flour price	-0.039	-0.05	-0.100***
	[0.034]	[0.035]	[0.036]
Log wheat flour price X urban dummy		0.203***	
		[0.048]	
Log wheat flour price X nonagricultural HH			0.097***
			[0.027]
Observations	19,325	19,325	19,325
R^2	0.215	0.218	0.203
P-value of F-statistic of joint significance		0.005	0.932

See notes for table 4. The sample includes all households that report positive consumption of wheat products. The last row displays the p-value of the F-statistic of the joint significance of both coefficients related to the log of wheat flour prices.

Source: USDA, Economic Research Service.

wheat products provide the largest number of calories per Afghani. Data on calories per Afghani spent for several commonly consumed foods support this story (table 14).

We argue that these patterns, though not conclusive, are broadly consistent with the paradox of Giffen goods—for which quantity demanded increases rather than falls as price increases. (See box, "The Paradox of Giffen Goods," for details.) The findings suggest that wheat products are both inferior goods, for which quantity demanded increases as household income decreases, and Giffen goods. The increase in wheat prices induces households to buy other relatively cheaper goods; however, since household purchasing power is lower due to the price increase of a key household necessity, households are induced to buy more of the inferior wheat products. In urban areas, the latter effect outweighs the former effect and, overall, households purchase more wheat products.

These findings are consistent with Jensen and Miller (2008), who find evidence of Giffen behavior related to rice consumption among impoverished urban households in the Hunan province of China using a randomized experiment. Jensen and Miller argue—theoretically and empirically—that a good may exhibit Giffen properties for certain subpopulations under specific conditions, but may not necessarily exhibit such properties for all populations.

Table 14
Calories per Afghani by food item

Wheat flour	184
Lentils	107
Mung (beans)	105
Purchased naan (Afghan bread)	103
Chickpeas	91
Rice	78
Lamb	13
Beef	9
Goat	9

Notes: Calculations use the food poverty bundle for relatively poor households (20th-50th percentiles).

Source: 2007-08 National Risk and Vulnerability Assessment.

Conclusions

With a long history of political instability and conflict, as well as weak infrastructure and mountainous terrain, Afghanistan is particularly vulnerable to economic and natural shocks. From 2007 to 2008 the price of wheat flour, the Afghan staple, rose dramatically due to a confluence of international and domestic factors. We use nationally representative household survey data from the 2007-08 National Risk and Vulnerability Assessment (collected by the Government of Afghanistan) to assess the impact of this price shock on household well-being. The survey provides a unique opportunity to study household responses using data collected during the price shocks, highlighting the benefits of such data collection initiatives in low-income, conflict countries.

We find evidence that the increases in staple food prices led to a decline in several measures of household well-being related to food security. At the national level, we observe reductions in food consumption, calorie and protein levels, and dietary diversity. We also find differences in the impact of the price increases across rural and urban areas, as well as based on whether a household owned and/or operated agricultural land.

Recent wildfires and export bans (Russia), flooding (Pakistan), and political instability (Middle East) have added to volatility in international commodity prices and are raising serious concerns about potential increases in food insecurity and global poverty. Our findings on the short-term household responses to high food prices suggest that if price levels were to increase again, many households would resort to cutting back on micronutrient-rich foods, as well as overall calories. Such episodes can exacerbate chronically low levels of nutrient intake in countries with large shares of the population living in poverty with generally poor diets. Even if there is only a short-term episode of low micronutrient and protein intake, there may be long-term repercussions for young children, whose development can be stunted or otherwise affected negatively. Recent literature highlights the links between early childhood nutrition and cognitive development (Glewwe and King, 2001), as well as long-term educational attainment (Alderman et al., 2006). Potential policy interventions could include micronutrient supplementation programs based on food inflation indicators, targeted food distribution programs, and wheat fortification programs.

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Appendix 1—Survey Design, Sample Selection and Construction of Key Variables

The primary data are drawn from the 2007-08 National Risk and Vulnerability Assessment (NRVA). The survey was administered between August 2007 and September 2008 and covered over 20,000 households (about 150,000 individuals) in 2,572 communities in all 34 provinces of Afghanistan. The frame used for drawing the sample was the 2003-05 national household listing—a listing of every house in the country; the sample was selected following a stratified, multistage design. The population frame was stratified into 46 domains or strata. The 11 provinces with the most populous provincial centers were each stratified into urban and rural areas, producing 22 strata. Each of the remaining 23 provinces was then also treated as a separate stratum (and all were identified as rural areas), and finally the nomadic Kuchi population was treated as a separate stratum. There were 2,441 primary sampling units (PSUs) from urban and rural settled populations and 131 PSUs from Kuchi populations. In the second and final stage, households were selected.

The effective sample size for our analysis is 20,491 households in 394 districts. The household response rate was 99.8 percent, and the primary sampling unit replacement rate was 3 percent. Thirty-two households were dropped due to missing female questionnaire modules; all of these households were located in four communities, suggesting systematic errors in field operations. Fifty-two households were dropped due to missing consumption data. One household was missing data on household size and was dropped because per capita measures of consumption and food security could not be calculated.

The survey was implicitly stratified over time, a key element to accounting for the seasonality associated with household well-being. Implicit stratification means that the frame was sorted both spatially and temporally to ensure that (with a systemic interval selection) the selected sample would be seasonally representative. (See Kish, 1965, p. 235-6, for a discussion.) Thus, each quarterly sample of the NRVA survey is representative at the national level.

The NRVA consists of three components: household and community questionnaires and a district market price survey. The household questionnaire includes 20 sections—6 administered by female interviewers to female household members and 14 administered by male interviewers to the male household head. Households were asked about consumption, demography, housing infrastructure and access, maternal and child health, education, income sources, agriculture and livestock, migration and remittances, assets, and credit.

Price data were collected at the district level based on interviews within each community that helped to identify the relevant market. District prices were used to calculate the total value of food consumption, described below. District prices were aggregated to the stratum level—i.e., urban and rural areas within provinces—by quarter in order to mitigate potential measurement error in estimating the coefficient on the log of domestic wheat flour

prices. The prices of other goods included in the regressions were constructed in a similar manner.

To calculate the total value of food consumption, prices were matched by month, item, and district. Since not all food items were available in all district markets at all times of the year, we imputed the missing elements to obtain a complete price matrix, which provides prices for those items that households may have been producing at home, as well as goods that households may have obtained from more distant markets. The imputation process filled in missing values using the first feasible methodology according to the following order:

(1) median of the 20 nearest neighbors (weighted by inverse distance)

(2) province median of that month

(3)national median of that month

(4) median price of 20 neighboring districts of the quarter (weighted by inverse distance)

(5) province median of that quarter

(6) national median of that quarter

In order to account for the significant differences in price and quality between domestic and imported wheat and rice, we calculated price averages for domestic and imported varieties separately. The survey includes questions on the percentages of imported wheat and rice the household consumes; these percentages were used to calculate total expenditure for these items. The value of expenditure on food away from home was included in the calculation of the value of food consumption, but not included in the calculation of calorie availability since quantity data on such food were not collected. Expenditure on food away from home accounts for approximately 2 percent of household food expenditure.

Per capita total consumption is the sum of the total value of goods and services utilized divided by the total number of household members. Total household consumption (Afghani per month) consists of expenditures on food, nonfood, durables, and rent. Nonfood expenditure consists of expenditures on medicine and health, education, clothing, housing and utilities, and transportation. The value of durable goods was imputed based on a detailed inventory of household assets and takes into account the time depreciation of the good, as well as the opportunity cost of the funds tied up in the good. Expenditure on rent was calculated using a Hedonic pricing model.

Appendix 2—Robustness Tests

We discuss several tests to evaluate the robustness of our coefficient of interest—the log of the price of domestic wheat flour. Results are available upon request from the author.

We replace our variable of interest with the price of imported wheat flour to see whether households respond differently to changes in the price of imported versus domestic flour; the main results are qualitatively the same. We also replace the price of domestic wheat flour with the prices of domestic wheat and imported wheat, with similar results. Although the magnitudes of some coefficients differ across these models, the basic picture remains the same.

We include extra controls for household demographics (i.e., the number of males, females, and children in the household). There is no change in the main results. The coefficient on number of children in a household is often statistically significant; it slightly increases the real value of monthly per capita food consumption and decreases per capita daily calorie availability.

We also include indicators of other coping mechanisms that a household may employ during the year to examine whether controlling for such differences across households change the results in a substantive manner. We include dummies for households that sold off livestock in the previous year or households that borrowed money to purchase food; the results are robust to such changes. In ongoing research, we directly examine such short-term nonfood-based strategies, which can have long-term negative effects. For example, if households borrow money at very high interest rates, they may enter into a situation of perpetual debt, increasing their vulnerability to future shocks. Furthermore, the sale of livestock, especially those used as productive assets on farms, could reduce the future earning potential of the household.

In a country like Afghanistan, we might be concerned that food aid is an important component of a household's budget and that households receiving food assistance may respond differently to price shocks. We test this hypothesis by excluding 7.03 percent of households that report receiving some form of food assistance over the past year. The results do not change.

Finally, we estimate separate regressions for each subpopulation that we examine: rural, urban, agricultural, and nonagricultural households; this allows full flexibility for all the coefficients included in the model. That is, instead of including the interaction term between the urban dummy and the price of wheat flour, we run separate regressions for each subpopulation, including only the price of wheat flour and the control variables. In all of the cases, the coefficients of interest are substantively the same; in some cases, allowing more flexibility for the control variables affected the magnitude and significance of their coefficients.