International Journal of Agricultural Management and Development (IJAMAD)
Available online on: www.ijamad.com
ISSN: 2159-5852 (Print)
ISSN:2159-5860 (Online)

Food Price Change and its Welfare Impact on Iranian Households

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Received: 14 March 2014,
Accepted: 1 May 2014

Abstract

Iran has experienced high food prices in recent years. This paper examines the welfare impacts of rising major food groups' prices on Iranian urban households using Quadratic Almost Ideal Demand System (QUAIDS) approach. The elasticity coefficients derived from QUAIDS are used to estimate Compensated Variations (CV).The study uses Iranian Household Expenditure and Income Survey (HEIS) raw data, encompassing both low and high price periods. Prices of all food and agricultural products increased during the entire survey period of 2004 to 2012. Based on our estimates, the food groups of cereals, dairy products, vegetable and pulses, Potables and Spices are necessary goods, as their budget elasticity is positive and below one at the same time. Meat, edible oils, fruits and dried fruits and Sugary products are luxury goods, with income elasticity above one. We find that the remarkable increases in food prices resulted in severe erosion of purchasing power for the Iranian urban households and they need to be compensated on average about 48% of their initial income for the food price changes they faced during the 2004 and 2012. In addition the high share of cereals in year 2012 implies that urban households shift their consumption to cheaper calorie source. This figure is confirmed with the decline in the share of meat, dairy Products, fruits and dried fruits, vegetables and pulses and potables expenditure.

Keywords:
Welfare Effects, Food price change, QUAIDS demand system, Compensated Variation (CV)

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INTRODUCTION

Prices of many staple foods have increased sharply in recent years. International prices of wheat and maize in 2008 were three times higher than in early 2003, and the price of rice was five times higher (von Braun, 2008). Food prices had plummeted after peaking in the second quarter of 2008, but have risen dramatically, except for meat and dairy products and partly for rice, since July/August 2010. By early of March 2011, the food prices passed the level that reached in the second quarter of 2008 (FAO, 2011). While higher food prices are a threat for many poor people in developing countries who spend nearly 60-80 percent of total budget on food (see Wood *et al*., 2010; Mitchell, 2008; Ivanic and Martin, 2008; von Braun, 2008). Iran was obviously not immune from these increases. Iran is amongst the nations which are experiencing high inflation rates during the past few years. The general consumer price index (CPI) of Iran has increased from 100 in 2004 to 277.2 in 2012 (Central Bank of Iran, 2012). This indicates that general price level has increased by more than 177% during last eight years. The situation is even worst in case of food inflation, as it has shown an increase of more than 220% during the same period (Central Bank of Iran, 2012).

Changes in food consumption and expenditures in developed and developing country households have been a topic for research throughout the twentieth century, as such it is well known that income influences food expenditure patterns (Abdulai, 2002). Knowledge of demand structure and consumer behavior is essential for a wide range of development policy questions like improvement in nutritional status, food subsidy, sectoral and Macroeconomic policy analysis. An analysis of food consumption patterns and how they are likely to shift due to change in income and relative price in particular help in assessing the food security-related policy issues in the agricultural sector (Mital, 2010). The change in demand structure is based on a matrix of price and income elasticity of demand for food groups. Thus, the techniques used in estimating this elasticity have to be based on a functional form that is based on realistic assumptions. The present paper in this context applies Quadratic Almost Ideal Demand System (QUAIDS) Technique on the food demand system. QUAIDS model is an extended form of Almost Ideal Demand System (AIDS) model, where the assumption of linearity in the expenditure function is given away.

Several demand studies have confirmed the appropriateness of QUAIDS in modeling preferences. Banks *et al*. (1997) and Blundell and Robin (1999) used expenditure data on broad consumption goods from the U.K., and Fisher *et al*. (2001) applied the model to the U.S. aggregate consumption data, Abdulai (2002) applied QUAIDS to the food expenditure data from Switzerland, Abdulai and Aubert (2004) on Tanzanian food expenditure data, Molina and Gil (2005) using aggregate consumption data from Peru, Gould and Villarreal (2006) using food expenditure data from urban China, Pangaribowo and Tsegai (2011) on Indonesian food expenditure data and Tefera (2012) using Rural Ethiopia food expenditure data. In contrast to the several of empirical work on QUAIDS food demand system in other countries, very few studies have analyzed food consumption and expenditure of Iranian households by QUAIDS model (e.g., Sohrabi, 2009; Mohammadzadeh, 2011). Unlike past studies using the time-series aggregated data, this is the first empirical analyses of Iranian food consumption pattern using the cross-sectional household survey data. There are several advantages in using the cross-sectional household survey data. First, by using household survey data, economic theory can be directly applied to individual household behavior without involving the aggregation process. The aggregation process generally impose restrictions on the individual household behaviors and thus, the relationship found using the aggregate data cannot be simply interpreted according to the economic theory based on the individual household behavior. The second advantage is that cross-sectional data is not affected by the structural change over time (Tokoyama, 2007). To our knowledge, this study is the first examination of welfare impacts of soaring food prices on households using Quadratic Almost Ideal demand System analysis with cross-sectional data in the context of Iran but there exists enough international literature on the exploring the welfare effects of price changes. In this regard, this study presents review of the studies estimating welfare effects through compensation variation.

Ackah and Appleton (2005) examined the welfare effects of trade and agricultural policy reforms for Ghanaian households during year 1991-92 and 1998-99. The welfare effects of price changes are calculated for cereal, tubers, fish, meat, alcohol and all other food in terms of compensating variations. The results suggest that household consumption did respond to relative prices and real income change resulted from policy reforms. It was found that all household groups suffered and welfare losses arising from the food price increases during the 1990s. Wood and *et al*. (2009) focused on quantifying the welfare losses for Mexican households due to the world food price increases from 2006 to 2009. The authors measured the welfare effects of tortilla price increase, differentiating by household status (poor and non-poor) and by region (border, north, central and south). The study focuses on the main staple foods to accurately represent the Mexican diet. An appropriate welfare analysis based on compensating and equivalent variation for the representative commodities, differentiated by geographic region and household status, observes small welfare losses for non-poor large differences for poor and non-poor households. Adding tortilla income loss to compensating variation it is found that non-poor households lose 9 percent of their food budget, on average, and poor households lose about 18 percent of their food budget, on average. These results provide evidence that poor Mexican households are the ones who experience significant welfare losses from significant food price increase. Alem (2011) investigate how urban households in Ethiopia coped with the food price shock between 2004 and 2008. Regression results indicate that households with low asset levels, and casual workers, were particularly adversely affected by high food prices.

The present study investigates the welfare effects of rising food prices in urban Iran, based on two household integrated surveys i.e., 2004 and 2012. The remainder of the paper is structured as follows. Section 2 discusses the methodology, while section three presents the data and descriptive statistics. The results are presented in section four and section five concludes.

MATERIALS AND METHODS

Compensated variation

The welfare impact of food price changes on households can be measured in monetary terms by using the money metric indirect utility function. Using a set of reference prices, we can compute how well - or worse off households were, moving from their initial utility level to the new or post-reform utility level in response to the changes in food prices. Following the usual practice in this literature (Minot and Goletti, 2000; Friedman and Levinsohn, 2002; Niimi, 2005; Vu and Glewwe, 2010), we characterize the welfare effects of food price changes as the compensating variation (CV).

Suppose c (u, p) denotes the expenditure function which defines the minimum expenditure required to achieve a specific utility level, u, at a given price vector p facing the household (see Deaton and Muellbauer, 1980). Assume that prices change from p_0 to p_1. The money measure of the resultant welfare effect is the difference between the minimum expenditure required to achieve the original utility level, at the new prices, and the initial total expenditure. In other words, CV is the amount of money the household would need to be given at the new set of (higher) prices in order to attain the pre-reform initial level of utility. Subscripts refer to before (0) and after (1) price changes, in this study 2004 (p_0) and 2012 (p_1) respectively. Hence, in terms of the expenditure (cost) function:

$$CV = c(P_1, u_0) - c(P_0, u_0) \quad (1)$$

The CV can be approximated using first order Taylor expansion of the minimum expenditure function as (Friedman and Levinsohn, 2002):

$$\ln C^h = \sum_{i=1}^{n} w_i^h \, \Delta \ln P_i^h \quad (2)$$

Where *i* subscripts refers to the commodity group in the commodity system and *h* refers the household. w_i^h is the budget share devoted to good *i* in household *h*'s budget, which is obtained by dividing the pre-reform expenditure on the good by households total expenditure on all goods.

The costs of attaining pre-inflation utility levels will increase less rapidly than indicated by (2) as the household has ability to switch away from commodities whose relative prices have disproportionately increased. Thus this measure of compensating variation provides only a maximum bound of the impact of the inflation, ignoring the behavioral responses, the substitution effects towards goods whose prices are relatively lower. Hence, in calculating the household welfare effect, we use the second order Taylor series expansion approximation that utilizes own and cross price elasticities to capture household's behavioral responses. This will be expressed as (Friedman and Levinsohn, 2002):

$$\Delta \ln C^h = \sum_{i=1}^{n} w_i^h \, \Delta \ln P_i^h + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} w_i^h \, \varepsilon_{ij} \, \Delta \ln P_i^h \, \Delta \ln P_j^h \tag{3}$$

where ε_{ij} is Hicks (1939) compensated price elasticity of commodity group i with respect to price change of group *j*.

Equation (3) indicates that the welfare effect depends on the size of price changes as well as the importance of a particular commodity in the household consumption basket and the Hicks price elasticity. Once can obtains the ε_{ij} by estimating the food demand system. The two compensating variation specifications given in (2) and (3) are used to identify the consumption effects of price changes to households in Iran between 2004 and 2012.

Deman system models in emprical studies

Estimating welfare impact of rising food prices requires reliable price elasticity that could be commonly derived from utility-based demand models. The AIDS model has been the most commonly used specification in applied demand analysis for more than two decades as it satisfies a number of desirable demand properties. Moreover, it allows a linear approximation at estimation stage and has budget shares as dependent variables and logarithm of prices and real expenditure/income as repressors. Banks *et al.* (1997), however, observed the existence of nonlinearity in the budget shares for some, if not all commodities and subsequently introduced an extension to permit non-linear Engle Curves. They proposed a generalized Quadratic Almost Ideal Demand System (QUAIDS) model which has budget shares that are quadratic in log total expenditure. Moreover, the QUAIDS retains the desirable properties of the popular AIDS model nested within it and allows for flexibility of a rank three specification in the Engel curves. Therefore, QUAIDS has been chosen as the demand model for empirical strategy of estimation.

Empirical Model: Quadratic Almost Ideal Demand System

The complete demand system employed in this study is Quadratic Almost Ideal Demand System. As mentioned above, QUAIDS is an extension from Almost Ideal Demand System. QUAIDS includes higher order of expenditure term to capture the non-linearity of Engel Curve. QUAIDS (Banks *et al.*, 1997) assumes that household's preferences follow quadratic logarithmic of household expenditure functions as the following:

$$\ln c(u,p) = \ln a(p) + \frac{u b(p)}{1-\lambda(p)b(p)u} \tag{4}$$

Where *u* is utility, *p* is a set of prices, *a(p)* is a function that is homogenous of degree one in prices, *b(p)* and *λ(p)* are functions that are homogenous of degree zero in prices. The household cost function in QUAIDS is similar to AIDS if λ set to zero. The indirect utility function accordingly is as follows:

$$\ln V = \left\{ \left[\frac{\ln m - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1} \tag{5}$$

where m is the total expenditure, *ln a(p)* and *b(p)* are the Translog and Cobb-Douglas functions of prices as in AIDS formulation:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} \gamma_{ij} \, \ln p_i \, \ln p_j \tag{6}$$

$$b(p) = \prod_{i=1}^{n} P_i^{\beta_i} \tag{7}$$

The λ(p) in QUAIDS is defined as:

$$\lambda(p) = \sum_{i=1}^{K} \lambda_i \ln p_i \quad , where \sum_{i=1}^{K} \lambda_i = 0 \tag{8}$$

The subscript i =1… K in the model denotes the number of goods in the demand systems. Applying Shephard's lemma to the cost function (1) or Roy's identity to the indirect utility function (2), the QUAIDS expenditure shares is given as the following:

$$W_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left\{\frac{m}{P(p)}\right\} + \frac{\lambda_i}{b(p)} \left[\ln\left\{\frac{m}{P(p)}\right\}\right]^2 \quad (9)$$

where, w_i is food budget share of food groups and *α, γ, β,* and *λ* are parameters. When *λ* is equal to zero, the equation (6) represents AIDS model.

From the QUAIDS model provided in equation (9), expenditure (μi) and price elasticities (μj) can be derived by differentiating equation (9) with respect to *ln m* and lnp_j, respectively. The derivation results are:

$$\mu_i \equiv \frac{\partial w_i}{\partial \ln m} = \beta_i + \frac{2\lambda_i}{b(p)} \left\{ln\left[\frac{m}{\alpha(p)}\right]\right\} \quad (10)$$

$$\mu_j \equiv \frac{\partial w_i}{\partial \ln P_j} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_{K} \gamma_{jK} \ln P_i\right) - \frac{\lambda_i \beta_i}{b(P)} \left\{ln\left[\frac{x}{a(P)}\right]\right\}^2 \quad (11)$$

The parameter α_i in equation (6) is the share of an item in the budget of a subsistence household, while $\beta_i + 2(\lambda_i/(b(P))[ln(x/a(p))]^2$ measures the effect of one per cent increase of real expenditure on budget share of good i. The expenditure elasticities can be calculated by:

$$e_i = \mu_i / w_i + 1 \quad (12)$$

From μ_{ij}, Marshallian uncompensated price elasticities can be calculated as:

$$e_{ij}^{u} = \frac{\mu_{ij}}{w_i} - \delta_{ij} \quad (13)$$

Where δ_{ij} is equal to one if i=j and equal to zero if i≠j. From slutsky equation, Hicksian or compensated price elasticities are calculated as follows:

$$e_{ij}^{c} = e_{ij}^{u} + w_j e_i \quad (14)$$

The system is estimated using Brain P Poi (2008) "demand-system estimation: update, Non-Linear Seemingly Unrelated regression (NLSUR) model", written in STATA.

Data Sources

We use the 2004 and 2012 rounds of the Household Expenditure and Income Survey (HEIS) collected by the Statistical Center of Iran (SCI). The HEIS is the principal annual household survey collected in Iran. It relies on a multistage stratified sampling method and has been collected without pause for the past fifty years. The surveys record everything that the interviewed households declare as consumed for one month. Respondents were asked to provide information on how much they spent on each item and on the quantity consumed. A total of 11,619 urban households for the 2004 sample; and 18,696 urban households for 2012 sample were covered in these surveys. The published form of HEIS data gives the information in groups form, such as expenditure made by entire group on the consumption of a particular commodity group, but for our analysis we need grass root level information of each household. Therefore instead of relying on published we have used raw data of HEIS. For the both surveys a total of 230 food items were covered. In order to maintain reasonable parameters, the all food items were reclassified into nine food groups: Cereals, Meat, Dairy Products, Edible Oils, Fruits and dried fruits, Vegetables and Pulses, Sugary, Spices and Condiments, and Potables. Table1 lists the groupings and food items in each group. The food items are aggregated based on Classification of Individual Consumption by Purpose (COICOP). These aggregated commodities make almost 100% of the food consumption basket for the urban households in Iran. Budget shares of the aggregate foods are calculated by dividing the expenditure on each sub-group by the overall food expenditure. One of the major challenges for commodity groupings is on how to compute prices for aggregated food bundles. For our analysis, price indices for the aggregated food bundles were computed using the geometric mean with expenditure shares as weights. Each group price is a weighted average of prices on specific items faced by the household.

Table 2 gives an overview of the consumption data by reporting budget shares for aggregated food bundles. Cereals are the major group in the Iranian diet and account for the lion's share of

Table 1: Classifications of major food groups

Food Groups		Details
Group 1	Cereals	Rice and Rice flour, Wheat and Wheat flour, Bread, Biscuits, Pastry, Confections and Other Cereal Products.
Group 2	Meat	Mutton, Beef, Chicken, Fish and other meat products.
Group 3	Dairy Products	Eggs, Milk and Dairy products except butter.
Group 4	Edible Oils	Edible Oils, Fats and Butter.
Group 5	Fruits and dried fruits	Nuts, Treed fruits and other fresh fruits.
Group 6	Vegetables and Pulses	Fresh vegetables, Dried vegetables, Chickpea, Bean, Split pea, Soybean and other Pulses.
Group 7	Sugary	Hard Sugar, Sugar, Honey, Molasses, and other Sugary Products
Group 8	Potables	Tea, Coffee, Cocoa and Non-alcoholic drinks.
Group 9	Spices and condiments	Salt, Tomato paste, Ketchup, Lemon juice, Sourness, Pickled Cucumbers and other Spices.

urban household food budget (on average, about 26 percent). The high share of cereals implies that households might shift their consumption to cheaper calorie source between 2004 and 2012 years. This figure is confirmed with the decline in the share of meat, dairy Products, fruits and dried fruits, vegetables and pulses and potables expenditure. These aggregated commodities make almost 100% of the food consumption basket for the urban households in Iran. Alongside the budget shares, Table 2 also reports the average price increase for each aggregated food bundle. This is accomplished by calculating the price increase of the aggregated foods using expenditure shares to weight the price increases of each constituent individual food. If one couples the fact that cereals price is the one that increased more between 2004 and 2012 among the food groups and that cereals represent almost 26.4% of the food budget of the population in our 2012 sample, it follows that households in our survey, are affected to a large extent by the increase in prices.

RESULTS AND DISCUSSION

Firstly we discus results obtained from estimating the system of demand equations that provides income, own and cross price elasticities. This is done in stages using the overall sample. Both Marshallian (uncompensated) and Hicksian (compensated) price elasticities for 2004 and 2012 evaluated at the sample means are reported in Tables 3 and 4 respectively, which include the cross-price elasticity estimates. The systems of equations in QUAIDS are estimated through imposing theoretical restrictions and applying Non-Linear Seemingly Unrelated regression (NLSUR). In all estimation the standard errors reported are robust to heteroskedasticity.

As shown in Tables 3 and 4, all the estimated own-price elasticities are negative. Consistent with consumer demand theory, there are exists an inverse relationship between changes in own-price indexes and quantities demanded. In most cases the absolute value of the own-price elasticity is less than unity, meaning that they are

Table 2. Urban households food budget shares and Proportionate price changes (in %)

Food Groups	Survey 2004	Survey 2012	Mean price increase %
Cereals	0.182	0.264	332
Meat	0.266	0.236	189
Dairy Products	0.117	0.106	172
Edible Oils	0.052	0.05	230
Fruits & dried fruits	0.115	0.113	179
Vegetables & Pulses	0.122	0.109	209
Sugary	0.059	0.047	184
Potables	0.049	0.044	127
Spices	0.037	0.031	140

Source: Author’s computation from HEIS raw data

Table 3: Marshallian and Hicksian Demand Elasticity Matrix, 2004

	Cereals	Meat	Dairy Prod-ucts	Edible Oils	Fruits& dried fruits	Veg-etable & Pulses	Sugary	Potable	Spices
Uncompensated									
Cereals	-0.48	-0.14	-0.01	-0.04	-0.06	-0.09	-0.03	0.011	-0.01
	(0.011)**	(0.008)**	(0.003)**	(0.003)**	(0.003)**	(0.004)**	(0.002)**	(0.001)**	(0.001)**
Meat	-0.16	-0.89	0.001	-0.06	-0.01	-0.08	-0.01	0.015	-0.01
	(0.006)**	(0.010)**	(0.003)	(0.003)**	(0.003)	(0.005)**	(0.002)**	(0.001)**	(0.001)**
Dairy Products	-0.01	0.111	-0.98	0.042	-0.04	0.048	0.007	0.002	0.026
	(0.006)	(0.008)**	(0.006)**	(0.003)**	(0.004)**	(0.003)**	(0.001)**	(0.001)	(0.001)**
Edible Oils	-0.16	-0.27	0.072	-0.61	-0.05	0.032	-0.04	0.014	0.016
	(0.011)**	(0.020)**	(0.007)**	(0.016)**	(0.009)**	(0.015)*	(0.006)**	(0.003)**	(0.003)**
Fruits & dried fruits	-0.13	0.018	-0.07	-0.03	-0.79	-0.06	-0.0001	-0.02	0.001
	(0.006)**	(0.008)	(0.003)**	(0.003)**	(0.006)**	(0.005)**	(0.003)	(0.001)**	(0.001)
Vegetables &	-0.16	-0.11	0.023	0.014	-0.05	-0.71	-0.02	0.002	0.018
Pulses	(0.007)**	(0.012)**	(0.004)**	(0.006)+	(0.004)**	(0.014)**	(0.004)**	(0.001)	(0.002)**
Sugary	-0.14	-0.0001	-.02	-0.04	0.0001	-0.05	-0.79	-0.02	-0.01
	(0.009)**	(0.013)	(0.005)**	(0.005)**	(0.005)	(0.009)**	(0.007)**	(0.002)**	(0.002)*
Potables	0.061	0.193	0.013	0.027	-0.01	0.034	-0.0001	-1.07	0.005
	(0.007)**	(0.010)**	(0.004)**	(0.004)**	(0.005)*	(0.005)**	(0.003)	(0.003)**	(0.002)*
Spices	-0.07	0.01	0.058	0.022	0.013	0.059	-0.01	-0.01	-1.06
	(0.009)**	(0.012)	(0.005)**	(0.005)**	(0.005)+	(0.007)**	(0.004)+	(0.002)*	(0.004)**
Compensated									
Cereals	-0.33	0.086	0.087	0.006	0.042	0.015	0.018	0.052	0.023
	(0.010)**	(0.008)**	(0.003)**	(0.003)*	(0.003**	(0.004)**	(0.002)**	(0.001)**	(0.001)**
Meat	0.058	-0.57	0.142	-0.0001	0.132	0.07	0.062	0.074	0.035
	(0.005)**	(0.009)**	(0.003)**	(0.003)	(0.003)**	(0.005)**	(0.002)**	(0.001)**	(0.001)**
Dairy Products	0.135	0.322	-0.89	0.083	0.054	0.145	0.054	0.041	0.055
	(0.005)**	(0.008)**	(0.005)**	(0.003)**	(0.003)**	(0.005)**	(0.003)**	(0.001)**	(0.001)**
Edible Oils	0.02	-0.01	0.189	-0.55	0.062	0.153	0.022	0.063	0.053
	(0.011)**	(0.018)	(0.008)**	(0.016)**	(0.008)**	(0.014)**	(0.006)**	(0.004)**	(0.003)**
Fruits & dried fruits	0.064	0.306	0.054	0.028	-0.66	0.072	0.062	0.033	0.041
	(0.005)**	(0.008)**	(0.003)**	(0.003)**	(0.006)**	(0.004)**	(0.002)**	(0.002)**	(0.001)**
Vegetables &	0.023	0.151	0.139	0.065	0.068	-0.59	0.037	0.051	0.054
Pulses	(0.006)**	(0.012)**	(0.004)**	(0.006)**	(0.004)**	(0.014**	(0.004)**	(0.002)**	(0.002)**
Sugary	0.055	0.28	0.107	0.019	0.122	0.076	-0.73	0.034	0.032
	(0.008)**	(0.012)**	(0.006)**	(0.005)**	(0.005)**	(0.008)**	(0.007)**	(0.002)**	(0.002)**
Potables	0.197	0.393	0.101	0.066	0.076	0.126	0.041	-1.03	0.033
	(0.006)**	(0.009)**	(0.004)**	(0.004)**	(0.004)**	(0.004)**	(0.003)**	(0.003)**	(0.002)**
Spices	0.114	0.252	0.175	0.074	0.129	0.182	0.051	0.044	-1.02
	(0.008)**	(0.011)**	(0.005)**	(0.005)**	(0.007)**	(0.004)**	(0.002)**	(0.002)**	(0.004)**

p+<0.1; p*<0.05; p**<0.01; Note: Robust standard errors in brackets

not price elastic. The compensated price elasticities provide a more accurate picture of cross-price substitution between food groups, since they are a measure of substitution effects net of income. In the matrix of the compensated price elasticities (in tables 3 and 4), it can be observed that own price effects are relatively large and negative. They are, in absolute terms, smaller than the uncompensated elasticities. Even after the income-compensation, Potables and Spices (in tables 3 and 4) remain the only commodities with own-price elasticity exceeding unity. For the remainder of the food groups, the absolute values of the own-price elasticities are smaller than unity, meaning that they are not price elastic. The fact that the signs of some compensated elasticities are different from those of the uncompensated elasticities suggests that expenditure effects are significant in affecting consumer demand decisions. Table 5 presents expenditure elasticities, for both 2004 and 2012. All food groups had positive consumption expenditure

Table 4: Marshallian and Hicksian Demand Elasticity Matrix, 2012

	Cereals	Meat	Dairy Products	Edible Oils	Fruits&dried fruits	Veg-etable & Pulses	Potable	Spices
Uncompensated								
Cereals	-0.75	-0.17	0.008	0.0036	-0.03	-0.04	0.016	0.007
	(0.009)**	(0.007)**	(0.002)**	(0.002)	(0.002)**	(0.003)**	(0.0009)**	(0.001)**
Meat	-0.23	-0.71	-0.01	-0.03	-0.004	-0.10	-0.003	-0.008
	(0.008)**	(0.009)**	(0.002)**	(0.002)**	(0.002)	(0.003)**	(0.001)**	(0.001)**
Dairy Products	0.059	-0.04	-1.01	0.05	-0.03	0.01	0.01	0.02
	(0.006)**	(0.006)**	(0.004)**	(0.003)**	(0.003)**	(0.004)**	(0.001)**	(0.001)**
Edible Oils	0.003	-0.14	0.08	-0.91	-0.03	-0.04	0.018	0.017
	(0.012)	(0.013)**	(0.007)**	(0.02)**	(0.005)**	(0.012)**	(0.001)**	(0.002)**
Fruits & dried fruits	-0.08	0.01	-0.05	-0.01	-0.81	-0.04	-0.01	-0.005
	(0.006)**	(0.006)**	(0.002)**	(0.002)**	(0.004)**	(0.003)**	(0.001)**	(0.001)**
Vegetables & Pulses	-0.09	-0.17	0.008	-0.01	-0.03	-0.59	0.001	0.01
	(0.007)**	(0.007)**	(0.004)*	(0.005)*	(0.003)**	(0.010)**	(0.001)	(0.001)**
Sugary	-0.08	-0.07	0.013	-0.006	-0.03	-0.079	-0.01	-0.01
	(0.010)**	(0.011)**	(0.005)*	(0.005)	(0.004)**	(0.006)**	(0.001)**	(0.002)**
Potables	0.12	0.03	0.02	0.02	-0.008	0.009	-1.08	-0.006
	(0.007)**	(0.007)**	(0.003)**	(0.002)**	(0.003)*	(0.003)**	(0.002)**	(0.001)**
Spices	0.03	-0.05	0.07	0.02	-0.02	0.02	-0.01	-1.116
	(0.009)**	(0.01)**	(0.004)**	(0.004)**	(0.004)**	(0.005)**	(0.001)**	(0.003)**
Compensated								
Cereals	-0.49	0.06	0.10	0.05	0.07	0.06	0.05	0.03
	(0.009)**	(0.007)**	(0.002)**	(0.002)**	(0.002)**	(0.003)**	(0.001)**	(0.001)**
Meat	0.06	-0.44	0.1	0.01	0.12	0.01	0.04	0.02
	(0.007)**	(0.008)**	(0.002)**	(0.002)**	(0.002)**	(0.003)**	(0.001)**	(0.001)**
Dairy Products	0.27	0.23	-0.92	0.09	0.06	0.10	0.04	0.05
	(0.005)**	(0.006)**	(0.004)**	(0.003)**	(0.003)**	(0.004)**	(0.001)**	(0.001)**
Edible Oils	0.27	0.09	0.19	-0.86	0.08	0.06	0.06	0.04
	(0.011)**	(0.013)**	(0.007)**	(0.020)**	(0.005)**	(0.012)**	(0.002)**	(0.002)**
Fruits & dried fruits	0.18	0.26	0.05	0.03	-0.69	0.06	0.03	0.02
	(0.005)**	(0.001)**	(0.002)**	(0.002)**	(0.004)**	(0.002)**	(0.001)**	(0.001)**
Vegetables & Pulses	0.14	0.03	0.10	0.03	0.06	-0.48	0.04	0.04
	(0.007)**	(0.007)**	(0.004)**	(0.005)**	(0.003)**	(0.010)**	(0.001)**	(0.001)**
Sugary	0.21	0.19	0.13	0.05	0.09	0.04	0.03	0.02
	(0.009)**	(0.010)**	(0.005)**	(0.005)**	(0.004)**	(0.006)**	(0.002)**	(0.002)**
Potables	0.35	0.24	0.12	0.07	0.09	0.10	-1.04	0.02
	(0.005)**	(0.006)**	(0.003)**	(0.002)**	(0.003)**	(0.003)**	(0.002)**	(0.001)**
Spices	0.31	0.19	0.18	0.07	0.09	0.14	0.03	-1.082
	(0.008)**	(0.009)**	(0.004)**	(0.004)**	(0.004)**	(0.005)**	(0.002)**	(0.003)*

p+<0.1; p*<0.05; p**<0.01; Note: Robust standard errors in brackets

elasticities, implying that no food group was classified as "inferior"; all were "normal goods". In 2004, cereals, dairy products, vegetable and pulses, Potables and Spices were necessities while meat, edible oils, fruits and dried fruits and finally sugary products were found to be luxury. This could be a reflection that most urban households are not yet consuming the desired quantities and hence suggest that as their income increases they will spend proportionately more on consumption of those food groups under consideration. In 2012, expenditure elasticities hold in the same patterns as with 2004 results.

Welfare impacts of high prices

Making use of the household budget share, observed proportionate price change and the estimated consumer responses, we assess the welfare effects of food price changes in Iran. The measurement of the 'dynamic' household welfare effect, one that jointly considers (static) first order effects in consumption as well as con-

Table 5: Expenditure Elasticity Estimates from QUAIDS Model for 2004 and 2012 Surveys

	Cereals	Meat	Dairy Products	Edible Oils	Fruits& dried fruits	Vegetable & Pulses	Sugary	Potable	Spices
2004	0.84	1.2	0.79	1.0	1.08	0.98	1.05	0.74	0.99
	(0.011)**	(0.008)**	(0.010)**	(0.019)**	(0.010)**	(0.0009)**	(0.012)**	(0.014)**	(0.013)**
2012	0.96	1.13	0.81	1.02	1.02	0.90	1.1	0.87	0.99
	(0.006)**	(0.008)**	(0.007)**	(0.011)**	(0.008)**	(0.006)**	(0.012)**	(0.012)**	(0.011)**

p+<0.1; p*<0.05; p**<0.01; Note: Robust standard errors in brackets

sumption responses, is the object of this subsection. For comparison purposes, we also present estimates from a first-order approximation to the food price changes, which holding constant consumers' behavioral responses and assuming households are not able to substitutes. To do that we utilize the estimated Hicksian elasticities for 2004 to measure the welfare impact of food price change observed between 2004 and 2012. The CV measure how much money we would have to give the consumers after the price change to make them as well of as they were before the price change, that is, as in 2004 for the period between 2004 and 2012. Table 6 presents welfare effects. The first column presents the first-order effects computed using equation (2) while Columns 2 and 3 thus measure dynamic effects, which jointly consider the first order and consumer responses effects in consumption as a share of household food expenditure and total household expenditure in 2004, respectively.

Households

Results show that on average, Iranian households need to be reimbursed around 48.41% of their 2004 total household expenditures due to food prices changes in order to make them in 2012 as well off as they were in 2004 (the initial situation). As is readily apparent, the first order effect as expected does overstate the welfare losses, even if marginally.

CONCLUSIONS

The paper analyses welfare impact of rising food prices for urban households in Iran based on Quadratic Almost Ideal Demand System (QUAIDS), followed by estimation of compensation variation (CV). For the first time we make use of the Iran Households Expenditure and Income Survey (HEIS) raw data collected before and after the sharp increase in food prices between 2004 and 2012. The QUAIDS model was estimated for nine food groups; Cereals, Meat, Dairy Products, Edible Oils, Fruits and dried fruits, Vegetables and Pulses, Sugary, Spices and Condiments, and Potables. The estimated price and expenditure elasticities are plausible and consistent with economic theory: all own-price elasticities were negative and statistically significant. Similarly, estimated expenditure elasticities were positive and statistically significant for all food groups as is expected. Based on our estimates cereals, dairy products, vegetable and pulses, Potables and Spices were necessities while meat, edible oils, fruits and dried fruits and Sugary products were found to be luxury. Although few studies have analyzed food consumption and expenditure of Iranian urban households by QUAIDS model (e.g., Sohrabi, 2009 and Mohammadzadeh, 2011) and by other functional forms (e.g., Seraj, 2003, Hashemi Bonab and Ghahremanzadeh, 2005, Mojaver Hosseini, 2007), but their estimated expenditure elasticities are not directly comparable to ours due to a number of reasons including the differences in the sample (pooled/not pooled), the absence of price variables and different food categories used. It is, however, worth comparing them with those foregoing results. The estimated compensated price elasticities are used to compute compensating variation for the observed proportionate price change. We find that the remarkable increases in food prices resulted in severe erosion of purchasing power for the urban households. Also the high share of cereals in year 2012 implies that urban households shift their consumption to cheaper calorie source in recent years. This figure is confirmed with the decline in the share of meat, dairy Products, fruits and dried fruits, vegetables and pulses and potables expenditure.

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