Rising Food Prices and Coping Strategies: Household-level Evidence from Afghanistan

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Acknowledgements

The authors are grateful to Central Statistics Organization, Government of Afghanistan (GoA), for granting access to the data for poverty research. Findings from this analysis provide background information for the World Bank's poverty assessment for Afghanistan, and have also informed the GoA Ministry of Economy. Jolliffe gratefully acknowledges support from the World Bank's Research Support Budget. The authors wish to thank for comments Amanullah Assil, Cheryl Christensen, John Hoddinott, Abdul Malik, Mark Nord, John Pender, Byron Ponce-Segura, Ismail Rahimi, Silvia Redaelli, Shahla Shapouri, seminar participants at ERS and the World Bank, Kabul office; and conference participants at the 2010 annual meeting of the Agricultural and Applied Economics Association. D'Souza is a Research Economist at ERS, USDA; Jolliffe is a Senior Economist at the World Bank, and also holds affiliations with the Institute for the Study of Labor (IZA) in Bonn and with the National Poverty Center (NPC) at the Ford School of Public Policy, University of Michigan. The views expressed here are those of the authors and may not be attributed to ERS-USDA, the World Bank, IZA, or NPC.

ABSTRACT This paper investigates the impact of rising wheat prices on household food security in Afghanistan. Exploiting a unique nationally-representative household survey, we find evidence of large declines in the real value of per capita food consumption. Smaller price elasticities with respect to calories than with respect to food consumption suggest that households trade off quality for quantity as they move away from nutrient-rich foods such as meat and vegetables toward staple foods. Our work improves upon country-level simulation studies by providing estimates of actual household food security during a price shock in one of the world's poorest, most food-insecure countries.

JEL Codes: D12, I3
Keywords: food security, high food prices, nutrition, poverty, Afghanistan

1 Introduction

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. During the last global food crisis, prices of some staple foods more than doubled; perhaps one of the most serious consequences of these price shocks was the disproportionate effect on the world's most vulnerable populations. For those who spend the majority of their budgets on food, the shocks led to a severe erosion of purchasing power, pushing households into poverty and crippling the already poor. Households cope with negative shocks in many ways, for example, by relying on family assistance, selling off assets, borrowing money, or – in the most desperate cases – reducing intake of food and nutrients. Such coping mechanisms can have both short and long run consequences for a family's wellbeing and livelihood.

This paper investigates the impact of increases in staple food prices on household food security in Afghanistan – one of the world's most food-insecure countries.[i] The analysis in this paper provides one of the very few empirical assessments of the effects of food price increases based on household consumption data collected prior to and during a largely unanticipated price shock. Also,

it is rare to have high-quality household data from a conflict country, where many of the world's most vulnerable live.

The estimates provided in this paper are based on direct measures of food security and food-based coping strategies, for example, moving to cheaper foods, based on observed household behavior prior to and after the price shock. Most recent studies on high food prices – and on the global food crisis in particular – use pre-crisis household survey data to simulate the short-run effects of the price increases on poverty. See for example, the research of Robles and Torero (2010) on four Latin American countries[ii], Woden *et al.* (2008) on twelve African countries[iii], and Simler (2010) on Uganda[iv]. In these studies, the magnitude of the impact of the crisis varies greatly across households and countries, depending on several characteristics including the degree of price transmission, dependence on food imports, whether staple foods are traded internationally, and whether households are net buyers or net sellers of food. But the general finding is similar – national poverty rates increase, with urban areas on average suffering larger increases.

From these studies though, it is difficult to disentangle the extent to which the simulated estimates result from actual changes in household behavior or wellbeing, or from modeling assumptions. For example, Woden *et al.* (2008) assume that increases in food prices directly produce an equivalent reduction in total consumption. That is, the household is assumed to have no behavioral response to the price increase. In this case, the magnitude of the poverty reduction is determined by the shape of the distribution of consumption and the modeling assumptions linked to a reduction in total consumption.

The need to simulate welfare effects is driven by a lack of comparable pre- and post-crisis data. Jensen and Miller (2008b) improve upon the simulation studies by using a panel of 1,300 urban poor households in two Chinese provinces to measure the nutritional effects of the crisis. Their data

are from April 2006 and December 2006 and largely do not reflect the stark increase in the price of staples during the crisis.[v] They find a limited nutritional impact, measured by calorie intake, of the crisis which they suggest is due to government policies that stabilised grain prices and household substitution toward cheaper foods.

The analysis in this paper is similar to Jensen and Miller (2008b) in that the estimates are based on measured (not simulated) differences in consumption behavior. We estimate the relationship between household food security and increases in staple food prices using a unique cross-sectional, temporally stratified, nationally representative survey. The data are from the National Risk and Vulnerability Assessment (NRVA) 2007/08, a sample of over 20,000 households from all 34 provinces of Afghanistan, conducted over a 13-month period (August 2007 – September 2008). It is the first nationally representative household survey in Afghanistan designed to account for seasonal variations in wellbeing.[vi] 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 2008 food price shock, providing substantial variation in prices and comparable sub-samples for our analysis.

A particular strength of the NRVA survey is its detailed information on the frequency and quantity of food consumption of 91 different food items, which allows us to examine how households change the composition of their diets in response to price changes and also allows us to create multiple measures of food security. Food security broadly consists of four main dimensions: availability of food, access to food, utilization of food, and stability of the other three dimensions (Food and Agricultural Organization, 2006). We concentrate on access and utilization. The former refers to a household's ability to obtain food, which depends on income, prices, and market access; the latter refers to an individual's ability to process nutrients and energy from food, which depends on many factors, including dietary diversity and nutrient absorption, intra-household allocation of

food, and hygienic preparation. In this analysis we examine two aspects of access – the real value of monthly per capita food consumption and per capita daily calorie intake – and two aspects of utilization – dietary diversity and per capita intake of protein (a key macronutrient).

Several salient findings emerge from the household-level food security analysis. The descriptive statistics reveal a 33 per cent decline in the real value of monthly per capita food consumption from August 2007 to September 2008. The regression analysis confirms large negative price elasticities with respect to food consumption, but much smaller price elasticities with respect to calories, suggesting that households traded off quality for quantity of calories in response to declining purchasing power and relative price changes. As additional evidence of this trade-off, we find estimated changes in the composition of food consumed and nutrient intake, specifically, decreases in dietary diversity and protein intake, and adjustments in expenditure shares with a movement toward staples. These results are similar to those of McKenzie (2006), who finds a shift in food consumption toward staples after the 1994 devaluation of the Mexican Peso.

The analysis in this paper also documents the statistical relationships between commonly used nutrition indicators and various measures of food security, and thereby contributes broadly to work on the efficacy of household-level indicators like dietary diversity.[vii] This is in line with the growing recognition of the importance of household- and individual-level consumption data in developing sub-national interventions to reduce chronic food insecurity (Barrett, 2010).[viii] We also believe that this analysis fills a critical gap in the knowledge base of policymakers. The dearth of data and analysis available on food security and nutrition in Afghanistan poses acute challenges to political leaders, lawmakers, and humanitarian organizations interested in creating programs and policies to alleviate poverty and food insecurity.

The next section briefly describes the Afghan economy and its ties to international markets during the survey time frame. Section 3 provides details on the survey, the methodology and the sample. Section 4 presents the results, and section 5 concludes.

2 Afghanistan

Over the past decade, the Afghan economy has experienced strong growth, with real GDP growth averaging approximately 10.8 per cent 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. The IMF (2009) estimates that gross domestic product (GDP) per capita was $350 in 2007 and $457 in 2008 (current US$).[ix] Based on the broader set of development indicators used in the UNDP human development index (for example, health, education, living standards), Afghanistan ranked 181 out of 182 countries in 2008 (UNDP, 2009). According to UNICEF (2009a), Afghanistan has the highest prevalence of stunting in the world among children under five years old.[x]

The Afghan economy is largely based on agriculture; major crops include wheat, rice, maize, barley, vegetables, fruits, and nuts. Approximately 70 per cent of cultivated crop area is devoted to wheat and about 15 per cent is devoted to rice, barley and maize (Chabot & Dorosh, 2007). Wheat is both a major production crop and the main staple of the Afghan diet, with wheat flour contributing 54 per cent to total calorie intake. Due to large fluctuations in weather and violence, however, wheat production is highly volatile and the country is dependent on its trading partners to meet any shortfalls. Pakistan is the major supplier of wheat (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

wheat flour import market range from 59 per cent (Chabot & Dorosh, 2007) to 79 per cent (Maletta, 2004).

Seasonality 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.

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

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 since 2000 (Persaud, 2010). The price impact of the large shortfall in wheat production was magnified by export bans in Pakistan and rising international food prices. In February 2008 the Afghan government eliminated import tariffs on wheat and wheat flour (tariffs had been set at 2.5%), 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 flour increased by over 100 per cent (Figure 1).

Total inflation was largely driven by the surge in food prices; Figure 2 depicts the consumer price indices (CPI) for food and non-food items in urban areas from 2006 to 2008.[xi] During the NRVA survey time frame (August 2007-September 2008), the urban food CPI increased by nearly 60 per cent, while the non-food CPI increased by only 10 per cent. Our calculations using price data collected in the NRVA similarly indicate a 60 per cent increase in food prices in urban areas during this period, with an overall increase of 40 per cent at the national level.

3 Data and Methodology

3.1 Data

Our primary data come from the National Risk and Vulnerability Assessment (NRVA) 2007/08, conducted by the Afghanistan Central Statistics Organization and the Ministry of Rural Rehabilitation and Development. 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, multi-stage design.[xii] The survey was administered between August 2007 and September 2008 and covered 20,576 households (about 150,000 individuals) in 2,572 communities.[xiii]

A salient feature of the survey is its implicit stratification over time, which ensures that each quarterly sample reflects the overall composition of the country.[xiv] This aspect is essential to address the seasonality associated with household food security. The year-long fieldwork also allowed coverage of conflict 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 a flexible design for field work. In particular, when a primary sampling unit was considered too dangerous to interview at the scheduled

time, it would not be immediately replaced, but would be re-considered at a later date within the quarter.[xv]

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.[xvi]

A key component of the survey is the food consumption section, which asks female respondents about the consumption of 91 food items belonging to nine food groups consumed over the previous week. The broad coverage of foods, including seasonal varieties, allows for better calculation of calorie and nutrient intake than do surveys with fewer items.

Another key component is the district market price survey. Given Afghanistan's mountainous terrain and poor infrastructure, transportation costs most likely vary greatly across the country, and in particular in remote and conflict-affected areas; therefore in order to identify correctly the impact of the price increases at the household level, it is necessary to obtain data on prices that households face in their local markets. Enumerators interviewed community members to identify the relevant local markets; then team supervisors collected the price data during visits to the primary sampling unit area.[xvii] Data were collected on the prevailing prices of all food items included in the consumption section, along with domestic and imported grains, and fuel.

3.2 Empirical specification

To assess the impact of rising prices of staple foods on household food security, we estimate the relationship between the price of domestic wheat flour and several measures of household food security. To isolate the effect of wheat flour prices from other potentially confounding correlates, our basic specification is as follows:

$$log(x_h) = \beta_0 + \beta_1 log(price\ wheat\ flour_{apq}) + \theta log(Prices_{apq}) + \alpha HH_h + \delta DIST_{dq}$$

$$+\Pi_p + \varepsilon_h \qquad [1]$$

where x is a measure of food security for household h. *Prices* denotes a vector of commodity prices, averaged by area a (urban or rural), province p, and quarter q. *HH* denotes a vector of household-level characteristics; *DIST* denotes district-level variables for district d and Π denotes province-level dummy variables. These control variables are described in detail below. ε denotes an idiosyncratic error term; we use the sandwich variance estimator (Huber-White robust estimator), which allows for correlation of the residuals within clusters (PSUs) and is therefore robust to violations of the assumptions of identically and independently distributed residuals.

3.2.1 Dependent variables

We examine the following measures of food security: real monthly per capita food consumption; per capita daily calorie and protein intakes; and household dietary diversity. We also examine expenditure shares devoted to broad food groups to see how dietary composition changes. And we examine the demand for wheat products (grams of wheat per capita), given the importance of wheat in the Afghan diet and the size of the price shocks.

Real per capita food consumption is an informative measure of household wellbeing and a core component of the poverty indicators. It has been used as a measure of food security in the literature as well; for an early example see Green and Kirkpatrick (1982). Calorie intake is related to United Nations Millennium Development Goal 1.9 – to reduce by half the proportion of population below a minimum level of dietary energy consumption. Dietary diversity and protein intake both relate to nutrient intake.[xviii] Several studies from developing countries demonstrate a statistically significant relationship between household dietary diversity and child and adult nutritional status,

and, more broadly, the access to and utilization of food (Arimond & Ruel, 2004; Hoddinott & Yohannes, 2002; Ruel, 2003).

Our priors are that increases in wheat flour prices will be associated with reductions in food consumption, calorie intake, and dietary diversity. In terms of wheat and protein consumption, the effects will depend on whether these products are normal or inferior goods. For normal goods, we expect a decline in consumption, but for inferior goods, the effect will depend on whether the substitution effect or the income effect is larger. The substitution effect describes the decline in consumption of a good whose price has increased; since the good has become more expensive relative to other goods, consumers substitute out of the good. The income effect relates to the fact that as the price of one good increases, real income declines, resulting in decreased consumption of normal goods and increased consumption of inferior goods.[xix] We also expect a change in the composition of food expenditures, with a general movement toward cheaper, lower quality foods.

To calculate the value of monthly per capita 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 seven days; these quantities are multiplied by 4.2 to get monthly values. Per capita amounts are obtained by dividing the total household values by the effective number of household members. The effective number of household members incorporates guests eating meals within the home.[xx] Food consumption data include food bought, produced or obtained through other methods such as food aid and gifts. 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 produced at home or obtained at more distant markets. The imputation process filled in missing values using the first-feasible methodology according to the following order: 1) median of that month of the 20 nearest neighboring districts; 2) province median

of that month; 3) national median of that month; 4) median price of 20 neighboring districts of the quarter; 5) province median of that quarter; and 6) national median of that quarter.

In order to account for price and quality differences between domestic and imported wheat and rice, we calculate separate average prices for domestic and imported varieties. The survey includes questions on the percentages of imported wheat and rice the household consumes; these percentages are used to calculate total expenditure for these items. Finally, the value of expenditure on food away from home is included in the calculation of food consumption, but not included in the calculation of calorie intake since quantity data on such food were not collected.[xxi]

We adjust the food consumption estimates using an NRVA-based, Laspeyres price index estimated by quarter for each region in order to compare consumption across regions and over time.[xxii] Real consumption is relative to the chosen base: urban areas in the Central region in quarter one; the capital, Kabul, is located in the Central region.

Daily per capita calorie intake and protein intake are calculated by dividing weekly total household calories and protein intake by seven days and by the effective household size. Food quantities were converted to kilocalories and nutrients using the FAO Food Composition Tables for the Near East.[xxiii]

We use the food consumption score (FCS) developed by the World Food Programme as an indicator of dietary diversity.[xxiv] It is constructed by taking the weighted sum of the frequencies with which households consume foods within eight food groups over the previous week.[xxv] The food groups include staples, pulses, vegetables, fruit, meat/fish, milk/dairy, sugar, and oil/fat. During the global food price crisis, the FCS was used in field assessments to gauge short-term changes in food security.

3.2.2 Variable of interest and control variables

Our coefficient of interest is β_1, which measures the price elasticity of the dependent variable with respect to changes in the price of wheat flour. (In other words, β_1 measures the percentage change in the food security measure from a one per cent change in price.) We use the average price of domestic wheat flour since wheat is the primary staple of the Afghan diet and households often purchase wheat in the form of flour. In the robustness tests, we use the prices of imported wheat flour, and domestic and imported wheat; the results are substantively the same.

Consumer theory indicates that choices are partly based on the relative prices of goods. In order to capture this in our empirical specification, and to better isolate the effect of wheat flour prices as distinct from co-movement from other price changes, we include the prices of milk, lamb, rice 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 eighty per cent of average food expenditure of the relatively poor (the reference population for defining the composition of food needs for the official poverty line). Average prices are calculated for rural and urban areas within each province for each quarter in order to mitigate potential biases caused by measurement error in prices collected at the district level.

The household controls include the following: quintile dummies for real total consumption;[xxvi] age of household head; dummy for households where heads are literate; dummy for households where heads are married. Since each household is observed only once over the year, the household-level controls do not vary over time. In the robustness tests, we find that the inclusion of other household demographic characteristics does not alter qualitatively the general findings.

District-level variables include topography dummies (plateau and mountainous areas, plains excluded) and a rural dummy. Lastly, we include province dummies, Π, to control for observable

and unobservable time-invariant province-level factors that could confound the results, for example, differences in local governance efficacy or conflict that is present throughout the survey year.

3.3 Estimating differential effects of food price increases

During the global food price crisis, much of the public discourse focused on differences in the ability of various subpopulations to cope with rising prices. Governments and international organizations emphasised the vulnerability of urban and landless rural households, who cannot produce their own food (Food and Agricultural Organization, 2008). In the literature, Deaton (1989, 2000) draws a theoretical distinction between households that can produce their own food and those who cannot. He defines the Net Benefit Ratio (NBR) of each household – the price elasticity of the consumer surplus for farm-households that both produce and consume – and proposes an estimation procedure to incorporate this information into the estimation of price elasticities. Producers benefit from increases in food prices in proportion to their production and consumers suffer from increases in food prices in proportion to their consumption. Much of the literature utilises binary proxies of the NBR, distinguishing between households that are net sellers (who produce enough food to consume as well as to sell on the market) and those that are net buyers (who depend on the market to meet their food needs). (Net buyers who produce some food are less vulnerable than those who do not produce any food, for example, households without access to agricultural land.)

Furthermore price variability may affect agricultural households in systematically different ways depending on the bundle of commodities that the household produces. Rapsomanikis and Sarris (2008) provide theoretical and empirical evidence that this is indeed the case in rural areas in

Peru and Ghana, suggesting that the source of price variability may have direct consequences for household welfare, and in particular, for household income.

The NRVA household production data are not rich enough to allow us to calculate the NBR, classify net sellers and net buyers, or identify the bundle of commodities produced. Therefore we use two variables as proxies for net sellers: a dummy for households situated in rural areas and a dummy for households with access to agricultural land (specifically, households who report owning or operating agricultural land). While many households that fall in these categories may be net buyers, empirical evidence demonstrates that most net sellers are situated in rural areas and have access to agricultural land and, further, the NBR for rural (and agricultural) households is likely to be higher, on average, than the NBR for urban (and non-agricultural) households.

We examine differential effects of the price shocks using an interaction term between the log of the price of wheat flour and either the rural household dummy or the agricultural household dummy.

A major limitation of this analysis is that we cannot disentangle the impacts of the price increases due to the 2007/08 global food crisis, the 2008 poor harvest, or seasonal variations based on weather and harvest quality.[xxvii] Therefore the results below identify the effect of overall price changes on household food security. An ability to disentangle the cause of the price changes would presumably alter how one thinks about policy prescriptions. For example, if the price changes are localized rather than global, the policy response would be more targeted, such as the release of grain reserves into the affected area. If the price changes are global, then the appropriate policy response may be more oriented toward macroeconomic and trade policies. If the price changes are due to anticipated seasonal variation, policies aimed at helping households to smooth consumption, such as improved grain storage, might be desired. Whereas if the price change is due to a fully unanticipated

price shock, as we believe was largely the case, then the policy response might be more oriented toward short-run safety net programs with a nutritional focus.

3.4 Sample Description

The effective sample size is 20,491 households.[xxviii] The households are located in 394 districts in all 34 provinces in Afghanistan. Approximately 80 per cent of households reside in rural areas; of these households, 6.3 per cent are Kuchi, nomadic pastoralists. On average, households have 8.6 members living in about 3.6 rooms (or tents for Kuchi populations). The typical household consists of 2.1 men, 2 females, and 4.7 children (under 16). Heads of households are about 45 years old; the vast majority are married. Most household heads are illiterate, though there are large differences between urban and rural areas.

Monthly nominal per capita total consumption for Afghan households is 1925 Afghani (slightly more than 1.5 times the official poverty line); about 60 per cent of total consumption is spent on food. Table 1 presents estimates of population characteristics. As in many developing countries, poverty in Afghanistan is more prevalent in rural areas than in urban ones (World Bank, 2007). Total monthly per capita consumption in rural areas is 44 per cent lower than that in urban areas, and rural households spend a larger share (63%) of total consumption on food than urban households (44%). Rural and urban households also differ in their levels of food security. Although their calorie intake levels are similar, rural households have lower levels of dietary diversity, suggesting lower levels of micronutrient intake. The characteristics of agricultural and nonagricultural households exhibit similar patterns to those of rural and urban households, respectively.

Further differences across households are observed in the calorie and expenditure shares devoted to various food groups (Table 2). The patterns are consistent with those seen in other low-income countries. Grain, including wheat, breads and other cereals, represent 48 per cent of food expenditure and 70 per cent of calorie intake for the national sample. On average, urban households devote significantly fewer resources to grains and dairy and significantly more resources to the other food groups than rural households; household calorie shares follow a similar pattern. Agricultural households have consumption and dietary patterns similar to those of rural households.

The basic descriptive statistics indicate that the price increases coincided with sharp declines in household food security (Table 3). Over the survey year, there was a small, statistically insignificant decrease in nominal monthly per capita total and food consumption, but the effects of the price shock can be seen in the inflation-adjusted amounts. Both real total consumption and real food consumption experienced large declines, of 27% and 33%, respectively. (Quarter 1, Central region urban prices are used as the base for the real amounts.) Calorie intake and the average level of dietary diversity also decline substantially. The largest changes are seen in protein intake, suggesting that households are shifting out of foods that are rich in this macronutrient. The percentage of households consuming less than 2,100 calories per person per day (conventional minimum daily energy requirement) rose from 24 per cent in quarter 1 to 34 per cent in quarter 4. These data provide a broad snapshot of the changing landscape during the global food price crisis; the econometric results below further investigate these patterns by controlling simultaneously for a variety of factors in order to isolate the effects of the price changes on household food security.

4 The Impact of Higher Food Prices on Afghan Households

4.1 National results

Increases in the prices of wheat flour are associated with declines in several dimensions of food security for Afghan households. (Table 4 displays the coefficient of interest, the log of wheat flour prices, for each regression; for the full set of coefficients, see Appendix Table 1.[xxix]) Specifically, a one per cent increase in the price of wheat flour is associated with a 0.20 per cent decline in real monthly per capita food consumption. Given that wheat flour prices were observed to more than double during the crisis, the magnitude of this effect is potentially large.

The estimates based on calories and diversity though, show that households are able to buffer the impact of the large shock in prices to a certain extent. The calorie elasticity is less than half the size of the food consumption elasticity, with a decline in per capita daily calorie intake of 0.07 per cent as a result of a one per cent increase in wheat flour prices. This relatively smaller effect can be explained by changes in dietary diversity. A one per cent increase in the price of wheat flour is associated with a 0.10 per cent decline in the food consumption score. The change in dietary diversity is also reflected in the relatively large decline in daily per capita protein intake; for a one per cent increase in price, we observe a 0.25 per cent decline in grams of protein consumed per person per day.

We observe declines in expenditure shares of all food groups except grains, consistent with a story of substitution across food groups and a movement toward staple foods (Table 5). The largest decline is seen in expenditure shares devoted to fruit, which can be considered a luxury item. These findings suggest that households are trading off quality for quantity. As a result of the price increases and the subsequent decline in purchasing power, households change the composition of their diets to maintain calories. In particular, they shift toward lower quality (less nutrient-rich), cheaper foods,

thus allowing them to acquire more food to maintain calories – to the extent possible – in the face of large declines in purchasing power. Diagana *et al.*, (1999) find similar effects after the devaluation of the CFA franc in 1994. Heltberg and Lund (2009) demonstrate that various types of shocks can induce Pakistani households to reduce food intake. See the online appendix for tests of robustness.

4.2 Differential effects of food price increases

While the repercussions of rising food costs are observed across Afghanistan, the impact differs across rural and urban households (Table 6 and Appendix Table 2). The differences are stark; the percentage decline in real monthly per capita food consumption in urban areas (-0.355) is over double the decline in rural areas (-0.186).[xxx] This evidence is consistent with literature on the global food crisis that demonstrates the disproportionate impact on urban areas, in terms of poverty and total consumption. It is also consistent with the interpretation that our rural dummy proxy broadly reflects net sellers, who are harmed relatively less by price increases.

The quality – quantity tradeoff seen at the national level seems to exist in urban and rural areas as well, but takes different forms. For urban households, we observe no statistically significant decline in calorie intake, despite the large reduction in the value of food consumption. For rural households, we observe a decline in calorie intake of 0.074 per cent for a one per cent increase in wheat flour prices. To understand these differences, we turn to changes in the level of dietary diversity and expenditure shares. The results show that urban households experience a large decline in dietary diversity, approximately three times that of rural areas; that is, urban households make relatively larger changes in the composition of their diets to buffer the shock to calories. Further, the results on expenditure shares reveal that the national level result of an increase in expenditure share on grains is largely driven by urban households (Table 7).

There are a few potential explanations for the observed differences in behavior between rural and urban households. The differences may be driven by differences in preferences for dietary diversity. Rural households may have a stronger preference for maintaining the quality of their diets and thus are willing to cope with a small reduction in calorie intake in lieu of a relatively large reduction in dietary diversity. Alternatively, through home food production, rural households 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.

Table 8 presents the findings using the agricultural household dummy as a proxy for net sellers; they generally follow the same patterns to the results using the rural dummy as a proxy (Table 6). Agricultural households experience smaller declines in food consumption than their counterparts. Nonagricultural households make larger reductions in dietary diversity and therefore experience smaller declines in calorie intake. Both types of households experience large declines in protein intake, with no evidence of statistical differences between the coefficients.

4.3 The demand for wheat products

We examine changes in the demand for wheat products using per capita daily intake of wheat as a dependent variable (Table 9).[xxxi] There are large differences between urban and rural areas, and smaller differences between agricultural and nonagricultural households. At the national level and for the population of nonagricultural households, the coefficient on wheat flour price is negative, but not statistically significant, suggesting no change in demand as a result of the price increases.

For rural households and for agricultural households, increases in the price of wheat flour reduce demand for wheat products, in line with the basic economic law of demand (an increase in

price reduces quantity demanded), or a downward-sloping demand curve. But in urban areas, we observe just the opposite – an upward-sloping demand curve. We argue that these patterns, while not conclusive, are suggestive of the paradox of Giffen goods in the economics literature. The finding suggests that wheat products are both inferior goods and Giffen goods.

Broadly, the consumer response to a price increase can be classified into two parts: the previously described income and substitution effects. The substitution effect reflects consumers substituting away from the relatively more expensive good. The income effect of a price increase is reflected in a decrease in the consumer's purchasing power, which reduces demand for all *normal* goods and increases demand for *inferior* goods. In the case of Giffen goods, the good is inferior and the income effect dominates the substitution effect. Jensen and Miller (2008a) find evidence of Giffen behavior related to rice consumption among impoverished urban households in the Hunan province of China. In Afghanistan, for urban households, our findings similarly suggest that the reduction in real income dominates the change in relative attractiveness of wheat products, and therefore these household increase their consumption of (demand for) wheat products. Furthermore wheat flour is a relatively cheaper source of calories than meat or other foods. One Afghani spent on wheat flour provides 184 calories; in contrast, this same amount of money spent on lamb, beef or goat, provides fewer than 15 calories.[xxxii]

5 Conclusion

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. In 2008, the country experienced rapid increases in staple food prices due to international (global food crisis) and domestic (drought) factors. Our work contributes to understanding how the people of

Afghanistan were affected by and coped with these price shocks, providing rare insight into the short-term coping mechanisms in a poor, conflict country. Such analysis is particularly crucial in conflict countries, which may be most susceptible to shocks, but which usually have little quantitative data.

Using nationally-representative household survey data, we found that increases in the price of wheat flour led to large declines in real monthly per capita food consumption, but smaller declines in per capita daily calorie intake. Households were able to buffer the shock to energy levels by changing the composition of their diets – by moving away from nutrient-rich foods like meat, fruits and vegetables toward staples.

Urban households and households without access to agricultural land experienced relatively larger declines in the real value of food consumption than rural households and households with access to land, respectively. These findings are consistent with the literature on the global food price crisis that emphasises the vulnerabilities of the urban poor and landless rural poor. The quality-quantity tradeoff observed at the national level was observed among these subpopulations as well. Urban households and households without access to agricultural land choose to make larger reductions in the diversity of their diets than their respective counterparts, and therefore were able to maintain calorie intake to a greater extent. Finally, we found evidence that among urban households, wheat products are inferior goods that exhibit Giffen good properties.

Our findings on the short-term household responses to high food prices suggest that were another food price shock to occur, 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 availability in countries with large shares of the population living in poverty with generally poor diets. Even short term declines in food security can have serious implications. In particular, low

levels of dietary diversity have been statistically linked to poor diet quality and inadequate nutrient intake (Arimond & Ruel, 2004). Micronutrient deficiencies have been linked to negative outcomes for children and adults; these include impaired cognitive development, physical and mental disabilities, child and maternal deaths, and lower productivity (UNICEF, 2009b). Children, lactating and pregnant women, and the chronically ill are particularly susceptible to decreases in nutrient intake due to high nutrient requirements (World Food Programme and UNICEF, 2008). In addition, there may be long-term repercussions for children who are in developmental stages; recent literature highlights the links between early childhood nutrition and cognitive development (Glewwe & King, 2001) and long-term human capital formation (Alderman, Hoddinott, & Kinsey, 2006; Glewwe & Jacoby, 1995).

In light of this evidence, potential policy interventions should focus on improving household access to food and nutrients. Lowering domestic food prices is one option, for example, lowering tariffs or utilizing strategic grain reserves. During the 2007/08 crisis, the Government of Afghanistan eliminated tariffs on wheat, however as we have shown, households still suffered declines in food security. The government is currently considering setting up grain reserves at a limited number of sites spread throughout the country. Our analysis indicates that grain reserves have the potential to be beneficial in improving the calorie intake of households if they are strategically released during lean periods; however calorie intake is only part of the food-security story. Dietary diversity is an oft-ignored aspect of food-security research and similarly plays a relatively smaller role in food assistance programs.[xxxiii]

Long-run solutions recognize that the problem of food security is linked to poverty. Anti-poverty programs aimed at increasing the income of the poor and improving access to infrastructure and education could also better protect people from food-related shocks. A long-run approach alone though, can leave the population vulnerable to shocks in the short and medium run. Short-run

interventions can play a potentially important role in protecting the population from long-run adverse effects of food price shocks.

As one example, the analysis indicates that dietary quality declines significantly during a period of high prices. Examples of interventions that focus on diet quality include micronutrient supplementation programs (such as "sprinkles"), expansion of the fortified school biscuit program, wheat flour fortification (e.g., with iron, folic acid, or vitamin A), or biofortification of staple crops. WFP in Afghanistan currently has a Food for Education program which in 2010 delivered a daily snack of micronutrient enriched biscuits to over a million children. Zinc-fortified wheat is currently being analysed in the region as a new candidate strain; given the high level of stunting in Afghanistan, zinc deficiency during childhood may be linked to this adverse outcome. All of these options would help address the decline in dietary quality observed during lean times and merit consideration for either program development or expansion in Afghanistan.

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[i] 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 (Economic Research Service, 2009).

[ii] They find urban households and poor households were affected disproportionately since the former are highly dependent on the market for food and the latter spend a large portion of their total budgets on food.

[iii] Their findings suggest overall increases in poverty as a result of the food crisis, with a large share of the increases in poverty due to a worsened situation for the already poor. For most countries, they find that urban poverty rates increase more than rural poverty rates.

[iv] He finds increases in the prevalence and depth of poverty due to large increases in the price of all staple foods and the fact that most poor households, even in rural areas, are net buyers of food.

[v] While their data track the start of the crisis, the province-average increase in the price of rice was just 4 per cent between April and December of 2006. In contrast, between June 2006 and June 2008, the China CPI indicates that the price of grains more than doubled.

[vi] While we do not have panel data, we exploit the fact that the samples from each quarter of the survey are nationally representative by design.

[vii] See Ruel (2003) for a review of studies examining the efficacy of dietary diversity measures.

[viii] See Ruel *et al. (2010)* for a more detailed review of the literature on the effects of economic crises on wellbeing.

[ix] In a country like Afghanistan though, where the drug economy is large, the official National Income Accounting data are likely to significantly understate GDP. UNODC (2008) estimates that in 2007 the farm gate value of opium cultivation was US$1 billion, but this dropped to US$730 million in 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).

[x] Data are from the 2004 National Nutrition Survey.

[xi] The indices were constructed by the Afghan Central Statistics Organization, based on data from six urban areas.

[xii] The population frame was stratified into a total of 46 domains or strata. The 11 provinces with the most populous provincial centres were each stratified into urban and rural areas, producing 22 strata. Each of the remaining 23

provinces was treated as separate stratum and identified as rural. 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. In our analysis, standard errors are corrected for this stratified, multi-stage design.

[xiii] The household response rate was 99.8%. The primary sampling unit replacement rate was 3%.

[xiv] 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, pp. 235-236) for a discussion of implicit stratification.

[xv] The motivation for this flexibility is that insecure areas were not necessarily insecure throughout the year. Many areas move in and out of periods of security.

[xvi] 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.

[xvii] Of the 391 districts surveyed, price data were collected from local markets in 384 districts.

[xviii] Since consumption data were collected at the household level, it is not possible to address the issue of individual nutritional status, which depends on the intra-household allocation of resources. There is some evidence that in times of difficulty, households allocate more food to children (Block et al., 2004). In the robustness tests, we include household composition variables (numbers of men, women and children) as additional controls; the results do not change.

[xix] For example, as wheat prices in Afghanistan increased, the price of lamb relative to wheat declined; this would suggest more consumption of meat. However, the increase in wheat prices also led to a decline in real income, suggesting less consumption of meat. Therefore the sign of the overall effect is an empirical question.

[xx] 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.

[xxi] Expenditure on food away from home accounts for approximately 2% of household food expenditure.

[xxii] The food price index is based on a reference bundle of goods consumed by relatively poor households; the reference bundle was constructed to reflect regional diversity in consumption patterns. See Diewert (1993) for a discussion of the Laspeyres price index.

[xxiii] Spices 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.

[xxiv] See Weismann *et al.* (2009) for an evaluation of the effectiveness of the food consumption score in measuring household food security.

[xxv] Weights for food groups range from 0.5 to 4 based on nutrient density. Condiments receive zero nutritional weight. Frequencies are truncated at 7 for each food group.

[xxvi] Total consumption (Afghani per month) consists of expenditures on food, non-food, durables and rent, following guidelines in Deaton and Zaidi (2002). For non-food items, we use a non-food price index developed by the Central Statistics Organization to deflate the consumption estimates. The index accounts for temporal, but not spatial, differences in prices.

[xxvii] If food prices follow a cyclical pattern, dropping in the months after harvest (September-October) and slowly increasing throughout the year as stocks deplete, then we would expect price increases due to the global food crisis to be compounded by the cyclical domestic pattern. The CPI data in Figure 2 though certainly suggests that the extent of seasonal price variation is very small relative to the 2007/08 price shocks.

[xxviii] Less than 100 households (0.5%) are dropped from the analysis due to missing data. For the model where we estimate consumption of wheat products, we select the sample based on positive consumption, which produces a subsample of 19,325 households.

[xxix] The parameter estimates for the control variables mostly follow a logical pattern; for example, we observe that households with higher levels of overall consumption have higher levels of food consumption, calorie and protein intake, and dietary diversity. The coefficient on the price of kerosene is an exception in that its sign is contrary to our expectations.

[xxx] The coefficient on the base effect of the price of wheat flour corresponds to the effect for urban households; to get the effect for rural households, we add the coefficient on the interaction term (0.169) to the coefficient on the base term (-0.355).

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

[xxxii] The calculations are based on region 1 prices, the base of our food price index.

[xxxiii] During the period 2005-2009, more than 1.12 million metric tons of food aid was delivered to Afghanistan to provide emergency food relief and nutritional support to vulnerable and acutely food insecure households. More than three-fourths of this overall food aid was comprised of wheat and wheat flour.

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Table 1: Summary Statistics

	National	Rural[a]	Urban[a]	Agricultural Households[b]	Non-Agricultural Households[b]
Value of per monthly capita total consumption	1925.6	1675.5	2931.5	1752.2	2159.4
(Afghani)	(1158.2)	(823.0)	(1658.5)	(934.2)	(1370.7)
Value of per monthly capita food consumption	1157.6	1104.6	1370.8	1134.0	1189.4
(Afghani)	(583.1)	(532.3)	(715.2)	(528.4)	(648.3)
Per capita daily calorie intake (kcal)	2600.7	2577.0	2696.0	2586.8	2619.5
	(973.7)	(952.9)	(1048.1)	(976.9)	(969.0)
Per capita daily protein intake (grams)	142.0	133.7	175.3	140.2	144.4
	(298.3)	(282.7)	(352.1)	(290.1)	(309.0)
Food consumption score	60.9	59.6	66.5	61.6	60.1
	(20.0)	(19.6)	(20.9)	(19.5)	(20.7)
Price of domestic wheat flour (Afghani per kg)	25.3	25.5	24.5	25.8	24.7
	(7.4)	(7.6)	(6.6)	(7.6)	(7.1)
Price of kerosene (Afghani per liter)	3.9	3.9	3.8	3.9	3.8
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Price of vegetable oil (Afghani per kg)	4.4	4.4	4.3	4.4	4.4
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Price of domestic rice (Afghani per kg)	3.7	3.7	3.7	3.7	3.7
	(0.3)	(0.3)	(0.2)	(0.3)	(0.3)
Price of lamb (Afghani per kg)	5.2	5.2	5.3	5.2	5.2
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Price of milk (Afghani per kg)	3.3	3.2	3.3	3.3	3.3
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Age of household head	44.9	44.4	46.6	45.4	44.2
	(13.8)	(13.7)	(13.9)	(13.7)	(13.9)
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	100.00	0.80	0.20	0.57	0.43

Note: Estimates are population weighted means, with standard deviations in parentheses. [a]: Statistical tests of differences in means between Rural and Urban Households show significant differences at a 5% level of significance for all variables, with the exceptions of per capita protein availability and per capita calories availability (which is significant at 10%). [b]: Statistical tests of differences in means between Agricultural and Non-Agricultural Households show significant differences at a 5% level of significance for all variables, with the exception of the price of lamb. Source: NRVA 2007/08

Table 2: Calorie and Food Expenditure Composition

	National	Rural[a]	Urban[a]	Agricultural Households[b]	Non-Agricultural Households[b]
Calorie shares					
Grains	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
Vegetables	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					
Grains	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
Vegetables	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. [a]: Statistical tests of differences in means between Rural and Urban Households show significant differences at a 1% level of significance for all calorie and expenditure shares, with the exception of Meat/fish. [b]: Statistical tests of differences in means between Agricultural and Non-Agricultural Households show significant differences at a 1% level of significance for all calorie shares and all expenditure shares, with the exceptions of Grains and Sugar. Source: NRVA 2007/08

Table 3: Population Statistics by Quarter

	Quarter 1 (Fall)	Quarter 2 (Winter)	Quarter 3 (Spring)	Quarter 4 (Summer)
Nominal value of per capita monthly total consumption (Afgani)	2018.7	1901.3	1876.6	1913.8
Real value of per capita monthly total consumption (Afgani)	2022.9	1716.9	1518.9	1476.6
Nominal value of per capita monthly food consumption (Afgani)	1195.5	1122.1	1128.8	1183.4
Real value of per capita monthly food consumption (Afgani)	1199.7	960.3	789.2	797.8
Per capita daily calorie intake	2883.3	2724.1	2445.3	2388.7
Per capita daily protein intake	187.9	219.7	91.6	74.8
Food consumption score	67.8	61.2	57.8	57.7
Price of local wheat flour (Afghani per kg)	18.1	23.5	34.2	36.5
Price of vegetable oil (Afghani per kg)	4.2	4.3	4.5	4.5
Price of local rice (Afghani per kg)	3.5	3.5	3.8	4.0
Price of lamb (Afghani per kg)	5.2	5.2	5.2	5.2
Price of milk (Afghani per kg)	3.1	3.2	3.3	3.4
Price of kerosene (Afghani per litre)	43.1	45.8	46.8	55.5

Notes: Estimates are population weighted means. Real values reflect adjustments for spatial and temporal price differences.
Source: NRVA 2007/08

Table 4: Impact of Higher Food Prices on Food Security				
	Log real per capita food consumption	**Log daily per capita calorie intake**	**Log food consumption score**	**Log daily per capita protein intake**
Log wheat flour price	-0.202***	-0.070***	-0.102***	-0.249***
	[0.021]	[0.020]	[0.024]	[0.069]
Observations	20,491	20,491	20,491	20,491
R-squared	0.66	0.42	0.44	0.31

Notes: Each coefficient is from a separate regression with the dependent variable listed at the top of the column; 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. Controls include dummies for consumption quintiles; logs of the prices of vegetable oil, local rice, lamb, milk, and kerosene; age of household head, dummy for whether household head is married; dummy for whether household head is literate; dummies for plateau and mountainous areas; dummy for rural areas. *, **, and *** denote significance at 10%, 5%, and 1%, respectively. *Source:* NRVA 2007/08.

Table 5: Impact of Higher Food Prices on Expenditure Shares by Food Group							
	Grains	**Meat/fish**	**Dairy**	**Oil/fat**	**Vegetables**	**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-squared	0.47	0.32	0.26	0.27	0.27	0.29	0.14

See Notes for Table 4. Dependent variable is the household expenditure share devoted to the food group listed at top of column.

Table 6: Differential Impact of Higher Food Prices by Area				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log wheat flour price	-0.366***	-0.018	-0.206***	-0.450***
	[0.038]	[0.032]	[0.035]	[0.110]
Log wheat flour price X Rural dummy	0.178***	-0.057**	0.112***	0.218**
	[0.034]	[0.028]	[0.029]	[0.100]
Observations	20,491	20,491	20,491	20,491
R-squared	0.67	0.42	0.44	0.31
P-value of F-statistic of test of joint significance	0.00	0.00	0.00	0.00
See Notes for Table 4.				

Table 7: Differential Impact of Higher Food Prices on Expenditure Share by Food Group and by Area							
	Grain	Meat/fish	Dairy	Oil/fat	Vegetables	Fruit	Sugar
Log wheat flour price	0.238***	-0.035***	-0.034***	-0.022***	-0.019**	-0.100***	-0.024***
	[0.018]	[0.011]	[0.009]	[0.005]	[0.009]	[0.012]	[0.003]
Log wheat flour price X Rural 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-squared	0.48	0.32	0.26	0.27	0.27	0.29	0.15
P-value of F-statistic of test of joint	0.00	0.00	0.02	0.00	0.00	0.00	0.00
See Notes for Table 4. Dependent variable is the household expenditure share devoted to the food group listed at top of							

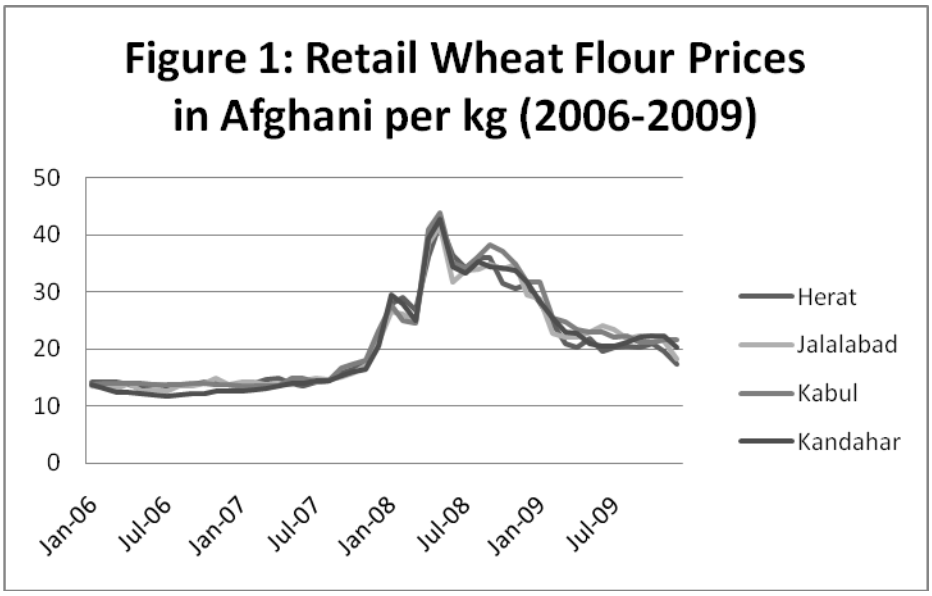
Table 8: Differential Impact of Higher Food Prices by Household Type				
	Log Real Per Capita Monthly Food Consumption	**Log Per Capita Daily Calorie Intake**	**Log Food Consumption Score**	**Log Per Capita Daily Protein Intake**
Log wheat flour price	-0.269***	-0.072***	-0.161***	-0.278***
	[0.025]	[0.022]	[0.026]	[0.074]
Log wheat flour price X Agricultural HH dummy	0.074***	-0.033*	0.089***	0.006
	[0.020]	[0.017]	[0.018]	[0.051]
Observations	20,491	20,491	20,491	20,491
R-squared	0.66	0.41	0.45	0.30
P-value of F-statistic of test of joint significance	0.00	0.00	0.00	0.00

See Notes for Table 4. Agriculture HH dummy represents households that report owning or having access to agricultural land.

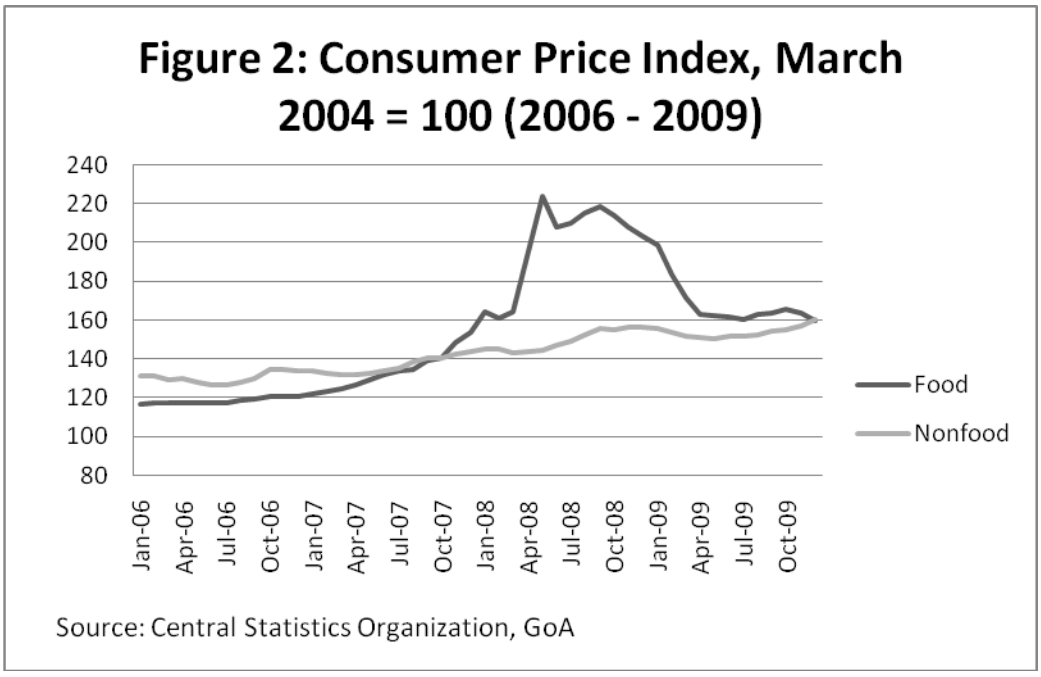
Table 9: Differential Impact of Higher Food Prices on Wheat

	Log Per Capita Daily Wheat Consumption		
Log wheat flour price	-0.039	0.152***	-0.003
	[0.034]	[0.055]	[0.039]
Log wheat flour price X Rural dummy		-0.203***	
		[0.048]	
Log wheat flour price X Agricultural HH dummy			-0.097***
			[0.027]
Observations	19,325	19,325	19,325
R-squared	0.22	0.22	0.20
P-value of F-statistic of test of joint significance	n/a	0.15	0.01

See Notes for Table 4. The sample includes all households that report positive consumption of wheat products. Agriculture HH dummy represents households that report owning or having access to agricultural land.



Source: FAO Global Information and Early Warning System (GIEWS)



Source: Central Statistics Organization, Government of Afghanistan

Rising Food Prices and Coping Strategies: Household-level Evidence from Afghanistan

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Online Appendix

Robustness Tests

We pursue several tests to evaluate the robustness of our coefficient of interest on the log of the price of domestic wheat flour; tables are available from the authors upon request.

We replace the 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 and imported wheat grains, with similar results. Although the magnitudes of some coefficients differ, the basic picture remains the same.

We next include extra controls for household demographics, that is, the number of males, females and children in the household. The results are qualitatively similar. The number of children in a household is often statistically significant; as the number of children increases, real monthly per capita food consumption increases slightly and per capita daily calorie intake decreases.

In order to capture alternative pathways by which literacy may affect food security, we replace the dummy for literate household heads with either a dummy for any literate household member or a variable for the total number of literate household members. These specifications address the possibility that literacy may be a within-household public good, as suggested by Basu and Foster (1998). The underlying hypothesis is that if anyone in the household can read, then the household as a unit has access to written material. The main results are completely robust to these alternative specifications.

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 the seven per cent of households that report receiving some form of food assistance over the past year. The results do not change.

We also include indicators of non-food coping mechanisms that a household may employ during the year to examine whether controlling for such differences across households would change the results in a significant 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.

Finally, we estimate separate regressions for each sub-population that we examine: rural, urban, agricultural, and nonagricultural households. In all cases, the coefficients of interest are qualitatively the same; in some cases, allowing more flexibility in the model affects the magnitude and significance of the coefficients on some control variables.

Table 1. The impact of higher food prices on household wellbeing

	Log real per capita monthly food consumption	Log per capita daily calorie intake	Log food consumption score	Log per capita daily protein intake
Log wheat flour price	−0.202***	−0.070***	−0.102***	−0.249***
	[0.021]	[0.020]	[0.024]	[0.069]
Rural	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 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	0.01	0.050*
	[0.012]	[0.012]	[0.013]	[0.029]
Observations	20,491	20,491	20,491	20,491
R-squared	0.66	0.42	0.44	0.31

Notes: Each column represents a separate regression; OLS estimates are population weighted. Robust standard errors – in brackets – are clustered by PSU and adjusted for stratification. Real values reflect adjustments for spatial and temporal price differences. Agriculture HH dummy represents households that report owning or having access to agricultural land. Consumption quintile 1 is excluded. Plains is excluded topography category. *, **, and *** denote significance at 10 per cent, 5 per cent, and 1 per cent, respectively.
Source: NRVA 2007/08.

Table 2. The impact of higher food prices on household wellbeing by area

	Log real per capita monthly food consumption	Log per capita daily calorie intake	Log food consumption score	Log per capita daily protein intake
Log wheat flour price	−0.366***	−0.018	−0.206***	−0.450***
	[0.038]	[0.032]	[0.035]	[0.110]
Log wheat flour price X Rural	0.178***	−0.057**	0.112***	0.218**
	[0.034]	[0.028]	[0.029]	[0.100]
Rural	−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 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	0.01	0.050*
	[0.012]	[0.012]	[0.013]	[0.029]
Observations	20,491	20,491	20,491	20,491
R-squared	0.67	0.42	0.44	0.31

Notes: See Notes Online Appendix Table 1.

Table 3. The impact of higher food prices on household wellbeing by household type

	Log real per capita monthly food consumption	Log per capita daily calorie intake	Log food consumption score	Log per capita daily protein intake
Log wheat flour price	−0.269***	−0.072***	−0.161***	−0.278***
	[0.025]	[0.022]	[0.026]	[0.074]
Log wheat flour price	0.074***	−0.033*	0.089***	0.006
X Agricultural HH	[0.020]	[0.017]	[0.018]	[0.051]
Agricultural 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 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-squared	0.66	0.41	0.45	0.30

Notes: See Notes Online Appendix Table 1. Agriculture HH dummy represents households that report owning or having access to agricultural land.