

VAT reforms and Moroccan household's food consumption: microsimulation analyses through the QAIDS model (2001-2014)

Mounia Bettah*, Abdeljaouad Ezzrari**, Mohamed Fouzi Mourji***

* PhD student, Hassan II University, Faculty of Juridical, Economic and Social Sciences Mohammedia - Morocco

** Researcher in economics affiliated to LASAARE and head manager at the Moroccan High Commission for Planning

*** Director of LASAARE and Professor at Hassan II University, Faculty of Juridical, Economic and Social Sciences Ain Chock –Casablanca- Morocco.

Correspondence: fmourji@gmail.com

Abstract

This study consists in determining how changes in indirect taxation, particularly VAT, affect differently various groups of household consumption's structure. To do so, we applied the Quadratic Almost Ideal Demand System (QAIDS) to data from the 2000/2001 and 2013/2014 National Household Consumption and Expenditure Surveys to estimate elasticities of demand for eight food groups and at the level of five household strata. Living standard differences of the diverse layers of the population influence their preferences and reactions to economic shocks, which are very different and change over time.

Indeed, it appears that Moroccan households tend to consume less vegetables and high-calorie products (sugars and cereals) in favor of the consumption of fruit and protein-rich foods (meat, fish, fats, milk and dairy products). Moreover, the poorest households consume insufficient quantities of nutritious food products such as dairy products, fish and fruit in 2014, unlike in 2001. In addition, it appears that extending the scope of VAT to basic products, especially cereals, would affect Moroccan households' consumption patterns, especially the poorest, for cereals as well as for other products rich in nutrients such as fish and fruit.

keywords: VAT, consumption, poverty, QAIDS, elasticity, micro-simulation.

1. Context and objectives

The Value Added Tax (VAT), which is an indirect tax based on consumption, constitutes in Morocco 70% of indirect taxes revenues and 36% of overall tax revenues, on average over the last decade, representing the main source of funding for the State and local authorities' budget.

Because of the importance of this tax, Morocco has been led to undertake a gradual reform of VAT, which since 1986 has sought, through rate differentiation and exemptions, to make it an instrument of equity and redistribution. Until 1986, the Turnover Tax (TCA prior to VAT) had 11 different rates which were reduced to 6 when VAT was introduced until 1992, then to 5 currently (0%, 7%, 10%, 14% and 20%). However, this strategy of reducing the number of rates is

often made to the detriment of the redistributive role of the tax and the reduction of inequalities.

In Morocco, more than 1.6 million people are considered poor and 4.2 million vulnerable, although the situation has generally improved: between 2001 and 2014, monetary poverty and vulnerability have decreased by 4.8% and 12.5%, respectively (HCP, World Bank; 2017). However, Morocco is still considered the most unequal country in North Africa, despite a slight decline in its Gini coefficient over the past decade (Oxfam 2018).

Inequalities are observed at the level of household expenditure. Therefore, poor households benefit least from the VAT rates differentiating policy. Although poor households spend more than half of their expenditure on food, while rich households spend only a quarter of their expenditure on food, the latter absorb a greater volume. It is important to mention that *food consumption is characterized by strong disparities between the wealthiest 10% of the population and the poorest 10%. These disparities are very marked for nutritionally rich products, notably dairy products (150.5 against 15.6 liters per person per year), eggs (191 against 35 units per person per year), meat (59.8 against 11.1 Kg per head per year), fish (25.1 against 4.8 Kg) and fruit (147 against 21.6 Kg). On the other hand, these disparities are less important for cereals, vegetables, legumes, oils and sugars (HCP 2016).*

Furthermore, we note that the rich class benefits the most from the subsidies. In 2014, the structure of household consumption of subsidies, according to social classes, shows that the wealthier class benefits from 14.4% of the total subsidies, which is higher than its demographic weight of 10.0%. The middle class represents 58.7% of the population and receives 62.2% of food and butane subsidies. By product, this proportion is 60.6% for sugar, 63.0% for national soft wheat flour, and 62.3% for butane. On the other hand, the modest class, with a demographic weight of 31.2%, only benefits from 23% of food and butane subsidies (HCP & World Bank; 2017). Similarly, for the reduced VAT rates of 7% and 10%, for example, in 2001 the highest quintile benefitted 5 times compared to the poorest quintile in 2001 and 6 times in 2007¹ (Mourji & Ezzrari, 2018; DEPF², 2007).

It appears that VAT with multiple rates cannot be an effective instrument for reducing income inequality (Mourji & Ezzrari, 2018). This is why the 'second generation reforms' have been carried out since 2005 in order to modernize this tax. They mainly aim to consolidate the principles of the VAT progressiveness and neutrality through the reorganization of its different rates: 0% for basic necessities, 10% for large consumption items, 20% as the standard rate and a higher rate for luxury goods. They also aim to limit exemptions, which means

¹ The fifth quintile gets 1354 million MAD in 2001 and 4614 million MAD in 2007, while the first quintile gets only 272 million MAD in 2001 and 770 million MAD in 2007.

² Financial Studies and Forecasting Department of the Moroccan Ministry of Economy and Finance.

that there will be no new exemptions and that certain goods and services that are currently exempted will be taxed. On the other hand, a proportion of VAT receipts could be used to extend social security cover and direct aid, via the Single Social Register³.

The aim of this study is to evaluate the effects, in 2001 and 2014, of VAT rates changes on the food consumption structure of the Moroccan households' various strata. That is why we apply the QAIDS "Quadratic Almost Ideal Demand System" to the National Household Consumption and Expenditure Surveys of 2000/2001 and 2013/2014⁴ data produced by the HCP, in order to estimate elasticities of demand for 8 food groups by five household strata. Differences in living standards among different strata of the population mean that their preferences and responses to economic shocks are very different from each other and change over time.

QAIDS modelling will also be used to simulate the impact of the VAT reforms on the structure of food consumption of various strata of Moroccan households. In this regard, and in the absence of details on the implementation of the proposed tax reform by the national conference on taxation, especially those concerning the composition of product groups (basic necessities, mass consumption or luxury goods), we propose, for instance, to evaluate the consequences of the VAT liability of some basic products that are currently exempted, such as cereals⁵, on the "superior" food products consumed volumes (such as meat and dairy products...). The purpose is to identify the households that will suffer most from an increase in the prices of strategic products (as a result of a higher taxation) and that will have to be targeted by direct aids at the time of the VAT reform.

After a review of the theoretical framework that sheds light on household consumption analyses techniques as well as on the model and data used, we will discuss the results of the different estimates.

³ According to the recommendations of the third edition of the national conference on taxation (2019).

The Single Social Register (RSU) is a social targeting mechanism whose benefits are expected by all stakeholders involved in social safety net reform. Its objective is to manage the allocation of public resources devoted to the fight against poverty and vulnerability, with a view to both efficiency and equity.

⁴ Source: HCP, Micro-data from the National Household Consumption and Expenditure Survey 2013/14 available online at www.hcp.ma.

⁵ According to the classification used in this document and detailed below, cereals represent 20% of the consumption of the "Poor and Vulnerable" class, 19% of the consumption of the "Modest" class, 18% of the consumption of the "Lower Average" class, 17% of the consumption of the "Upper Average" class and 13% of the consumption of the "Wealthy" class.

2. The demand function analysis: A theoretical framework

Consumer theory has made substantial progress over the last three decades. Today it is one of the most developed fields of economic theory. This progress has been not only theoretical but also practical.

Indeed, the establishment of comprehensive systems of demand functions (CSDF), as well as the estimation of price and income elasticities, now covers the majority of developed countries and some developing countries.

In the present work we apply the QAIDS model (Quadratic Almost Ideal Demand System). This is the extension (with a quadratic form) of the AIDS model of Deaton and Muellbauer (1980) developed by James Banks, Richard Blundell, and Arthur Lewbel, in order to estimate the price and income effects of changes in VAT rates on food expenditure by different classes of Moroccan households.

i. Heavy Reliance on Indirect Taxes

The AIDS model is built from the Working (1943) and Leser (1963) model. Deaton and Muellbauer's developments of the Working & Leser's model include the price effect. The AIDS demand system therefore links the budget coefficients of each good to the logarithms of prices and real disposable income.

The share of expenditure spent on the good i is written as follows:

$$\frac{P_i q_i}{Y} \equiv w_i = a_i + \sum_j b_{ij} \ln P_j + c_i \ln \frac{Y}{P};$$

where W_i is the budget share,

Y : total expenditure per household

P is the price index defined by: $\ln P = a_0 + \sum_k a_k \ln P_k + \frac{1}{2} \sum_j \sum_k b_{jk} \ln P_k \ln P_j$

and a_i , b_{ij} and c_i are the parameters to be estimated.

The parameters must be estimated under the following restrictions:

Additivity: $\sum_i a_i = 1$; Homogeneity: $\sum_i b_{ij} = 0$; $\sum_i c_i = 0$; $\sum_j b_{ij} = 0$;

et Symmetry: $b_{ij} = b_{ji}$.

Due to the non-linearity of the parameters, Deaton and Muellbauer suggest replacing the general price index P by a linear approximation of Stone's geometric index as follows:

$$\ln P^* = \sum_i w_i \ln P_i.$$

This linear approximation of the AIDS system called LA/AIDS (linear approximate/ almost ideal demand system), which is most commonly used, greatly facilitate the estimation of the parameters.

From this simplification, we obtain a system of linear equations in respect of all their parameters which can be easily estimated by imposing the constraints previously defined. Even if the OLS estimator appears unbiased for each of the equations, it seems that the SURE (Seemingly Unrelated Regressions) estimation method proposed by Zellner (1962) is the most efficient for these systems of equations (Sadoulet and De Janvry, 1992).

Price and income elasticities are obtained from the parameters estimated as follows:

$$\text{Direct price elasticity: } E_{ii} = -1 + \frac{b_{ij}}{w_i} - c_i; \text{ Cross price elasticity: } E_{ij} = \frac{b_{ij}}{w_i} - \frac{c_i}{w_i} w_j;$$

$$\text{Income elasticity: } \eta_i = 1 + \frac{c_i}{w_i}$$

ii. The QAIDS demand system: Introduction of a quadratic term in the AIDS model

Because of the non-linearity of the Engel curves for certain goods, the estimation of the AIDS model becomes insufficient. Consequently, Banks, Blundell and Lewbel (1997) have completed this model by introducing the square of the logarithm of income into the demand function. The AIDS model becomes the QAIDS model (Quadratic Almost Ideal Demand System). As a result, the following system of equations is obtained:

$$W_i = a_i + \sum_j b_{ij} \ln (P_i) + c_i \ln (Y/P_s) + d_i \ln (Y/P_s)^2$$

Where:

W_i : represents the budgetary share of each product group in food expenditure.

P_i : the price of commodity sub-group i ;

Y : is the predicted value of food expenditure obtained from the estimate made in step one;

P_s : is the Stone's geometric price index of food.

The ratio (Y/P_s) is therefore the food expenditure deflated by the price, and makes it possible to take into account real household income.

The advantage of this specification is that it retains the existing flexibility properties in the AIDS model. In addition, it is more practical for the analysis of several goods demand and introduces relative flexibility in income and price effects.

The system is conditionally linear in $d(p)$, Blundell and Robin (1999) propose an iteration procedure and use the iterated least squares estimator (ILLS).

Additivity, price and income homogeneity and symmetry constraints must be imposed to estimate the model parameters.

The additivity constraint that requires the sum of the budget shares to be equal to one is written as: $\sum_{i=1}^n a_i = 1$

The homogeneity constraint in relation to prices and income is expressed as follows: $\sum_{j=1}^n b_{ij} = 0$; $\sum_{i=1}^n c_i = 0$; $2\sum_{i=1}^n d_i = 0$

The symmetry constraint: $b_{ij} = b_{ji}$.

3. Presentation of the data and of the performed treatments

To estimate the elasticities of demand, three kinds of data are generally required: household income (or total expenditure), the quantity consumed of different goods, and their purchase prices. When considering differences across the various population strata, it is necessary to have a representative sample for each household group.

The data used in this study are from two national surveys on household consumption and expenditure, one of 2000/2001 and the other of 2013/2014, carried out by the Moroccan High Commissioner for Planning throughout the national territory on a sample of 14.243 households in 2000/2001 and 16.000 households in 2013/2014. Then, preliminary statistical work was carried out in order to be able to meet the requirements of the study.

In our study, we selected five social classes⁶ as described in the following table:

⁶ This classification is inspired from Mourji & Ezzrari (2018).

Table 1: Definition of social classes

Classes	Description
Poor and vulnerable	<i>Per capita expenditure \leq (relative threshold = $0.6 \times$ median per capita expenditure)</i>
Modest	$0.6 \times$ median per capita expenditure $<$ per capita expenditure $\leq 0.75 \times$ median per capita expenditure
Lower average	$0.75 \times$ median expenditure per capita $<$ expenditure per capita \leq median expenditure per capita
Upper average	The median expenditure per capita $<$ per capita $\leq 2.5 \times$ the median expenditure per capita
Wealthy	<i>Expenditure per capita $> 2.5 \times$ median expenditure per capita</i>

We consider the absolute poverty line⁷ adopted by the HCP for 2001 and for 2014. In 2001 (HCP, 2006) it was 3421 DH for urban areas, 3098 DH for rural areas (per capita and per year), and in 2014, it was 4667 DH in urban areas and 4312 DH in rural areas (HCP, 2016).

We have also selected from the analytical nomenclature of goods and services 8 groups of food products consumed by different types of households. Aggregating the groups of products allows us to reduce the number of missing values, which poses statistical complications when estimating the parameters.

The classification is retained as used in the analytical nomenclature of goods and services. However, our analysis will focus on eight product groups: "Cereals", "Milk and milk products", "Fats", "Meat", "Fish", "Vegetables", "Fruit" and "Other food goods". It should be noted that the quantities demanded of the different food products in the study are all expressed in kilograms.

Before proceeding with the estimation of the demand parameters themselves, a major data reconciliation exercise was carried out, especially with regard to the prices (or unit values) of the products. In fact, outliers were removed, and the product prices were replaced by their averages per region. This regional variability may be due to the costs linked to transport from the point of production to the points of actual consumption of the products (Deaton Angus (1988)).

⁷ Absolute poverty line: it is the sum of the food poverty line and a non-food allowance equivalent to the cost of non-food purchases made by households that actually reach the minimum food requirement (World Bank method).

4. Estimation method

As already mentioned, in our study we adopted the QAIDS model to describe household food consumption behavior. The parameters of the model are estimated by the two-step SURE (Seemingly Unrelated Regressions) method developed by Zellner (1962) and specified by Surabhi Mittal (2010) for the food sector in India.

The two-stage QAIDS model is fundamentally based on the assumption of separability of preferences (Deaton and Muellbauer 1980) of households in their budget allocation between commodity groups and sub-groups.

The SURE method is widely used in the literature for the estimation of flexible demand models (such as AIDS, QAIDS, IQAIDS). Indeed, for a given system, the equations interact with each other, implying correlations between the error terms of the different equations. The advantage of the SURE estimator is that it allows these correlations to be taken into account by regressing each equation independently and with a specific error term (Zellner, 1962).

5. Results analysis and discussion

The results of the model's estimates of demand systems for the product groups considered and at both surveys 2000/2001 and 2013/2014 are presented in Tables 2 and 3, respectively.

At the national level and for both surveys, total food expenditure (capturing income in this system) is significant for all food groups, except for the "fish" group, reflecting the fact that the share of the food budget allocated to this product is not significantly influenced by a change in the Moroccans' income.

Furthermore, it is noted that the quadratic term introduced in the model, which was not significant for fish and fruit in 2000/2001, became significant for all groups in 2013/2014 and significant at 10% for the "fish" group. This justifies well the hypothesis assumed for the use of the QAIDS model according to which the linear form would not be suitable for any type of products.

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Table 2: Estimated parameters at national level 2000/2001

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(E1)	(E2)	(E3)	(E4)	(E5)	(E6)	(E7)	(E8)
Constant	-0.628	-0.161	0.360	1.137	0.033	-0.022	-0.108	0.390
	0.000	0.000	0.000	0.000	0.087	0.581	0.000	0.000
Cereals	0.008	0.007	-0.029	0.044	-0.007	-0.008	-0.014	-0.001
	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.128
Milk and dairy products	0.007	0.015	-0.006	-0.009	-0.001	-0.005	0.000	-0.001
	0.000	0.000	0.000	0.000	0.003	0.000	0.502	0.128
Fat	-0.029	-0.006	0.065	-0.010	-0.005	-0.013	-0.003	0.001
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061
Meat	0.044	-0.009	-0.010	-0.020	-0.005	-0.007	-0.001	0.008
	0.000	0.000	0.000	0.000	0.000	0.000	0.185	0.000
Fish	-0.007	-0.001	-0.005	-0.005	0.025	-0.001	0.000	-0.006
	0.000	0.003	0.000	0.000	0.000	0.259	0.433	0.000
Vegetables	-0.008	-0.005	-0.013	-0.007	-0.001	0.046	-0.006	-0.007
	0.000	0.000	0.000	0.000	0.259	0.000	0.000	0.000
Fruits	-0.014	0.000	-0.003	-0.001	0.000	-0.006	0.018	0.007
	0.000	0.502	0.000	0.185	0.433	0.000	0.000	0.000
Other food items	-0.003	-0.001	0.001	0.008	-0.006	-0.007	0.007	0.000
	0.040	0.128	0.061	0.000	0.000	0.000	0.000	0.066
Deflated food expenditure	0.267	0.058	-0.098	-0.253	-0.002	0.074	0.030	-0.077
	0.000	0.000	0.000	0.000	0.718	0.000	0.001	0.002
(Deflated food expenditure) ²	-0.022	-0.002	0.007	0.017	0.000	-0.007	-0.001	0.008
	0.000	0.010	0.000	0.000	0.686	0.000	0.296	0.000
Observations	14238	14238	14238	14238	14238	14238	14238	14238
R ²	0.050	0.126	0.240	0.034	0.172	0.080	0.140	0.004

The P-Values in parentheses

Authors' calculations based on ENCDM 2000/2001

Moreover, the expenditure allocated to the different food groups appears to be significant overall. Consumption for all groups is positively related to income, except for the consumption of meat, fats, fish and other foodstuffs, which had a negative coefficient in the 2000/2001 survey. In 2013/2014, income appears negative only for the "fats" and "meat" groups.

The coefficients of direct prices on the budget shares (diagonal) are all significant and positive, except for meat, which has a negative coefficient in 2000/2001.

With regard to cross effects, we can distinguish both positive and negative coefficients that may reflect substitutability or complementarity effects between products.

Table 3: Estimated parameters at national level 2013/2014

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(E1)	(E2)	(E3)	(E4)	(E5)	(E6)	(E7)	(E8)
Constant	-0.059 (-0.289)	-0.190 (0)	0.341 (0)	1.336 (0)	-0.003 (-0.91)	-0.275 (0)	-0.227 (0)	0.077 (0)
Cereals	0.014 (0)	0.006 (0)	-0.018 (0)	0.007 (0)	-0.005 (0)	0.000 (-0.715)	-0.004 (0)	-0.001 (-0.26)
Milk and dairy products	0.006 (0)	0.016 (0)	-0.013 (0)	-0.001 (-0.16)	-0.002 (0)	-0.005 (0)	-0.001 (-0.30)	-0.001 (-0.26)
Fat	-0.018 (0)	-0.013 (0)	0.064 (0)	-0.015 (0)	-0.013 (0)	0.001 (-0.138)	-0.006 (0)	-0.002 (-0.008)
Meat	0.007 (0)	-0.001 (-0.159)	-0.015 (0)	0.016 (0)	-0.004 (0)	-0.012 (0)	-0.003 (0)	0.013 (0)
Fish	-0.005 (0)	-0.002 (0)	-0.013 (0)	-0.004 (0)	0.033 (0)	-0.002 (-0.016)	-0.002 (0)	-0.006 (0)
Vegetables	0.000 (-0.715)	-0.005 (0)	0.001 (-0.14)	-0.012 (0)	-0.002 (-0.02)	0.031 (0)	-0.007 (0)	-0.007 (0)
Fruits	-0.004 (0)	-0.001 (-0.298)	-0.006 (0)	-0.003 (0)	-0.002 (0)	-0.007 (0)	0.016 (0)	0.007 (0)
Other food items	-0.004 (0)	-0.001 (-0.264)	-0.002 (-0.01)	0.013 (0)	-0.006 (0)	-0.007 (0)	0.007 (0)	0.001 (0)
Deflated food expenditure	0.089 (0)	0.081 (0)	-0.077 (0)	-0.319 (0)	0.014 (-0.14)	0.144 (0)	0.067 (0)	0.002 (0)
(Deflated food expenditure)²	-0.008 (0)	-0.005 (0)	0.005 (0)	0.022 (0)	-0.001 (-0.10)	-0.012 (0)	-0.003 (-0.002)	0.002 (0)
Observations	15967	15967	15967	15967	15967	15967	15967	15967
R2	0.007	0.088	0.163	0.055	0.121	0.045	0.109	0.014

The P-Values in parentheses

Authors' calculations based on ENCDM 2013/2014

i. Estimation and elasticities analyses

In order to evaluate the expenditure and price elasticities, the parameters obtained in the two steps of the QAIDS model will be used. They are calculated as follows:

Expenditure elasticity (or conditional elasticity) of product group i:

$$\eta_i = (c_i + 2d_i \ln(Y)/W_i) + 1$$

Non-compensated price elasticity⁸:

$$\xi_{ij} = (b_{ij}/W_i) - (c_i + 2d_i \ln(Y))(W_j/W_i) - K_{ij}$$

Y : is the predicted value of the food expenditure deducted from the estimate made in the first step;

K_{ij} : designates the Kronecker delta which is equal to 1 for direct price elasticities and equal to 0 for cross price elasticities ;

W_i : refers to the budget share of group i used, inter alia, to calculate Stone's price index.

Based on the expenditure elasticity and the non-compensated price elasticities, we deduce direct and cross-price elasticities pure or compensated⁹ from Slutsky as follows:

$$\xi_{ij}^H = \xi_{ij} + W_j \eta_i$$

The unconditional elasticity of aggregate demand for each commodity group i « η_i^Y » is obtained as the multiple of the conditional elasticity and the elasticity of food expenditure relative to total expenditure (η^Y) obtained from the first stage estimation:

$$\eta_i^Y = \eta_i * \eta^Y.$$

The expenditure elasticities of the different goods were estimated for each stratum (Table 5). These elasticities measure the change in the quantity demanded of a good as a result of a change in total expenditure. Since total expenditure is used as a proxy for income, expenditure elasticities are, therefore,

⁸ Non-compensated price elasticity: adjustment of the quantity demanded after price change including the effect on disposable income.

⁹ They are used to highlight changes in demand due only to price changes. Total expenditure virtually varies in the same direction as the price change in order to keep the household's purchasing power constant.

interpreted as income elasticities. However, they do not mean exactly the same thing in the sense that total expenditure includes the quantities requested themselves and also describe the outcome of the consumption attitude of individuals.

i.i Budget coefficients and total expenditure elasticities by social class between 2001 and 2014

The analysis of the budgetary coefficients shows that between 2001 and 2014, the food basket of Moroccans tends more to be balanced and diversified while keeping almost the same structure. Among the food groups selected, Moroccan household expenditure is mainly assigned to the "Meat" group with a share of 23% in 2014, up 3 points compared to 2001. However, households have reduced their consumption of calorie-rich products, particularly "other food items" and "cereals", by 4 and 5 points compared with 2001, representing 18% and 17% respectively of total expenditure in 2014.

Moroccans have also reduced their consumption of vegetables by 2 points, representing 12% in 2014, to the benefit of the consumption of "milk and dairy products" (+1pts), fats (+2pts), fish (+2pts) and fruit (+1pts).

Thus, Moroccan households tend to consume less vegetables and products rich in calories (other foodstuffs - especially sugars and sweet products - as well as cereals) to the advantage of the consumption of fruit and foods rich in proteins (meat, fish, fats, milk and dairy products).

Table 4: Budget shares "Wi" by food groups at national level and by stratum (%)

	2000/2001						2013/2014					
	National	C1	C2	C3	C4	C5	National	C1	C2	C3	C4	C5
Cereals	22	28	25	23	20	16	17	20	19	18	17	13
Milk & dairy products	7	4	5	6	7	10	8	6	7	8	9	10
Fat	9	10	9	9	9	7	11	13	12	12	11	9
Meat	20	16	18	19	22	23	23	22	23	23	23	24
Fish	2	2	2	2	2	3	4	3	3	3	4	5
Vegetables	14	14	15	14	13	11	12	15	14	14	12	9
Fruits	5	3	3	4	5	7	6	4	5	6	7	8
Other food items	22	24	23	23	22	22	18	18	17	17	18	21

C1: Poor and vulnerable; C2: Modest; C3: Lower average; C4: Upper average; C5: Wealthy.

Calculations realized by the HCP based on ENCDM 2000/2001 and 2013/2014.

At the level of the five household groups (Table 2) we observe that:

- The shares of the "meat" and "other food items" groups are predominant in the food basket of the different groups, as at the national level;
- Data from the 2013/2014 survey show that an improvement in household income increases the consumption of nutritionally rich products, particularly dairy products (+4pts), fruit (+4pts) and fish (+2pts), which account for 10%, 8% and 5% respectively of the food consumption of the wealthiest households, compared with 6%, 4% and 3% of the food basket of the poor;
- On the other hand, the rich households consume less cereals (13%), fats (9%) and vegetables (9%) than the poor (20%), (13%) and (15%) respectively.
- Compared to the 2000/2001 survey data, the richest households improved their consumption of fish (+2pts), fats (+2pts), fruit (+1pt) and meat (+1pt) instead of cereals (-3pts), vegetables (-2pts) and other food items (-1pt).
- Concerning the poorest classes, we notice that between 2001 and 2014, they have significantly improved their consumption of meat (+6pts), to represent 22% of their budget in 2014, and to a lower extent the consumption of fats (+3pts), milk and dairy products (+2pts), fish (+1pt), vegetables (+1pt) and fruit (+1pt). However, their consumption has fallen by 8 points for cereals, which occupy only 20% of their food basket in 2014, and by 6 points for other food items (18% in 2014).

Table 5: Expenditure elasticities by food commodity groups at the national level and by stratum

	2000/2001						2013/2014					
	National	C1	C2	C3	C4	C5	National	C1	C2	C3	C4	C5
Cereals	0.56	1.24	1.39	1.01	0.92	1.32	0.98	1.23	1.34	1.32	1.22	1.18
Milk & dairy products	1.28	0.34	0.72	0.34	0.21	0.04	1.22	1.15	1.18	1.12	1.07	1.09
Fat	1.19	0.49	0.52	0.84	1.24	1.18	0.85	0.77	0.79	0.79	0.86	0.85
Meat	1.15	0.49	1.48	1.44	1.32	1.50	0.80	0.57	0.46	0.45	0.58	0.64
Fish	1.05	0.50	-1.09	-0.50	1.10	1.06	0.96	1.18	0.69	0.74	0.70	0.76
Vegetables	0.74	1.05	1.38	0.45	0.77	0.88	0.98	1.30	1.31	1.32	1.27	1.31
Fruits	1.39	0.77	1.30	-0.32	-0.43	-0.55	1.49	1.69	1.68	1.54	1.56	1.26
Other food items	1.21	1.42	0.32	1.53	1.38	1.18	1.13	0.95	1.02	1.11	1.07	1.13

C1: Poor and vulnerable; C2: Modest; C3: Lower average; C4: Upper average; C5: Wealthy.

Authors' calculations from ENCDM 2000/2001 and 2013/2014

Overall, the expenditure elasticities obtained are statistically significant and, at the national level, they are statistically different from zero (Table 5).

At the national level, it can be observed that the expenditure elasticities of meats, fats and fish are below 1 in 2014, in contrast to 2001, which means that these products are increasingly becoming staple or mass consumption items, as is the case for "cereals and cereal products" and "vegetables", which have been characterized by expenditure elasticities below 1 since 2001. These goods can, moreover, be considered as essential or incompressible goods. Their consumption is not very sensitive to a variation in total expenditure. As soon as the standard of living exceeds the subsistence level, other needs (luxury goods) appear to absorb an increasingly important part of the income growth.

Furthermore, the elasticities of the "milk and dairy products", "fruit" and "other food items" groups are structurally greater than 1, reflecting the fact that expenditure on these items increases more than proportionally to income growth. Thus, the quantity demanded for these products varies more than proportionally when the budget allocated to food varies either up or down.

By household class, the consumption behavior varies significantly. Among poor households, for example, we notice that :

- In 2014, these households have increased their consumption of products, with total expenditure elasticities relatively close to 1, i.e., "other food items" (0.95%) and fats (0.77%) in proportion as their expenditure on food is risen.
- The elasticity of meat is 0.56% in 2014 against 0.49% in 2001. This means that this group of products is a basic necessity (or a largely consumed food) for the poor and that its consumption is not very sensitive to a variation in total expenditure.
- The other nutritionally rich food groups, namely the 'milk and milk products', 'fish' and 'fruit' groups, are on average being consumed in insufficient quantities by the poor and vulnerable people in 2014, in contrast to 2001, so these commodities are the most qualified to absorb any increase in their budgets. These products have expenditure elasticities exceeding 1 in 2014, of 1.15% for milk and dairy products, 1.18% for fish and 1.7% for fruit, compared to 0.34%, 0.50% and 0.77% respectively in 2001.

i.ii Direct price elasticities

Estimates of direct price elasticities, which measure the reaction of the demand for a product to changes in its price, are shown in Table 6. We notice that all these elasticities are statistically significant and, in accordance with theory, negative, except for fish, which shows, in 2001, a positive value of direct price elasticity at the national level and for the first 3 classes of households (C1, C2 and C3).

At national level, the most sensitive products to price variations, according to the two surveys, are "other food items", "cereals and cereal-based products", "meat" and the "milk and dairy products" group, with elasticities of -1.01, -0.91, -0.88 and -0.83 respectively in 2014 instead of -1.04; -0.87, -1.13 and -0.79 respectively in 2001. This implies that a rise in prices will generate a sharp drop in the demand for these goods.

By social class, direct price elasticities are slightly higher in absolute terms among the poorest households than among the most prosperous, and are still higher overall in 2014 compared with 2001, especially for meat, cereals, milk and dairy products and fish. As a result, a 1% increase in the price of meat, for example, will result in decreases of 1.02% and 0.65% in the quantities demanded respectively among the very poor and the rich groups in 2014 compared to decreases of 1.02% and 0.93% respectively in 2001.

Table 6: Direct price elasticities at the national level and by stratum

	2000/2001						2013/2014					
	National	C1	C2	C3	C4	C5	National	C1	C2	C3	C4	C5
Cereals	-0.87	-0.93	-0.94	-0.89	-0.93	-0.94	-0.91	-0.95	-0.97	-0.97	-0.93	-0.76
Milk & dairy products	-0.79	-0.63	-0.77	-0.73	-0.78	-0.62	-0.83	-0.89	-0.82	-0.83	-0.782	-0.79
Fat	-0.28	-0.12	-0.16	-0.19	-0.42	-0.33	-0.41	-0.34	-0.33	-0.32	-0.42	-0.38
Meat	-1.13	-1.02	-1.08	-1.06	-0.78	-0.93	-0.88	-1.02	-0.91	-0.82	-0.77	-0.65
Fish	0.13	0.40	0.26	0.24	-0.18	-0.16	-0.09	-0.22	-0.32	-0.11	-0.18	-0.15
Vegetables	-0.63	-0.73	-0.79	-0.63	-0.84	-0.69	-0.75	-0.81	-0.86	-0.86	-0.84	-0.89
Fruits	-0.62	-0.27	-0.53	-0.55	-0.82	-0.58	-0.78	-0.59	-0.77	-0.76	-0.82	-0.79
Other food items	-1.04	-1.10	-0.84	-1.12	-1.01	-1.02	-1.02	-0.99	-1	-1.02	-1.01	-1.03

C1: Poor and vulnerable; C2: Modest; C3: Lower average; C4: Upper average; C5: Wealthy.

Authors' calculations from ENCDM 2000/2001 and 2013/2014

i.iii Cross-price elasticities

Cross-price elasticities measure the response of the quantity demanded of one good to the variation in the price of another good. The positive or negative sign of the cross-price elasticity shows whether goods are substitutes or complements.

Table 7 presents the cross-price elasticities at the national level¹⁰ with values other than zero. The diagonal of the matrix represents the non-compensated direct price elasticities.

On average, cross-price elasticities in 2014 seem very low¹¹ compared to 2001, especially for certain goods such as "cereals", "fats", "milk and dairy products", "vegetables" and "other food items". This means that the price variation of these goods affects less the consumption of the other goods. This leads to relatively insignificant substitution or complementarity effects.

Moreover, cross-price elasticities are more significant, in 2014, for "fish" and "meat". Indeed, the increase in the prices of "fish" and "meat" particularly affects the consumption of other types of goods. We notice that households react differently to the increase in meat and fish. For them, meats are considered substitutes, especially with fish, with an elasticity of +0.28%, while fish is rather complementary with other goods (especially fats with an elasticity of -0.34%).

Table 7: Non-compensated price elasticities of demand by food groups at national level 2000/2001

Product	Cereals	Milk & dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.87	0.11	-0.34	0.19	-0.32	-0.04	-0.31	-0.05
Milk & dairy products	0.35	-0.79	-0.09	-0.14	-0.04	0.03	-0.02	-0.16
Fat	0.10	-0.11	-0.28	-0.12	-0.24	-0.04	-0.07	-0.11
Meat	0.31	-0.14	-0.12	-1.13	-0.23	-0.03	-0.03	-0.02
Fish	0.91	-0.07	-0.13	-0.31	0.13	0.21	-0.04	-0.49
Vegetables	0.12	-0.09	-0.16	-0.08	-0.03	-0.63	-0.14	-0.11
Fruits	0.40	-0.03	-0.07	-0.15	-0.01	0.06	-0.62	-0.20
Other food items	0.08	-0.02	0.01	0.01	-0.25	-0.03	0.15	-1.04

Authors' calculations based on ENCDM 2000/2001

¹⁰ Details of the cross-price elasticities per stratum are presented in the appendix.

¹¹ In absolute values less than 0.1.

Table 8: Non-compensated price elasticities of demand by food groups at the national level 2013/2014

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.912	0.057	-0.146	0.094	-0.139	0.005	-0.075	-0.027
Milk and dairy products	0.041	-0.827	-0.093	0.123	-0.059	-0.033	-0.030	-0.051
Fat	-0.097	-0.165	-0.404	0.032	-0.339	0.014	-0.107	-0.049
Meat	0.043	-0.021	-0.128	-0.884	-0.096	-0.097	-0.064	0.054
Fish	-0.012	-0.070	-0.061	0.280	-0.094	-0.006	-0.090	-0.142
Vegetables	0.008	-0.067	0.028	0.034	-0.047	-0.751	-0.127	-0.072
Fruits	-0.013	-0.032	-0.020	0.159	-0.064	-0.051	-0.780	-0.024
Other food items	-0.021	-0.017	-0.010	0.117	-0.157	-0.056	0.106	-1.015

Authors' calculations based on ENCDM 2000/2001

6. Simulations of the effects of a VAT reform on cereals

Reforms of the indirect tax system, through changes in VAT rates, lead to changes in prices to which consumers are exposed. In this paragraph, we use non-compensated price elasticities to run simulations (Allen 2010) in order to predict the impact of commodity VAT reforms on the consumption behavior of various quintiles of households.

We consider here a 20% price increase of the "cereals and cereal-based products" group, which is actually exempt from VAT. We then evaluate the effect of this price increase on the considered commodities. It is however assumed that the observed VAT increase is fully reflected in the price of cereals.

The table below summarizes the non-compensated cross-price elasticities of cereals.

Table 9: Summary of non-compensated cross-price elasticities of demand for food groups relative to cereals at national level and by stratum

Social class	2001						2014					
	National	C1	C2	C3	C4	C5	National	C1	C2	C3	C4	C5
Product												
Cereals	-0.87	-0.93	-0.94	-0.89	-0.91	-0.94	-0.91	-0.95	-0.97	-0.97	-0.93	-0.76
Milk & dairy products	0.11	-0.02	0.13	0.18	0.14	0.11	0.06	0.08	0.09	0.10	0.11	-0.01
Fat	-0.34	-0.41	-0.42	-0.42	-0.29	-0.22	-0.15	-0.27	-0.26	-0.19	-0.14	-0.13
Meat	0.19	0.28	0.10	0.13	0.07	-0.12	0.09	0.25	0.24	0.18	0.12	0.11
Fish	-0.32	-0.51	-0.48	-0.40	-0.30	-0.18	-0.14	0.00	-0.07	-0.05	-0.09	-0.19
Vegetables	-0.04	-0.08	-0.09	-0.04	-0.05	-0.05	0.00	-0.07	0.00	-0.03	0.00	-0.06
Fruits	-0.31	-0.32	-0.28	-0.25	-0.18	-0.04	-0.07	-0.16	-0.06	-0.01	-0.06	-0.01
Other food items	-0.05	-0.11	0.10	-0.15	-0.11	-0.04	-0.03	-0.04	-0.06	-0.04	-0.04	-0.03

C1: Poor and vulnerable; C2: Modest; C3: Lower average; C4: Upper average; C5: Wealthy.

Authors' calculations based on ENCDM 2000/2001 and ENCDM 2013/2014

Considering that the elasticity (E_{ij}) of the demand for good i in relation to good j is written as follows:

$E_{ij} = \text{Variation in \% of the quantity demanded of good } i / \text{Variation in \% of the price of good } j$.

Thus, for a 20% variation in the price of cereals, the variation in the quantity¹² requested from group i (in %) is equal to the cross-price elasticity of demand for good i in relation to cereals multiplied by 20%. The results for each group of goods are summarized in Table 10.

¹² In the study, the quantities are all expressed in kilograms.

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Table 10: Percentage changes in the quantity demanded in each product group and per stratum as a result of a 20% VAT increase on cereals.

Social class	2001						2014					
	National	C1	C2	C3	C4	C5	National	C1	C2	C3	C4	C5
Product												
Cereals	-17.3	-	-	-	-	-	-18.2	-	-	-	-	-
		18.6	18.9	17.7	18.2	18.7		18.9	19.5	19.5	18.6	15.3
Milk & dairy products	2.1	-0.3	2.6	3.6	2.7	2.2	1.1	1.5	1.7	2.0	2.2	-0.2
Fat	-6.8	-8.1	-8.3	-8.5	-5.8	-4.4	-2.9	-5.3	-5.3	-3.8	-2.8	-2.6
Meat	3.8	5.6	1.9	2.6	1.4	-2.5	1.9	4.9	4.7	3.7	2.4	2.2
Fish	-6.4	-	-	-	-	-	-2.8	0.1	-1.5	-0.9	-1.9	-3.9
		10.1	-9.5	-8.0	-6.0	-3.5						
Vegetables	-0.7	-1.6	-1.7	-0.8	-0.9	-1.1	0.1	-1.3	0.0	-0.6	0.0	-1.3
Fruits	-6.3	-6.5	-5.6	-4.9	-3.5	-0.8	-1.5	-3.1	-1.2	-0.1	-1.1	-0.2
Other food items	-1.0	-2.2	2.0	-2.9	-2.3	-0.9	-0.5	-0.8	-1.2	-0.8	-0.8	-0.7

C1: Poor and vulnerable; C2: Modest; C3: Lower average; C4: Upper average; C5: Wealthy.

Authors' calculations based on ENCDM 2000/2001 and ENCDM 2013/2014

The simulation results show that a 20% increase in VAT on cereals would lead to a decrease in the domestic consumption of cereals by 17.3% in 2001 and 18.9% in 2014. At the stratum level, this impact would lead to an 18.6% drop in poor and vulnerable households' demand in 2001, which will increase by 0.4 points in 2014.

In contrast to the poorest classes, the impact on the richest households is lighter, and their demand for cereals will only fall by 15.3% in 2014 instead of 18.7% in 2001, which represents a reduction of 3.5 points. Thus, the VAT reforms, which aim to broaden the tax base by imposing taxes on basic products, such as cereals, would have an increasingly significant impact on the poor and vulnerable households' demand for cereals.

The by-product analysis shows that in 2001 this reform would reduce the demand for the majority of the product groups analyzed, especially fats (-6.8%), fish (-6.4%) and fruit (-6.3%). However, demand in the "milk and dairy products" and "meat" groups would increase by 2.1% and 3.8% respectively in 2001.

These decreases would be clearly moderated in 2014. The most significant would be about -2.9% for fats, -2.8% for fish and -1.5% for fruit.

Also, these falls would be more pronounced among the poorest households, for all products except meat, especially the demand for fish (-10.1%), fats (-8.1%) and fruit (-6.5%), which would also be significantly reduced in 2014 (0.1%, -5.3% and -3.1% respectively).

The rest of the products, namely "vegetables" and "other food items", would have lower variations and their demand would be less affected by an increase in the VAT rate on cereals.

Generally, the extension of the scope of VAT to basic products, particularly cereals, would affect the consumption structure of households, especially the poorest ones, both as to the cereals themselves but also to other products, particularly nutrient-rich products such as fish, fruit, fats and, to a lesser extent, vegetables and other food items.

Moreover, this partial equilibrium analysis could be extended and enriched by a general equilibrium approach in order to identify the behavior of the different economic actors in the analysis of the impact of a VAT reform. Among the researches based on this sort of analysis are those of Spadaro (2007), A.Harding and N.Warren (1998), Sadoulet and Janvry (1992), etc.

7. Conclusion

This paper examined how changes in indirect taxation, particularly VAT, affect differently the consumption structure of different strata of Moroccan households. For this purpose, we applied the Quadratic Almost Ideal Demand System (QAIDS) to data from the 2000/2001 and 2013/2014 National Household Consumption and Expenditure Surveys to estimate elasticities of demand for eight food groups and for five household strata. Differences in living standards of different strata of the population mean that their preferences and responses to economic shocks are very different from each other and vary over time.

Indeed, it appears that Moroccan households tend to consume less vegetables and high-calorie products (sugars and cereals) in favor of the consumption of fruit and protein-rich foods (meat, fish, fats, milk and dairy products). Moreover, the poorest households consumed insufficient quantities of nutritious food products such as dairy products, fish and fruit in 2014, unlike in 2001. In addition, it appears that extending the scope of VAT to basic products would affect particularly the poorest Moroccan households' consumption patterns, especially for cereals as well as for other products rich in nutrients such as fish and fruit.

Finally, it should be mentioned that this study can be the subject of several more targeted researches using detailed data - whether on the current tax reform or on the household consumption detailed data - and appropriate econometric methods. For example, we could study the impact of the current reform of VAT on certain strategic products (butane, for example) on both food and non-food Moroccan consumption. At stratum level, a finer classification could be considered in order to identify the categories that are the most affected by the VAT reforms.

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VAT reforms and Moroccan household's food consumption

Appendix 1: Composition of the 8 food product groups analysed according to the HCP nomenclature of goods and services

Cereals and cereal-based products	Milk and dairy products	Fat	Meat	Fish	vegetables	Fruits	Other food items
011 Non-processed cereals (into grains)	021 untreated fresh milk	031 butter	041 beef and veal	051 fresh fish	06 fresh vegetables	081 citrus fruits	09 sugar, sugar products, chocolate-based products and products for desserts and pastries
012 purchased bread	022 long-life pasteurized milk	032 Oil	042 sheep or lamb meat	052 fresh shellfish and molluscs	07 dried or canned vegetables	082 fresh seeded fruit	10 chocolate-based breakfast products, dessert and pastry products
013 flour	023 condensed milk	033 other fats	043 other butcher meats	053 canned fish		083 fresh stoned fruits	11 tea, coffee and herbal teas
014 semolina	024 powdered milk		044 living animals	054 frozen or deep-frozen fish		084 dried fruit	12 food seasonings and various food products n.c.a
015 couscous	025 whey		045 tripery			085 oleaginous fruits	13 non-alcoholic beverages
016 alimentary pastas	026 cheese		046 charcuterie			086 tropical fruits	14 alcoholic beverages
017 other cereal-based products	027 other milk-based products		047 birds, rabbit and prey "non-live"			087 prepared fruits	15 food and drink taken outdoors
	028 baby milk and milk products		048 birds, rabbit and prey "live"			088 fruit mixture	17 various expenses related to the acquisition of food products (n.c. transport)
	029 eggs		049 other edible animals				18 exceptional expenses: purchases of food products

VAT reforms and Moroccan household's food consumption

Appendix 2: Estimated parameters from the QAIDS model (ENCDM 2000/2001)**1- Estimated parameters for the poor/vulnerable strata**

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.567	-0.225	0.098	0.834	0.000	0.052	-0.088	0.896
	0.013	0.018	0.397	0.000	0.999	0.701	0.209	0.000
Cereals	0.038	-0.001	-0.041	0.038	-0.008	-0.011	-0.009	-0.006
	0.000	0.747	0.000	0.000	0.000	0.006	0.000	0.000
Milk and dairy products	-0.001	0.014	0.000	-0.004	-0.002	-0.001	-0.001	-0.006
	0.747	0.000	0.773	0.041	0.004	0.582	0.388	0.000
Fat	-0.041	0.000	0.081	-0.010	-0.003	-0.017	-0.004	-0.005
	0.000	0.773	0.000	0.001	0.003	0.000	0.000	0.009
Meat	0.038	-0.004	-0.010	-0.017	-0.003	-0.005	0.001	0.000
	0.000	0.041	0.001	0.002	0.030	0.153	0.696	0.978
Fish	-0.008	-0.002	-0.003	-0.003	0.021	0.004	-0.002	-0.007
	0.000	0.004	0.003	0.030	0.000	0.004	0.001	0.000
Vegetables	-0.011	-0.001	-0.017	-0.005	0.004	0.041	-0.005	-0.005
	0.006	0.582	0.000	0.153	0.004	0.000	0.000	0.000
Fruits	-0.009	-0.001	-0.004	0.001	-0.002	-0.005	0.020	0.001
	0.000	0.388	0.000	0.696	0.001	0.000	0.000	0.423
Other food items	0.022	-0.006	-0.005	0.000	-0.007	-0.005	0.001	0.000
	0.000	0.000	0.009	0.978	0.000	0.000	0.423	0.824
Deflated food expenditure	0.185	0.100	0.007	-0.134	0.010	0.035	0.040	-0.243
	0.033	0.005	0.878	0.037	0.572	0.494	0.131	0.002
(Deflated food expenditure) ²	-0.008	-0.009	-0.004	0.004	-0.001	-0.002	-0.003	0.024
	0.318	0.010	0.341	0.558	0.469	0.685	0.201	0.001
Observations	2354.000	2354.000	2354.000	2354.000	2354.000	2354.000	2354.000	2354.000
R2	0.099	0.054	0.294	0.170	0.126	0.076	0.146	0.020

VAT reforms and Moroccan household's food consumption

2- Estimated parameters for the modest strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-1.127	0.062	-0.050	3.683	-0.229	0.311	0.040	-1.690
	0.008	0.779	0.827	0.000	0.033	0.260	0.794	0.000
Cereals	0.038	0.006	-0.040	0.029	-0.009	-0.008	-0.009	-0.009
	0.000	0.009	0.000	0.000	0.000	0.063	0.000	0.000
Milk and dairy products	0.006	0.011	-0.005	-0.003	-0.001	-0.003	0.002	-0.009
	0.009	0.000	0.002	0.200	0.095	0.139	0.017	0.000
Fat	-0.040	-0.005	0.074	-0.003	-0.005	-0.013	-0.003	-0.005
	0.000	0.002	0.000	0.417	0.000	0.000	0.032	0.013
Meat	0.029	-0.003	-0.003	0.002	-0.001	-0.011	-0.004	-0.009
	0.000	0.200	0.417	0.790	0.548	0.004	0.023	0.001
Fish	-0.009	-0.001	-0.005	-0.001	0.022	0.003	0.000	-0.009
	0.000	0.095	0.000	0.548	0.000	0.049	0.979	0.000
Vegetables	-0.008	-0.003	-0.013	-0.011	0.003	0.039	-0.004	-0.004
	0.063	0.139	0.000	0.004	0.049	0.000	0.003	0.002
Fruits	-0.009	0.002	-0.003	-0.004	0.000	-0.004	0.015	0.003
	0.000	0.017	0.032	0.023	0.979	0.003	0.000	0.013
Other food items	0.033	-0.009	-0.005	-0.009	-0.009	-0.004	0.003	0.000
	0.000	0.000	0.013	0.001	0.000	0.002	0.013	0.718
Deflated food expenditure	0.304	0.011	0.042	-1.030	0.092	-0.066	-0.004	0.651
	0.038	0.884	0.600	0.000	0.014	0.489	0.941	0.000
(Deflated food expenditure) ²	-0.014	-0.002	-0.006	0.073	-0.008	0.008	0.001	-0.053
	0.288	0.804	0.418	0.000	0.009	0.334	0.851	0.000
Observations	1613.000	1613.000	1613.000	1613.000	1613.000	1613.000	1613.000	1613.000
R2	0.165	0.044	0.264	0.377	0.132	0.085	0.099	0.050

VAT reforms and Moroccan household's food consumption

3- Estimated parameters for the lower middle strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-1.471	-0.188	0.187	3.478	-0.111	-0.753	-0.436	0.294
	0.000	0.354	0.340	0.000	0.230	0.001	0.004	0.476
Cereals	0.027	0.010	-0.039	0.039	-0.008	-0.013	-0.009	-0.007
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Milk and dairy products	0.010	0.013	-0.004	-0.005	-0.001	-0.005	0.000	-0.007
	0.000	0.000	0.001	0.004	0.031	0.001	0.899	0.000
Fat	-0.039	-0.004	0.071	-0.010	-0.004	-0.010	-0.003	-0.002
	0.000	0.001	0.000	0.000	0.001	0.000	0.018	0.240
Meat	0.039	-0.005	-0.010	0.004	-0.007	-0.010	-0.002	-0.008
	0.000	0.004	0.000	0.437	0.000	0.001	0.223	0.001
Fish	-0.008	-0.001	-0.004	-0.007	0.024	0.005	-0.001	-0.007
	0.000	0.031	0.001	0.000	0.000	0.000	0.072	0.000
Vegetables	-0.013	-0.005	-0.010	-0.010	0.005	0.042	-0.005	-0.005
	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000
Fruits	-0.009	0.000	-0.003	-0.002	-0.001	-0.005	0.015	0.006
	0.000	0.899	0.018	0.223	0.072	0.000	0.000	0.000
Other food items	0.023	-0.007	-0.002	-0.008	-0.007	-0.005	0.006	0.000
	0.000	0.000	0.240	0.001	0.000	0.000	0.000	0.791
Deflated food expenditure	0.438	0.095	-0.036	-0.941	0.057	0.302	0.160	-0.075
	0.000	0.164	0.586	0.000	0.067	0.000	0.002	0.592
(Deflated food expenditure) ²	-0.028	-0.008	0.001	0.065	-0.006	-0.024	-0.013	0.012
	0.007	0.147	0.803	0.000	0.035	0.000	0.002	0.292
Observations	2232	2232	2232	2232	2232	2232	2232	2232
R2	0.120	0.053	0.274	0.344	0.172	0.088	0.082	0.052

VAT reforms and Moroccan household's food consumption

4- Estimated parameters for the upper middle strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-1.037	-0.642	0.347	2.894	0.175	-0.181	-0.749	0.191
	0.000	0.000	0.005	0.000	0.010	0.177	0.000	0.480
Cereals	0.015	0.008	-0.024	0.032	-0.007	-0.009	-0.009	-0.005
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Milk and dairy products	0.008	0.016	-0.007	-0.004	-0.001	-0.006	-0.001	-0.005
	0.000	0.000	0.000	0.002	0.032	0.000	0.220	0.000
Fat	-0.024	-0.007	0.058	-0.007	-0.005	-0.014	-0.003	0.003
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Meat	0.032	-0.004	-0.007	0.001	-0.006	-0.007	-0.005	-0.003
	0.000	0.002	0.000	0.704	0.000	0.000	0.000	0.067
Fish	-0.007	-0.001	-0.005	-0.006	0.025	0.001	0.000	-0.007
	0.000	0.032	0.000	0.000	0.000	0.240	0.998	0.000
Vegetables	-0.009	-0.006	-0.014	-0.007	0.001	0.043	-0.004	-0.005
	0.000	0.000	0.000	0.000	0.240	0.000	0.000	0.000
Fruits	-0.009	-0.001	-0.003	-0.005	0.000	-0.004	0.017	0.006
	0.000	0.220	0.000	0.000	0.998	0.000	0.000	0.000
Other food items	0.010	-0.005	0.003	-0.003	-0.007	-0.005	0.006	0.000
	0.000	0.000	0.004	0.067	0.000	0.000	0.000	0.459
Deflated food expenditure	0.312	0.224	-0.094	-0.726	-0.039	0.110	0.249	-0.036
	0.000	0.000	0.018	0.000	0.072	0.010	0.000	0.677
(Deflated food expenditure) ²	-0.020	-0.017	0.007	0.048	0.002	-0.008	-0.019	0.007
	0.000	0.000	0.030	0.000	0.152	0.013	0.000	0.302
Observations	5960	5960	5960	5960	5960	5960	5960	5960
R2	0.044	0.075	0.188	0.196	0.150	0.076	0.070	0.028

VAT reforms and Moroccan household's food consumption

5- Estimated parameters for the wealthy strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.061	-0.882	0.086	3.110	0.129	-0.178	-1.130	-0.074
	-0.027	0.974	1.974	2.974	3.974	4.974	5.974	6.974
Cereals	0.018	0.005	-0.016	0.011	-0.006	-0.007	-0.007	0.002
	0.000	0.029	0.000	0.002	0.000	0.006	0.001	0.238
Milk and dairy products	0.005	0.028	-0.011	-0.016	0.002	-0.006	-0.004	0.002
	0.029	0.000	0.000	0.000	0.039	0.000	0.004	0.238
Fat	-0.016	-0.011	0.051	-0.009	-0.008	-0.006	-0.005	0.006
	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.001
Meat	0.011	-0.016	-0.009	0.042	-0.004	-0.006	-0.011	-0.007
	0.002	0.000	0.000	0.000	0.027	0.060	0.000	0.015
Fish	-0.006	0.002	-0.008	-0.004	0.028	-0.008	-0.002	-0.003
	0.000	0.039	0.000	0.027	0.000	0.000	0.111	0.027
Vegetables	-0.007	-0.006	-0.006	-0.006	-0.008	0.033	0.000	-0.006
	0.006	0.000	0.002	0.060	0.000	0.000	0.769	0.000
Fruits	-0.007	-0.004	-0.005	-0.011	-0.002	0.000	0.023	0.007
	0.001	0.004	0.001	0.000	0.111	0.769	0.000	0.000
Other food items	0.001	0.002	0.006	-0.007	-0.003	-0.006	0.007	0.004
	0.601	0.238	0.001	0.015	0.027	0.000	0.000	0.000
Deflated food expenditure	0.023	0.296	-0.019	-0.758	-0.025	0.086	0.352	0.046
	0.826	0.000	0.752	0.000	0.580	0.199	0.000	0.794
(Deflated food expenditure) ²	0.001	-0.021	0.002	0.047	0.001	-0.005	-0.025	0.000
	0.844	0.000	0.688	0.000	0.657	0.272	0.000	0.975
Observations	2079	2079	2079	2079	2079	2079	2079	2079
R2	0.037	0.116	0.226	0.163	0.202	0.079	0.060	0.015

Appendix 3: Estimated parameters from the QAIDS model (ENCDM 2013/2014)**1- Estimated parameters for the poor/vulnerable strata**

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.192	-0.079	-0.020	0.946	-0.021	-0.270	0.082	0.170
	-0.400	-0.559	-0.911	0.000	-0.825	-0.112	-0.466	-0.433
Cereals	0.020	0.005	-0.036	0.031	0.000	-0.005	-0.006	-0.008
	0.000	-0.019	(0)	(0)	-0.943	-0.143	-0.002	0.000
Milk and dairy products	0.005	0.007	-0.010	0.003	-0.001	0.000	0.003	-0.008
	-0.019	0.000	0.000	-0.170	-0.501	-0.792	-0.005	0.000
Fat	-0.036	-0.010	0.082	-0.003	-0.013	-0.008	-0.004	-0.008
	(0)	0.000	(0)	-0.361	0.000	-0.011	-0.053	-0.005
Meat	0.031	0.003	-0.003	-0.026	-0.003	-0.010	-0.005	0.013
	(0)	-0.170	-0.361	0.000	-0.184	-0.003	-0.031	0.000
Fish	0.000	-0.001	-0.013	-0.003	0.022	0.005	-0.002	-0.008
	-0.943	-0.501	0.000	-0.184	(0)	-0.014	-0.058	0.000
Vegetables	-0.005	0.000	-0.008	-0.010	0.005	0.035	-0.009	-0.009
	-0.143	-0.792	-0.011	-0.003	-0.014	(0)	0.000	0.000
Fruits	-0.006	0.003	-0.004	-0.005	-0.002	-0.009	0.018	0.005
	-0.002	-0.005	-0.053	-0.031	-0.058	0.000	(0)	-0.007
Other food items	0.016	-0.008	-0.008	0.013	-0.008	-0.009	0.005	0.000
	0.000	0.000	-0.005	0.000	0.000	0.000	-0.007	-0.822
Deflated food expenditure	-0.065	0.051	0.043	-0.154	0.019	0.124	-0.039	0.021
	-0.447	-0.316	-0.515	-0.083	-0.600	-0.050	-0.355	-0.798
(Deflated food expenditure)²	0.010	-0.004	-0.007	0.005	-0.001	-0.007	0.006	-0.003
	-0.202	-0.422	-0.282	-0.510	-0.706	-0.211	-0.111	-0.715
Observations	0.010	-0.004	-0.007	0.005	-0.001	-0.007	0.006	-0.003
R2	-0.202	-0.422	-0.282	-0.510	-0.706	-0.211	-0.111	-0.715

VAT reforms and Moroccan household's food consumption

2- Estimated parameters for the modest strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.996	-0.259	-0.212	3.814	0.221	-1.329	-0.434	0.195
	-0.021	-0.357	-0.537	(0)	-0.261	0.000	-0.101	-0.665
Cereals	0.017	0.007	-0.033	0.020	-0.002	0.005	-0.003	-0.010
	-0.003	-0.003	(0)	0.000	-0.340	-0.197	-0.276	0.000
Milk and dairy products	0.007	0.015	-0.013	0.004	-0.003	0.001	0.000	-0.010
	-0.003	(0)	(0)	-0.125	-0.027	-0.658	-0.963	0.000
Fat	-0.033	-0.013	0.076	-0.001	-0.011	-0.008	-0.002	-0.007
	(0)	(0)	(0)	-0.734	0.000	-0.016	-0.311	-0.009
Meat	0.020	0.004	-0.001	-0.007	-0.005	-0.016	-0.003	0.010
	0.000	-0.125	-0.734	-0.240	-0.074	0.000	-0.188	-0.003
Fish	-0.002	-0.003	-0.011	-0.005	0.021	0.009	-0.002	-0.007
	-0.340	-0.027	0.000	-0.074	(0)	0.000	-0.249	0.000
Vegetables	0.005	0.001	-0.008	-0.016	0.009	0.025	-0.008	-0.008
	-0.197	-0.658	-0.016	0.000	0.000	0.000	0.000	0.000
Fruits	-0.003	0.000	-0.002	-0.003	-0.002	-0.008	0.014	0.004
	-0.276	-0.963	-0.311	-0.188	-0.249	0.000	0.000	-0.037
Other food items	0.018	-0.010	-0.007	0.010	-0.007	-0.008	0.004	0.000
	0.000	0.000	-0.009	-0.003	0.000	0.000	-0.037	-0.621
Deflated food expenditure	0.331	0.113	0.102	-1.110	-0.051	0.481	0.135	-0.001
	-0.026	-0.247	-0.391	(0)	-0.453	0.000	-0.140	-0.997
(Deflated food expenditure) ²	-0.023	-0.009	-0.011	0.085	0.004	-0.038	-0.009	0.000
	-0.073	-0.309	-0.287	0.000	-0.543	0.000	-0.277	-0.978
Observations	1.648	1.648	1.648	1.648	1.648	1.648	1.648	1.648
R2	0.047	0.081	0.145	0.190	0.071	0.090	0.077	0.010

VAT reforms and Moroccan household's food consumption

3- Estimated parameters for the lower middle strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.188	-0.172	0.238	2.517	-0.044	-1.579	-0.110	0.338
	-0.515	-0.429	-0.303	(0)	-0.768	(0)	-0.572	-0.318
Cereals	0.015	0.008	-0.024	0.006	-0.002	0.001	0.000	-0.004
	0.000	0.000	(0)	-0.083	-0.384	-0.795	-0.948	-0.008
Milk and dairy products	0.008	0.014	-0.011	0.001	-0.004	-0.003	-0.002	-0.004
	0.000	(0)	(0)	-0.704	0.000	-0.021	-0.156	-0.008
Fat	-0.024	-0.011	0.077	-0.005	-0.016	-0.009	-0.009	-0.003
	(0)	(0)	(0)	-0.094	(0)	0.000	0.000	-0.112
Meat	0.006	0.001	-0.005	0.014	-0.007	-0.009	-0.004	0.006
	-0.083	-0.704	-0.094	-0.006	0.000	-0.001	-0.068	-0.028
Fish	-0.002	-0.004	-0.016	-0.007	0.030	0.007	-0.003	-0.006
	-0.384	0.000	(0)	0.000	(0)	0.000	-0.005	0.000
Vegetables	0.001	-0.003	-0.009	-0.009	0.007	0.025	-0.006	-0.006
	-0.795	-0.021	0.000	-0.001	0.000	(0)	0.000	0.000
Fruits	0.000	-0.002	-0.009	-0.004	-0.003	-0.006	0.015	0.007
	-0.948	-0.156	0.000	-0.068	-0.005	0.000	(0)	0.000
Other food items	0.005	-0.004	-0.003	0.006	-0.006	-0.006	0.007	0.000
	-0.038	-0.008	-0.112	-0.028	0.000	0.000	0.000	-0.962
Deflated food expenditure	0.070	0.084	-0.048	-0.646	0.040	0.542	0.030	-0.072
	-0.466	-0.243	-0.528	0.000	-0.411	(0)	-0.639	-0.522
(Deflated food expenditure)²	-0.001	-0.006	0.002	0.044	-0.004	-0.042	0.000	0.008
	-0.890	-0.299	-0.751	0.000	-0.315	(0)	-0.993	-0.415
Observations	2.693	2.693	2.693	2.693	2.693	2.693	2.693	2.693
R2	0.043	0.051	0.162	0.182	0.107	0.106	0.069	0.009

VAT reforms and Moroccan household's food consumption

4- Estimated parameters for the upper middle strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.164	-0.330	0.161	2.247	-0.039	-0.990	-0.763	0.878
	-0.266	-0.003	-0.181	(0)	-0.641	(0)	(0)	0.000
Cereals	0.018	0.010	-0.017	-0.004	-0.004	0.003	-0.003	-0.005
	(0)	(0)	(0)	-0.065	-0.002	-0.054	-0.020	0.000
Milk and dairy products	0.010	0.020	-0.014	-0.003	-0.003	-0.004	-0.002	-0.005
	(0)	(0)	(0)	-0.023	0.000	0.000	-0.040	0.000
Fat	-0.017	-0.014	0.061	-0.013	-0.009	-0.002	-0.005	-0.001
	(0)	(0)	(0)	(0)	(0)	-0.103	0.000	-0.619
Meat	-0.004	-0.003	-0.013	0.029	-0.004	-0.010	-0.003	0.006
	-0.065	-0.023	(0)	(0)	-0.006	0.000	-0.031	0.000
Fish	-0.004	-0.003	-0.009	-0.004	0.030	0.001	-0.004	-0.008
	-0.002	0.000	(0)	-0.006	(0)	-0.556	0.000	(0)
Vegetables	0.003	-0.004	-0.002	-0.010	0.001	0.023	-0.005	-0.005
	-0.054	0.000	-0.103	0.000	-0.556	(0)	(0)	0.000
Fruits	-0.003	-0.002	-0.005	-0.003	-0.004	-0.005	0.015	0.007
	-0.020	-0.040	0.000	-0.031	0.000	(0)	(0)	0.000
Other food items	0.006	-0.005	-0.001	0.006	-0.008	-0.005	0.007	0.000
	0.000	0.000	-0.619	0.000	(0)	0.000	0.000	-0.733
Deflated food expenditure	0.073	0.141	-0.021	-0.554	0.035	0.330	0.229	-0.232
	-0.111	0.000	-0.575	(0)	-0.183	(0)	(0)	0.000
(Deflated food expenditure) ²	-0.003	-0.011	0.000	0.036	-0.004	-0.024	-0.015	0.019
	-0.432	0.000	-0.871	(0)	-0.074	(0)	0.000	0.000
Observations	7.034	7.034	7.034	7.034	7.034	7.034	7.034	7.034
R2	0.025	0.089	0.137	0.132	0.111	0.066	0.076	0.006

VAT reforms and Moroccan household's food consumption

5- Estimated parameters for the wealthy strata

Product group	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Ln (Product prices)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.522	-0.800	0.361	2.485	0.286	-0.915	-0.882	0.987
	-0.027	0.000	-0.079	(0)	-0.111	0.000	0.000	-0.044
Cereals	0.035	0.000	-0.013	-0.010	-0.010	-0.004	0.000	0.002
	(0)	-0.842	0.000	-0.001	0.000	-0.054	-0.903	-0.205
Milk and dairy products	0.000	0.022	-0.009	-0.013	0.000	-0.003	0.000	0.002
	-0.842	(0)	0.000	0.000	-0.963	-0.047	-0.990	-0.205
Fat	-0.013	-0.009	0.055	-0.019	-0.012	0.007	-0.009	-0.001
	0.000	0.000	(0)	0.000	(0)	0.000	0.000	-0.590
Meat	-0.010	-0.013	-0.019	0.065	-0.008	-0.007	-0.013	0.004
	-0.001	0.000	0.000	(0)	0.000	-0.010	0.000	-0.178
Fish	-0.010	0.000	-0.012	-0.008	0.043	-0.005	-0.001	-0.006
	0.000	-0.963	(0)	0.000	(0)	-0.001	-0.311	-0.001
Vegetables	-0.004	-0.003	0.007	-0.007	-0.005	0.012	-0.001	-0.001
	-0.054	-0.047	0.000	-0.010	-0.001	0.000	-0.541	-0.487
Fruits	0.000	0.000	-0.009	-0.013	-0.001	-0.001	0.019	0.005
	-0.903	-0.990	0.000	0.000	-0.311	-0.541	(0)	-0.014
Other food items	-0.003	0.002	-0.001	0.004	-0.006	-0.001	0.005	0.000
	-0.173	-0.205	-0.590	-0.178	-0.001	-0.487	-0.014	-0.622
Deflated food expenditure	0.188	0.272	-0.073	-0.611	-0.062	0.275	0.274	-0.263
	-0.006	0.000	-0.222	0.000	-0.234	0.000	0.000	-0.065
(Deflated food expenditure)²	-0.012	-0.020	0.004	0.039	0.004	-0.018	-0.019	0.022
	-0.013	0.000	-0.312	0.000	-0.328	0.000	0.000	-0.037
Observations	2.399	2.399	2.399	2.399	2.399	2.399	2.399	2.399
R2	0.051	0.074	0.157	0.118	0.203	0.073	0.052	0.013

Appendix 4: Price Elasticities by Household Strata (2000/2001)**Poor/vulnerable**

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.928	-0.015	-0.407	0.282	-0.506	-0.082	-0.323	-0.111
Milk & dairy products	-0.463	-0.631	0.127	0.310	-0.119	-0.030	-0.022	-0.618
Fat	-0.338	0.021	-0.119	0.076	-0.212	-0.130	-0.158	-0.265
Meat	0.023	-0.090	-0.069	-1.022	-0.206	-0.038	0.025	-0.147
Fish	-1.215	0.021	0.283	0.842	0.396	-0.035	-0.076	-1.557
Vegetables	-0.168	-0.015	-0.145	0.063	0.255	-0.726	-0.188	-0.185
Fruits	-0.715	0.022	0.138	0.500	-0.147	-0.071	-0.268	-0.876
Other food items	0.003	-0.145	-0.034	0.056	-0.442	-0.040	0.038	-1.100

Modest

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.945	0.128	-0.417	0.097	-0.476	-0.087	-0.282	0.102
Milk & dairy products	-0.459	-0.767	0.031	-0.327	-0.060	-0.183	0.068	0.655
Fat	-0.424	-0.084	-0.157	-0.185	-0.301	-0.177	-0.104	0.356
Meat	-0.018	-0.049	-0.006	-1.078	-0.057	-0.117	-0.144	0.151
Fish	-1.409	0.014	0.170	-0.893	0.258	-0.448	-0.017	1.930
Vegetables	-0.197	-0.047	-0.111	-0.164	0.188	-0.793	-0.136	0.217
Fruits	-0.812	0.068	0.095	-0.526	0.020	-0.294	-0.532	1.127
Other food items	0.022	-0.166	-0.037	-0.121	-0.480	-0.067	0.106	-0.845

VAT reforms and Moroccan household's food consumption

Lower average

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.886	0.182	-0.425	0.129	-0.401	-0.041	-0.246	-0.146
Milk & dairy products	0.030	-0.734	-0.024	-0.324	-0.060	0.167	0.030	-0.516
Fat	-0.173	-0.052	-0.192	-0.235	-0.187	0.055	-0.059	-0.311
Meat	0.163	-0.086	-0.102	-1.065	-0.361	-0.013	-0.048	-0.177
Fish	-0.066	0.077	0.019	-0.860	0.240	0.590	0.056	-1.382
Vegetables	-0.059	-0.070	-0.102	-0.168	0.257	-0.628	-0.113	-0.212
Fruits	-0.058	0.053	0.001	-0.456	-0.047	0.267	-0.549	-0.705
Other food items	0.097	-0.110	-0.016	-0.116	-0.363	0.016	0.162	-1.120

Upper average

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.932	0.111	-0.142	0.121	-0.094	0.001	-0.056	-0.038
Milk & dairy products	-0.008	-0.782	-0.114	0.241	-0.068	-0.080	-0.051	-0.048
Fat	-0.156	-0.165	-0.424	0.155	-0.238	-0.054	-0.103	-0.022
Meat	-0.049	-0.034	-0.112	-0.776	-0.092	-0.096	-0.053	0.026
Fish	-0.190	-0.044	-0.039	0.598	-0.184	-0.099	-0.121	-0.101
Vegetables	-0.034	-0.053	-0.007	0.148	0.020	-0.843	-0.097	-0.046
Fruits	-0.111	-0.025	-0.024	0.332	-0.092	-0.100	-0.817	0.006
Other food items	-0.001	-0.053	0.004	0.156	-0.216	-0.065	0.085	-1.011

VAT reforms and Moroccan household's food consumption

Wealthy

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.936	0.108	-0.222	-0.125	-0.176	-0.054	-0.040	-0.045
Milk & dairy products	-0.049	-0.619	-0.165	-0.343	0.066	-0.039	0.028	-0.077
Fat	-0.208	0.008	-0.332	-0.404	-0.245	-0.036	0.043	-0.088
Meat	0.039	-0.119	-0.131	-0.934	-0.124	-0.045	-0.118	-0.070
Fish	-0.268	0.297	-0.141	-0.817	-0.165	-0.025	0.223	-0.264
Vegetables	-0.115	0.023	-0.092	-0.268	-0.224	-0.687	0.069	-0.106
Fruits	-0.150	0.083	-0.083	-0.417	-0.055	0.016	-0.578	-0.083
Other food items	-0.026	0.064	0.073	-0.155	-0.084	-0.051	0.137	-1.019

Appendix 5: Price elasticities by household strata (2013/2014)**Poor/vulnerable**

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.946	0.075	-0.265	0.247	0.005	-0.065	-0.156	-0.039
Milk & dairy products	-0.119	-0.891	-0.016	0.345	-0.028	-0.098	0.054	-0.022
Fat	-0.255	-0.160	-0.334	0.146	-0.448	-0.103	-0.099	-0.031
Meat	0.117	0.045	-0.010	-1.022	-0.109	-0.100	-0.118	0.082
Fish	-0.318	-0.032	0.035	0.723	-0.221	-0.192	-0.100	0.011
Vegetables	-0.086	0.003	-0.035	0.095	0.174	-0.806	-0.211	-0.038
Fruits	-0.246	0.036	0.060	0.472	-0.088	-0.209	-0.599	0.065
Other food items	0.028	-0.138	-0.039	0.178	-0.300	-0.095	0.100	-0.990

Modest

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.974	0.086	-0.264	0.235	-0.073	0.000	-0.062	-0.061
Milk & dairy products	-0.123	-0.818	-0.075	0.394	-0.083	-0.077	-0.026	-0.066
Fat	-0.275	-0.189	-0.329	0.232	-0.354	-0.108	-0.059	-0.048
Meat	0.052	0.045	0.001	-0.909	-0.145	-0.143	-0.074	0.057
Fish	-0.391	-0.069	-0.001	0.882	-0.322	-0.133	-0.091	-0.064
Vegetables	-0.059	0.004	-0.047	0.126	0.292	-0.864	-0.161	-0.052
Fruits	-0.242	-0.020	0.037	0.527	-0.048	-0.173	-0.770	0.012
Other food items	0.027	-0.136	-0.044	0.210	-0.236	-0.093	0.068	-1.002

VAT reforms and Moroccan household's food consumption

Lower average

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.973	0.099	-0.190	0.183	-0.047	-0.028	-0.007	-0.042
Milk & dairy products	-0.079	-0.832	-0.057	0.356	-0.109	-0.099	-0.050	-0.064
Fat	-0.221	-0.140	-0.322	0.221	-0.460	-0.118	-0.168	-0.047
Meat	-0.014	0.006	-0.031	-0.815	-0.212	-0.096	-0.074	0.019
Fish	-0.308	-0.070	-0.051	0.807	-0.105	-0.121	-0.108	-0.130
Vegetables	-0.071	-0.048	-0.057	0.169	0.219	-0.859	-0.111	-0.057
Fruits	-0.182	-0.035	-0.022	0.497	-0.091	-0.148	-0.756	-0.016
Other food items	-0.029	-0.054	-0.011	0.192	-0.168	-0.076	0.123	-1.019

Upper average

Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items
Cereals	-0.932	0.111	-0.142	0.121	-0.094	0.001	-0.056	-0.038
Milk & dairy products	-0.008	-0.782	-0.114	0.241	-0.068	-0.080	-0.051	-0.048
Fat	-0.156	-0.165	-0.424	0.155	-0.238	-0.054	-0.103	-0.022
Meat	-0.049	-0.034	-0.112	-0.776	-0.092	-0.096	-0.053	0.026
Fish	-0.190	-0.044	-0.039	0.598	-0.184	-0.099	-0.121	-0.101
Vegetables	-0.034	-0.053	-0.007	0.148	0.020	-0.843	-0.097	-0.046
Fruits	-0.111	-0.025	-0.024	0.332	-0.092	-0.100	-0.817	0.006
Other food items	-0.001	-0.053	0.004	0.156	-0.216	-0.065	0.085	-1.011

VAT reforms and Moroccan household's food consumption

Wealthy									
Product	Cereals	Milk and dairy products	Fat	Meat	Fish	Vegetables	Fruits	Other food items	
Cereals	-0.763	-0.011	-0.132	0.111	-0.193	-0.063	-0.011	-0.034	
Milk & dairy products	-0.034	-0.790	-0.081	0.148	0.005	-0.057	-0.019	-0.047	
Fat	-0.131	-0.094	-0.378	0.147	-0.239	0.052	-0.131	-0.069	
Meat	-0.089	-0.128	-0.199	-0.641	-0.161	-0.083	-0.158	-0.006	
Fish	-0.137	-0.020	-0.111	0.371	-0.142	-0.104	-0.055	-0.143	
Vegetables	-0.064	-0.038	0.096	0.194	-0.088	-0.894	-0.030	-0.068	
Fruits	-0.036	-0.012	-0.087	0.189	-0.022	-0.040	-0.793	-0.046	
Other food items	-0.038	0.016	-0.006	0.114	-0.110	-0.023	0.048	-1.026	