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THE DEMAND FOR POTATOES IN TUNISIA

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I. INTRODUCTION

Tunisia, like other North African countries, has experienced strong and sustained growth in potato consumption over the past 30 years. Between 1960 and 1990, average per capita potato consumption in Tunisia doubled from 10.5 to over 20 kg/person/year. Total annual potato consumption increased from 42,000 tons to 160,000 tons, for an annual growth rate of 4.5 percent (Horton, 1988). The increasing importance of potatoes as a major food source has earned it the title of a "price-sensitive" good (La Presse, April 21, 1991), in that consumers have come to expect an affordable supply of fresh potatoes available on the market year-round whereas seasonal availability for most other vegetables is accepted. While potatoes are still far from supplanting traditional cereal staples in the local diet, they are no longer considered as simply another seasonal fresh vegetable. One result is that potato supply and prices have become an important concern of government policy.

This paper investigates potato consumption and demand in Tunisia. It draws upon information from national household food consumption surveys, time series market data on food prices and quantities, and from an independent survey of retail potato markets conducted in the capital city of Tunis. These data are used to shed light on consumer attitudes and preferences for potatoes, estimate income and price elasticities, and construct an hedonic price model to determine how potato quality characteristics affect market prices. Also, a method to determine whether structural change may have occurred in potato

demand is devised and tested. Finally, some aspects of current government potato price and supply management policies are discussed. While the findings draw exclusively upon Tunisian data, the same general tendencies are likely to be true for other North African countries as well.

II. INCOME, URBANIZATION AND POTATO CONSUMPTION

A. Potato in the local cuisine.

Potatoes are a relatively recent addition to Tunisian cuisine, being introduced during French colonial rule by European settlers in the early part of the 20th century. They were slowly incorporated into local cuisine, and now can regularly be found in traditional dishes including salads, couscous, and ragout.[1] In the post-colonial period potatoes have also emerged as an important urban convenience food. In a consumer survey conducted in Tunis during the summer of 1990, one-third of fresh potatoes purchased by households were prepared and consumed as french fries (pomme frites). Potatoes are viewed by consumers as being tasty, nutritious, and easy to prepare. The preference of children in particular for french fries over other vegetables was noted by many of the households in the survey. Potatoes in the form of french fries are also the most important vegetable served by the large hotel and restaurant industry.

While urban households consume potatoes regularly and as a main vegetable in family meals, in rural areas potatoes are still largely regarded as a side vegetable to be added to sauces and traditional dishes. According to the 1985 *Enquête National sur le Budget et la Consommation des Menages* (National Household Expenditure and Consumption Survey), annual per capita potato consumption in rural areas was only 14 kilograms (kg), compared

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[1]Couscous is a form of semolina made from durum wheat and ragout is prepared with noodles or macaroni.

to 23 kg in urban areas (Institut National de la Statistique, 1985). Higher potato consumption in urban areas can partly be explained by the significantly higher rate of female labor force participation in the urban cities of Tunisia. For women working outside the home, easy preparation is a highly desired food characteristic. This has contributed to a preference in urban areas for foods such as potatoes and bread over traditional staples like couscous and semolina, which take considerably longer to prepare (Périssé and Kamoun, 1987; Radwan, Jamal and Ghose, 1991).

B. Potato consumption and personal income

Family capita income is another important factor determining the level of household potato consumption. According to the 1985 National Household Expenditure and Consumption Survey, average potato consumption increased from 5 kg/person/year for the lowest income (measured as consumption expenditure) groups to 30 kg/person/year for the highest income groups (see Figure 1). Higher urban incomes is another factor explaining the rural-urban difference in potato consumption. In 1985, the average per capita income for the country was 471 Dinars (1 Dinar = $1.05), of which about 40 percent was spent on food. But average rural per capita income was only 294 Dinars, compared to 625 Dinars for urban residents.

A visual inspection of Figure 1 indicates that the effect of personal income on potato consumption declines as income rises. Among low income consumers, potato consumption is quite sensitive

to changes in income. But for high income consumers, potato consumption levels off at around 30 kg/person/year. This relationship was quantified by fitting these data to a log-quadratic function to yield

(eq 1) $(\log Q) = -3.02 + 1.52 (\log Y) - 0.09 (\log Y)^2$

where Q is per capita potato consumption, Y is per capita income, and log is the natural logarithm. This curve is plotted in Figure 1.

Taking the derivative of (log Q) with respect to (log Y) gives the income elasticity of potato demand, E_y, for each level of income:

(eq 2) $E_y = 1.52 - 0.18 (\log Y)$.

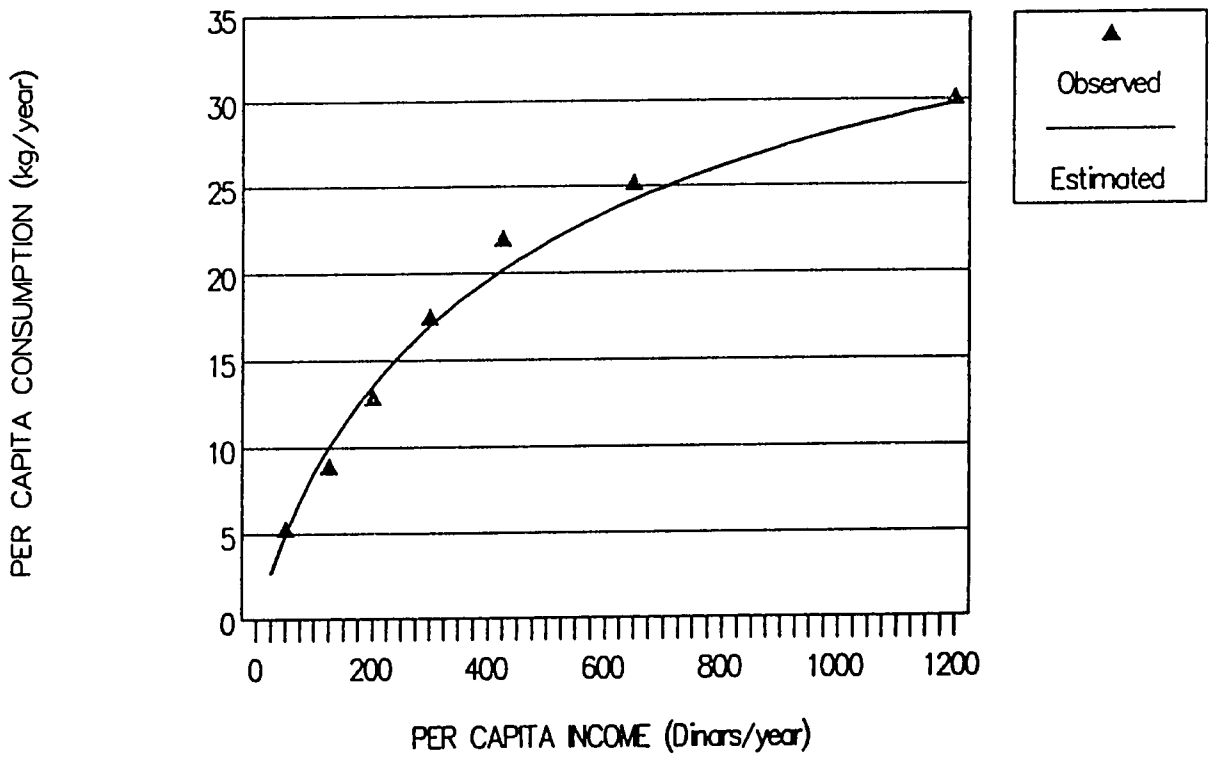
E_y gives the percent change in potato consumption when income changes by 1 percent. According to (eq 2), the income elasticity of potato demand decreases as income rises. For example, at a low per capita income of 200 Dinars, the income elasticity is 0.60. At the average income level of 471 Dinars, E_y is 0.45. The income elasticity falls to 0.36 for high income consumers with an income of 800 Dinars.

Behind the strong correlation between income and potato consumption depicted in Figure 1 is a basic behavioral explanation: once basic food needs are met, people prefer variety in their diets. Low income consumers, however, are obliged to spend much of their total income on food just to meet basic needs. They tend to choose the cheapest source of calories, which in Tunisia are heavily subsidized cereal products. As personal income rises, individuals diversify their

diets and consume more vegetables, fruits, oils, meats, and fewer cereals.

FIGURE 1

POTATO CONSUMPTION AND INCOME IN TUNISIA



One Dinar = $ 1.05 U.S. at the 1991 official exchange rate.
Income is measured as consumption expenditure.

Source: Institut National de la Statistique, 1985

III. FOOD PRICES AND POTATO DEMAND

In addition to urbanization and income, the relative price of potatoes to other foods affects household potato consumption. The relationship between food prices and potato demand for the Tunis metropolitan area is investigated below using both time series market data and a small cross-sectional consumer survey conducted in 1990.[2] The consumer survey sheds light on consumer attitudes toward the potato and food preparation habits. Using time series market data, three functional forms for the potato demand function are specified and estimated with multiple regression analysis. A test for structural change in potato demand is also devised and estimated. It is hypothesized that demand should be more inelastic for staple foods compared to other foods. The test for structural change examines whether the own-price elasticity of potato demand has been stable or declining (in absolute value) between 1975 and 1990, the period for which market price and quantity figures are available.

Market data for the econometric analysis come from a monthly statistical series published by the *Institut National de la Statistique* (INS, or National Statistics Institute). The INS conducts and publishes the results of monthly surveys of consumer prices in Tunis and its surrounding suburbs. The quantity of potatoes transiting through the Tunis fruit and vegetable wholesale market each month is a measure of potato consumption in

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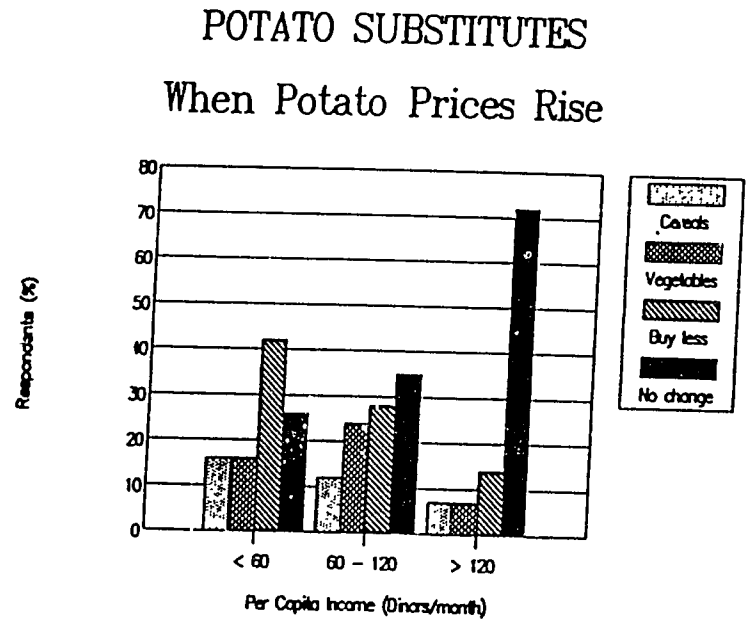
[2] This survey was conducted by the International Potato Center (CIP) and the National Agricultural Research Institute of Tunisia (INRAT) and was directed by the author.

the urban area. This is the main transaction point for fresh horticultural products entering Tunis. These statistics were assembled for the period between January, 1975 and December, 1990 and are listed in the Appendix. Also listed in the Appendix are some other data series which may influence demand, such as the number of non-resident tourists visiting Tunisia, whether the Moslem fasting month Ramadan falls on the calendar period (note that the Moslem religious calendar follows the lunar cycle), aggregate population and average per capita income. The latter two are statistics are from annual series which cover the entire country, as these are not available for just the Tunis area. About one-fourth of the national population reside in the capital and surrounding suburbs, and they account for about half of national income. All price and income series were deflated by the consumer price index (1983=100) for the econometric analysis.

In addition, a survey of 60 potato consumers (interviewed in local markets while shopping) was carried out in Tunis during the summer of 1990. This survey provides useful information on how to specify a potato demand function. Figure 2 shows the food groups that consumers identified as potato substitutes, broken down by income classes. Poorer households were likely to substitute potatoes with cereals or other vegetables if they found the price of potatoes too high. Richer households were much less sensitive to price changes. Most high income respondents said that they would continue to purchase similar quantities of potatoes even at higher prices. The absence of close substitutes for potatoes among middle and upper income consumers (the main potato buyers) suggests that potatoes should

be fairly price inelastic. An inelastic demand implies that a small reduction in the quantity supplied to the market would lead to a relatively large price increase. In the survey, consumers identified poultry, red meats, fish, and other vegetables as foods most often consumed with potatoes (potato complements).

FIGURE 2



Consumers were asked: "If potato prices rise, what other commodities, if any, would be buy instead of potatoes?

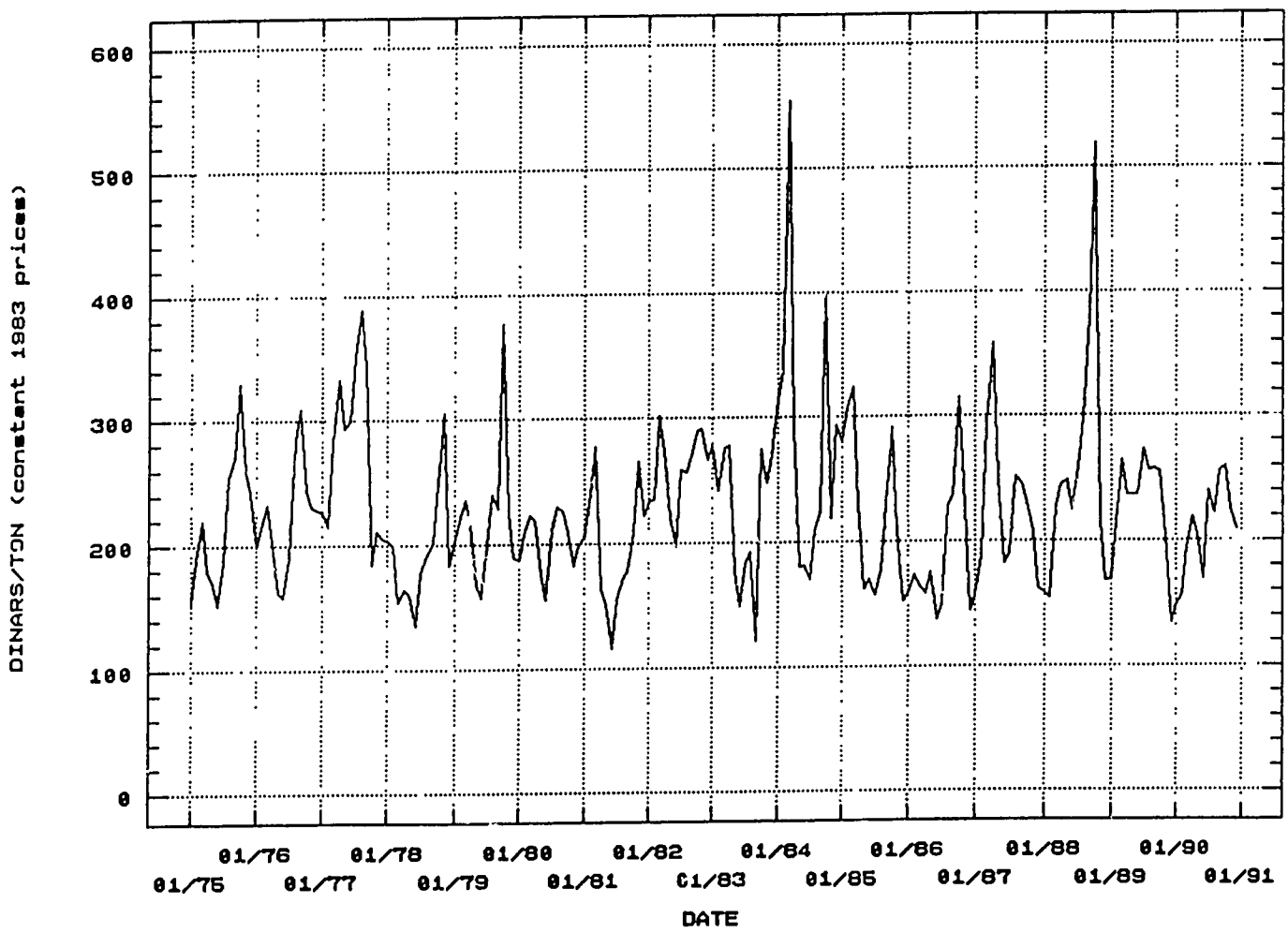
One Dinar = $ 1.05 U.S. at the 1991 official exchange rate.

The entire monthly potato retail price series (at constant 1983 prices) is presented in Figure 3. While seasonal price movements are large, the long-term price trend appears to be generally stable. Two months of exceptionally high potato prices are March, 1983 and October, 1988, when the retail potato price exceeded 0.500 Dinars/kg at 1983 prices (other prices ranged from 0.120 to 0.400 Dinars/kg). These two data points were dropped from the series for the econometric analysis because they were judged to be outliers.

FIGURE 3

RETAIL POTATO PRICES IN TUNIS

(constant 1983 prices)



The potato demand function consists of the following:

$$\text{(eq 3)} \quad \text{Potato Quantity} = A + B_1 \text{ (Potato Price)} + \sum_j B_j \text{ (Other Food Price}_j\text{, } j = 2 \ldots n) + \sum_k C_k \text{ (Demand Shifter}_k\text{, } k = 1 \ldots m) + e,$$

where A and vectors B and C are coefficients to be estimated and e is an error term assumed to be normally distributed. Other food prices include price indices for cereal products, vegetables, and meats (beef, lamb, and poultry products). Demand shifters include population, per capita income, Ramadan, and the number of non-resident tourist-nights.

Linear, log-linear, and log-log functional forms for the demand function were specified and estimated. In the log-linear form, potato quantity is expressed in normal units (tons/month) while the right-hand-side variables are expressed in natural logarithms. In the log-log form, both sides of the equation are expressed in logarithms.

The price elasticities of potato demand can be derived from the estimates of the coefficients in (eq 3). Elasticities measure the percent change in the quantity of potatoes demanded for a 1 percent change in price. Equation 4 describes how the elasticities are calculated for each functional form:

$$\text{(eq 4a)} \quad \text{Linear:} \quad E_j = B_j \left(\hat{P}_j / \hat{Q}_p \right)$$

$$\text{(eq 4b)} \quad \text{Log-linear:} \quad E_j = B_j \left(1 / \hat{Q}_p \right)$$

$$\text{(eq 4c)} \quad \text{Log-log:} \quad E_j = B_j$$

where E_j is the elasticity and B_j is the regression coefficient

of price variable j, $\hat{P}_j$ is the is the average price of commodity j and $\hat{Q}_p$ is the average quantity of potatoes over the data period. For the linear and log-linear functions the elasticities are calculated at mean values of $\hat{P}_j$ and $\hat{Q}_p$. The elasticity for the log-log function is constant for all quantities and prices and is equal to the coefficient.

To test for structural change in potato demand, the specification was changed so that the potato price coefficient B_1 could vary. Since our main interest is to determine whether the own-price potato elasticity may have declined in absolute value over time, we specify a simply linear trend for B_1:

(eq 5) $$B_{1t} = \alpha + \beta * T$$

where B_{1t} is the potato price coefficient in year t, ? and ? are coefficients to be estimated, and T stands for the year. By replacing B_1 in (eq 3) with B_{1t} in (eq 4) the function to be estimated becomes

(eq 6) $$\text{Potato Quantity} = A + \alpha\,(\text{Potato Price}) + \beta\,(\text{Potato Price} * \\ + \Sigma_j\, B_j\,(\text{Other Food Price}_j,\ j = 2 \ldots n) \\ + \Sigma_k\, C_k\,(\text{Demand Shifter}_k,\ k = 1 \ldots m) + e.$$

The hypothesis of structural change in potato demand (i.e. of a declining own-price elasticity) is tested by the sign and significance of the coefficient β in (eq 6).

Regression results showed that the demand shifters for average per capita income, Ramadan, and the number of tourists did not significantly affect final potato demand in Tunis (these results are reported in the Appendix). These variables were

dropped from the regression results reported in Table 1. Table 1 also shows own and cross-price elasticities and the results of the test for structural change.

The R-Squared (adj.) measures how well the model fits the data. The linear and log-linear model appear to fit the data much better than the log-log model, although all models give the same sign for the coefficients. The elasticity estimates of the linear and log-linear models are also very similar. These models probably give the more reasonable estimates of the elasticities. The low value of the Durban-Watson statistic suggests that positive autocorrelation is present in the data. However, since most of the estimated elasticities are statistically significant, corrective measures for autocorrelation were not taken.

The signs of the coefficients and elasticities are consistent with the findings of our consumer survey about which foods serve as potato substitutes and complements. The quantitative estimates, however, give further evidence on the strengths of these relationships. The coefficient of the cereal price variable is significant and positive. This implies that potatoes and cereals are food substitutes. Increases in the prices of cereals will increase the consumption of potatoes, as consumers substitute potatoes for cereals. While the consumer survey identified other vegetables as both substitutes and complements, the complementary effect appears to be more important given the significant and negative coefficient of the vegetable price variable. This is further evidence that potatoes play a role in the family food basket that is quite different

Table 1 REGRESSION ESTIMATES OF POTATO DEMAND FUNCTIONS

DEPENDENT VARIABLE: Q Potato (mean value = 2149 tons/month).
N = 190 observations (1/75 to 12/90 with two outliers omitted: 4/83 and 10/88).

INDEPENDENT VARIABLES	Mean Value (units)	LINEAR MODEL				LOG-LINEAR MODEL				LOG-LOG MODEL			
		Coefficient (std. err.)	t-value	sig. level	**Elasticity at means**	Coefficient (std. err.)	t-value	sig. level	**Elasticity at means**	Coefficient (std. err.)	t-value	sig. level	**Elasticity**
Constant		-822.20	-0.418	0.677		-37990.00	-3.782	0.000		-28.199	-2.656	0.009	
		.(1967.85)				.(10045)				.(10.618)			
P Potato	223	-7.017	-8.779	0.000	**-0.73**	-1576.87	-8.604	0.000	**-0.73**	-0.976	-5.021	0.000	**-0.98**
	(D/ton)	.(0.799)				.(183.27)				.(0.194)			
P Cereal	110	14.543	1.956	0.052	**0.74**	1576.51	1.907	0.058	**0.73**	1.909	2.184	0.030	**1.91**
	(Index)	.(7.435)				.(826.90)				.(0.874)			
P Meat	95	-12.231	-1.211	0.228	**-0.54**	-1143.97	-1.181	0.239	**-0.53**	-0.305	-0.298	0.766	**-0.31**
	(Index)	.(10.101)				.(968.80)				.(1.024)			
P Vegetable	102	-23.312	-2.455	0.015	**-1.11**	-2782.01	-3.017	0.003	**-1.29**	-2.301	-2.361	0.019	**-2.30**
	(Index)	.(9.496)				.(922.15)				.(0.975)			
Population	6822	0.951	6.146	0.000	**3.02**	6721.02	6.037	0.000	**3.13**	4.989	4.240	0.000	**4.99**
	('000)	.(0.155)				.(1113.23)				.(1.177)			
R-Squared (adj.)		0.442				0.428				0.233			
Standard Error		611.04				624.16				0.652			
Durban-Watson		0.931				0.884				1.080			
TEST FOR STRUCTURAL CHANGE [1]													
P Potato		-4.891	-3.251	0.001	**-0.508**	-1334.65	-4.698	0.000	**-0.621**	-0.768	-2.554	0.012	**-0.768**
		.(1.504)				.(284.07)				.(0.301)			
P Potato * Year		-0.295	-1.665	0.098	**-0.031**	-31.19	-1.116	0.226	**-0.015**	-0.026	-0.892	0.374	**-0.026**
		.(0.177)				.(27.96)				.(0.030)			

[1] In the test for structural change, the regressions were rerun with the variable (PPotato*Year) included. Only the estimates for the variables (PPotato) and (PPotato*Year) from these regressions are reported below.

from other fresh vegetables. Potatoes appear to be consumed as a main dish rather than simply as a side vegetable. The sign of the coefficient with the meat price variable is not statistically significant. While the negative sign of the elasticity is consistent with our hypothesis that meat and potatoes are food complements, the relationship between meat price and potato consumption does not appear to be very strong.

The bottom of Table 1 shows the results of the test for structural change in potato demand. These results do not support the hypothesis of structural change. The own-price elasticity of potato demand has probably remained fairly constant at around - 0.5 to - 0.8 between the data period (1975 to 1990). While the estimates of β in the linear is statistically significant, its value is negative, which is the opposite of what we would expect if demand was becoming more inelastic. Note, however, that there has also been an offsetting upward trend in potato quantity over time. Thus the value of own-price potato elasticity in the linear function has not changed appreciable over time. The most appropriate test of the hypothesis is given by the results of the log-log function, which gives a constant elasticity for all quantities and prices. The estimate of β in this function is not statistically significant.

The price elasticities shown in Table 1 are estimates of an uncompensated, or Marshallian, demand function. In other words, the estimated price elasticity is made up of both a pure substitution effect (in which the consumers' utility is held constant) and the real income effect of a price change. We can

separate these two effects so long as we know the income elasticity and the proportion of the consumer's budget spent on the commodity. The relationship between total or uncompensated price elasticities (E_j^U) and pure substitution elasticities (E_j^S) is given by the Slutsky equation:

$$\text{(eq 7)} \qquad E_j^S = E_j^U + K_j E_y$$

where K_j is the proportion of the average consumer's income spent on good j and E_y is the income elasticity for potatoes. Table 2 shows the results of this exercise using the price elasticity estimates from the linear demand function and an average income elasticity of 0.45 derived above. Budget shares come from the 1985 National Household Expenditure and Consumption Survey (Institut National de la Statistique, 1985).

Because potato purchases make up only about 1 percent of the average household budget, there is very little difference (none after rounding to two decimal places) between own-price uncompensated and pure substitution price elasticities. A 10 percent increase in the retail price of potatoes will decrease consumption by 7.3 percent. An own-price elasticity of this magnitude is consistent with the hypothesis that potatoes are moderately price inelastic i.e. that there are few close substitutes in the consumer's food basket (Tomek and Robinson, 1981, contains a thorough discussion of demand elasticities, their measurement and interpretation).

In the above exercise income elasticities were derived from a cross-sectional survey of households and price elasticities were estimated from monthly time series on market quantities and

prices. However, elasticities estimated from different kinds of data may be measuring different aspects of consumer choice. Demand elasticities estimated from cross-sectional data are generally thought to reflect long-run adjustments in consumer demand behavior. On the other hand, elasticities derived from monthly or quarterly data are more likely to reflect short-run consumer adjustments to market fluctuations. Short-run effects of income and price changes may be smaller due to established patterns in lifestyles and habits (see Timmer, Falcon, and Pearson, 1983, pp. 1976, for explanations of this and other aspects of applied consumer demand analysis).

Table 2. BUDGET SHARES, UNCOMPENSATED PRICE ELASTICITIES AND PURE SUBSTITUTION EFFECTS

Commodity	Budget Share	Uncompensated Price Elasticity	Pure Substitution Effects
Potatoes	0.01	- 0.73	- 0.73
Cereals	0.06	0.75	0.78
Meat	0.09	- 0.54	- 0.50
Vegetables	0.08	- 1.11	- 1.07

IV. PREFERENCES FOR POTATO QUALITY CHARACTERISTICS

The potato price series depicted in Figure 3 was constructed from average potato prices observed in wholesale vegetable markets. However, during any given day at a given vegetable market one can find potatoes being sold at a variety of prices. Although no official grading system exists in Tunisia for potatoes, the market has clearly established some informal grading rules by which potatoes are sorted and priced according to quality characteristics that reflect consumer preferences.

During the summer of 1990, a survey of potato prices and quality characteristics was conducted in Tunis retail markets (see footnote 2). Each week several samples of potatoes from four different retail markets were purchased and observations made on various quality characteristic of the sample.

One obvious grading criteria was tuber size. Consumers generally prefer larger tubers, especially for preparing french fries. Smaller tubers will be used more for traditional dishes, such as sauces, couscous or ragout. Another grading criteria is tuber damage. Potatoes that are partly green or rotten, cut, or that have been infested by the Potato Tuber Moth (an insect pest most troublesome in rustic farm potato stores) will often be sorted and sold separately at a discount. Other potential quality characteristics that vary with potato variety, such as color and specific density are not relevant grading criteria in Tunisia because of the predominance of one single variety in the

market, Spunta.[3]

Table 3 presents the results of a multiple regression analysis in which the prices of the potato samples were regressed against four quality characteristics and two other variables that describe market conditions. The four quality variables include average tuber size in the sample (TUBERSIZE, expressed as the log of grams per tuber), two variables to reflect low and high levels of Potato Tuber Moth infestation (PTMLOW and PTMHIGH) and a variable to quantify damage from rotting and greening (OTHERLOSS). Potato Tuber Moth damage was measured by inspecting tubers for visible galleries created by the insects (larvae enter potatoes through potato eyes and bore galleries in the interior). Low infestation was defined as the percent of tubers in a sample with one gallery per tuber. High infestation was the percent of tubers with two or more galleries per tuber. Other losses (from rotting and greening) were measured by the percent weight loss in the sample after these parts were cut away and discarded.

The two variables describing market conditions included one for venue (a dummy variable called MARKET to represent samples purchased in middle and upper class residential neighborhoods)

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[3]Spunta gives good yields under Tunisian agroclimatic conditions and consumers are accustomed to its size, color, and shape. The lack of a significant potato processing industry has dampened the demand for varieties with better processing characteristics such as uniformity and dry matter content. However, this situation could likely change in the near future. The past three to four years have witnessed the introduction of new processed products in local supermarkets (chips and dehydrated flakes for instant mashed potatoes). Consumer demand for more varied and convenient food products will probably give strong impetus to new processed products. This may lead to the encouragement of new varieties with more desirable processing characteristics.

and one for the date of purchase. During the sampling period (August and September), potatoes prices were continuously rising due to declining supplies during this non-production period.

These six variables together explain about 70 percent of the observed variation in retail potato prices among the 77 observations. All variables are statistically significant except PTMLOW, which measures low levels of insect damage. It appears that while potatoes with very visible insect infestation are sorted out and sold at a discount, tubers with minor infestation will often be passed off in lots of otherwise clean (and full-priced) potatoes.

The quantitative regression estimates presented in Table 3 allow us to determine to what extent the price discounts given for damaged potatoes compensate for losses. For example, in interviews with 59 potato consumers, about three-fourths said they would cut away and discard damages caused by the Potato Tuber Moth and would use the rest of the potato (the other fourth said they would discard the entire potato if they found insect damage). One insect gallery destroys from 5 to 10 percent of a tuber. Potatoes with more than two galleries will lose 10 to 30 percent of their weight when damaged parts are cut away. To measure the percentage price discount when potatoes are damaged, the regression coefficient is divided by the average observed price (0.354 Dinars/kg) and multiplied by 10^3 (because of the units used to measure the variables). To take into account the variation found in the data, a range for the price discount level was calculated by taking the value of the regression coefficient one standard error above and below the mean estimate.

The results of this loss-compensation exercise are shown in Table 4. Consumers who buy low quality tubers appear to be more than fully compensated for losses (perhaps as compensation for the extra effort involved), except in the case of low levels of insect damage. Potatoes with high levels of insect infestation are typically sold at a one-third to one-half price discount, which more than makes up for the 10 to 30 percent quantity loss. The costs of high infestation are born entirely by farmers in the form of lower prices for their products.

Our market survey also revealed that low income consumers are more likely to buy low quality potatoes. The availability of low priced, partially damaged potatoes is one way for poor consumers to enter the market during the non-production season when prices are relatively high.[4]

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[4]It is not implied, however, that insect damage represents a net benefit to poor consumers. Insect pests also reduce the total quantity of potatoes available on the market, resulting in higher prices for all quality grades. The quantity losses from insect pests, which never reach the market, are probably much more economically significant than the quality losses. It is likely that better insect control would benefit all consumer classes by increasing the overall quantity and improving the quality of potatoes available in the market.

Table 3. PREFERENCES FOR POTATO QUALITY CHARACTERISTICS IN TUNIS RETAIL MARKETS

Dependent Variable: Retail potato price (millimes/kg, where 1000 millimes = 1 Dinar)
Average price of samples = 354 millimes/kg.

Independent Variable	Explanation	Coefficient	Standard Error	T-value	Signif. Level
CONSTANT		29.42	52.11	0.565	0.574
MARKET	Dummy variable for middle class market	34.89	10.77	3.240	0.002
DATE	Date of purchase	1.89	0.28	6.786	0.000
TUBERSIZE	Average tuber size log of grams/tuber Ave. size = 183 g/tuber	55.76	9.61	5.806	0.000
PTMLOW	Percent of tubers with one insect gallery	-0.19	0.42	-0.459	0.648
PTMHIGH	Percent of tubers with two or more galleries	-1.46	0.35	-4.164	0.000
OTHERLOSS	Percent weight loss from greening or rot	-4.03	0.95	-4.222	0.000

R^2 ADJ. = 0.70 SE = 39.538 DW STAT. = 2.050 77 observations fitted.

Table 4. WEIGHT LOSSES AND PRICE DISCOUNTS FOR INSECT INFESTED AND DAMAGED POTATOES IN TUNIS RETAIL MARKETS

Kind of Damage	Weight Loss	Price Discount[1]
LOW INSECT INFESTATION -1 gallery per tuber	5 - 10 %	insignificant
HIGH INSECT INFESTATION -2 or more galleries per tuber	10 - 30 %	31 - 52 %
OTHER DAMAGE[2] -from rotting or greening	10 %	9 - 14 %

[1]Price discounts are derived from the regression results presented in Table 3. The price discount is calculated at one standard error above and below the mean value of the regression coefficient to give the typical range in discounts for low quality potatoes.

[2]For illustrative purposes, it is assumed that 10 % of the sample is unusable. In fact, actual losses from rotting and greening in the 77 samples ranged from 0 to 30 percent of purchased weight.

V. SEASONAL POTATO SUPPLY AND GOVERNMENT POLICY RESPONSE

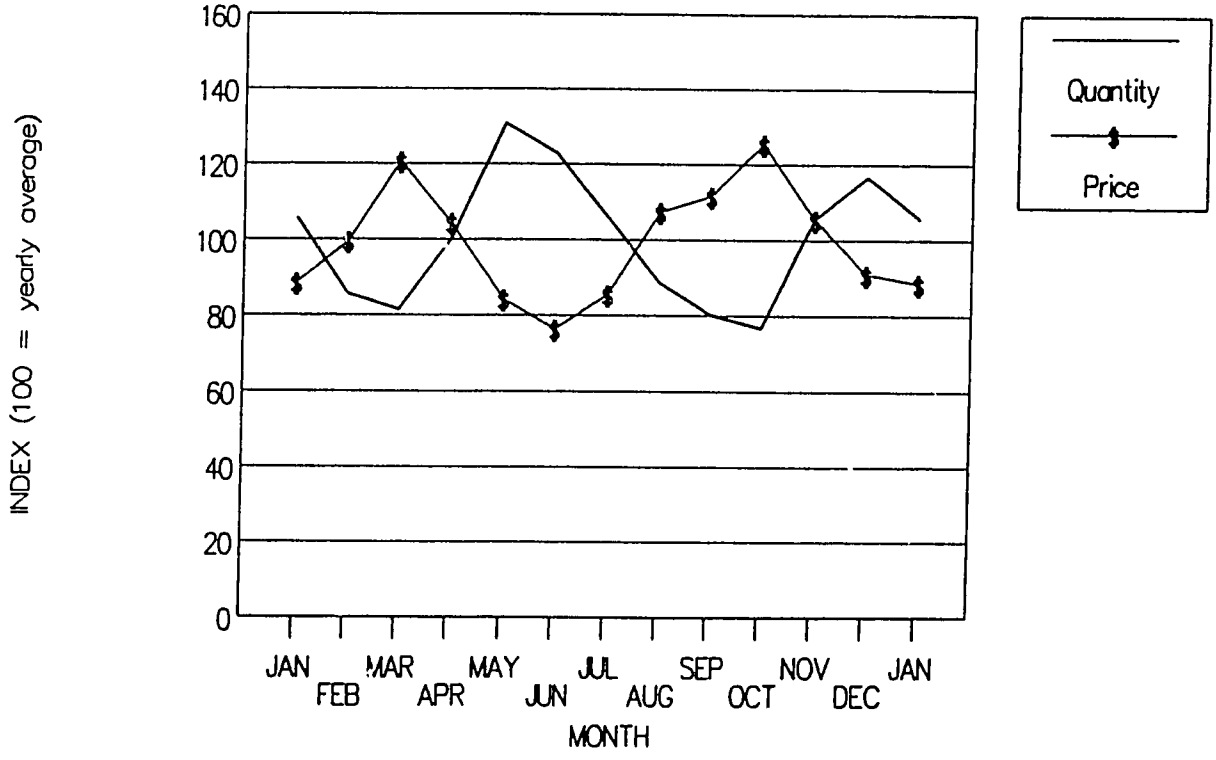
The emergence of potatoes as an urban convenience food, especially among middle and upper class consumers, has created a demand for a year-round stable supply of potatoes in the market. Local potato production, on the other hand, is seasonal, with two main crops a year. The Spring crop is harvested from May to mid July, and the Fall crop is harvested between November and February. There is also a small Winter crop harvested in March and April in frost free areas. To meet consumer demand from mid July through October, potatoes must be either stored or imported. But since potatoes are a bulky and semi-perishable commodity, storage costs tend to be high relative to the value of the crop.

Seasonal production and relatively high storage costs give rise to the price/quantity cycles depicted in Figure 4. Figure 4 shows the average monthly potato price (at constant 1983 prices) and quantity sold in the Tunis wholesale market between 1975 and 1990. The first seasonal price peak occurs in March and the second in September and October, periods of little or no new domestic production. Price troughs occur when the main Spring and Fall crops are harvested, in May and June and again in November and December.

The incongruence between seasonal supply and consumers' expectations for stable market prices and quantities has led the Tunisian Government to embark on supply management policies. First, a major effort has been made to increase the overall production of potatoes. This has come about mainly by encouraging the expansion the area planted to potatoes,

FIGURE 4

MONTHLY POTATO PRICES AND QUANTITIES IN THE TUNIS WHOLESALE MARKET, 1975–90



Source: Groupement Interprofessionnel Des Legumes, unpublished data on market transactions in the Tunis wholesale market.

especially in new irrigation perimeters.[5] The growth in production of Fall Season potatoes has been particularly strong.

A second supply management strategy that the government has used is to import potatoes during periods of scarce local supplies and high market prices. While benefiting consumers through low prices, this policy has probably depressed farm-gate prices and farm incomes. The government has also attempted to increase publicly-owned refrigerated storage capacity for locally-grown ware potatoes (Groupement Interprofessionnel Des Legumes, 1991). It is unlikely, however, that government-held stores have had any substantial effect on seasonal supply. Its main effect has probably been to displace private potato storage. Both of these policies, while benefiting consumers, may tend to discourage potato production and privately-held storage.

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[5] One mechanism the government has used to encourage potato production has been to subsidize the cost of selected inputs, namely imported potato seed and irrigation water. However, these costs are partially recouped through sales taxes imposed at wholesale vegetable markets.

VI. CONCLUDING COMMENTS

The rapid growth in potato consumption by Tunisian households during the past 30 years can be attributed to increased consumer purchasing power, urbanization, and evolving consumer preferences and food consumption habits. Strong growth in potato demand is likely to continue in the future given current economic and demographic trends. Potato demand will probably grow by 3 to 4 percent per year over the next decade.

The analysis in this paper used existing household and market survey data, plus an independent consumer survey conducted in Tunis, to shed light on potato demand and consumer preferences for potatoes. The average income elasticity for potatoes was estimated to be 0.45, with potato consumption among low income consumers being more sensitive to changes in income than higher income individuals. The own-price potato elasticity, measured from monthly market time series on prices and quantities in the Tunis metropolitan area, was estimated to be around - 0.7. This suggests that potato demand is moderately inelastic. Potatoes were also found to be a substitute for staple cereal products and a complement with other vegetables, suggesting that the role of potatoes in the Tunisian diet is substantial. The claim that potatoes are a "price sensitive" good is probably well deserved. However, no evidence was found to suggest that potatoes are becoming more price inelastic, at least during the 1975 to 1990 period.

Fresh potatoes are sorted and sold in the market according to informal grading rules based on potato size and quality. Low

quality potatoes may be damaged by insect pests, cut, or partly green or rotten. Price discounts for low quality potatoes appear to more than fully compensate consumers who buy them, except for insect damages which are not easily visible.

The predominance of the market for fresh potatoes has dampened the demand for varieties with good processing characteristics. However, this is likely to change in the near future with the recent introduction of new processed potato products.

The growing consumer demand for potatoes has brought it to the attention of government policy makers. The government has attempted to stabilize potato supply and prices by encouraging new production, importation, and increasing government-owned cold storage capacity for ware potatoes. The first policy has been the most successful and will probably continue to be the main mechanism for meeting the future growth in potato demand. One possible effect of potato importation and government-owned storage may be to indirectly transfer economic welfare from producers and private storers to consumers.

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APPENDIX TABLE: REGRESSION ESTIMATES OF POTATO DEMAND FUNCTIONS

DEPENDENT VARIABLE: Q Potato (mean value = 2149 tons/month).
N = 190 observations (1/75 to 12/90 with two outliers omitted: 4/83 and 10/88).

INDEPENDENT VARIABLES	Mean Value (units)	LINEAR MODEL				LOG-LINEAR MODEL				LOG-LOG MODEL			
		Coefficient (std. err.)	t-value	sig. level	Elasticity at means	Coefficient (std. err.)	t-value	sig. level	Elasticity at means	Coefficient (std. err.)	t-value	sig. level	Elasticity
Constant		-675.61	-0.418	0.677		-33245.00	-2.968	0.003		-25.532	-2.152	0.033	
		.(2045.45)				.(11200)				.(11.865)			
P Potato	223	-7.018	-8.558	0.000	**-0.73**	-1604.28	-8.628	0.000	**-0.75**	-0.981	-4.983	0.000	**-0.98**
	(D/ton)	.(0.820)				.(185.93)				.(0.197)			
P Cereal	110	13.425	1.720	0.087	**0.68**	1380.12	1.618	0.107	**0.64**	1.875	2.076	0.039	**1.88**
	(Index)	.(7.804)				.(852.82)				.(0.903)			
P Meat	95	-9.412	-0.846	0.399	**-0.42**	-523.08	-0.488	0.626	**-0.24**	-0.037	-0.033	0.974	**-0.04**
	(Index)	.(11.126)				.(1071.98)				.(1.136)			
P Vegetable	102	-17.652	-1.579	0.116	**-0.84**	-1868.49	-1.670	0.097	**-0.87**	-2.365	-1.996	0.047	**-2.37**
	(Index)	.(11.177)				.(1118.57)				.(1.185)			
Population	6822	0.985	5.485	0.000	**3.13**	6566.29	5.187	0.000	**3.06**	4.285	3.195	0.002	**4.29**
	('000)	.(0.179)				.(1265.91)				.(1.341)			
Per capita Income	738	-1.451	-1.026	0.307	**-0.50**	-1452.77	-1.400	0.163	**-0.68**	0.327	0.298	0.766	**0.33**
	(Dinars)	.(1.415)				.(1037.51)				.(1.099)			
Tourist nights	1051	-0.0385	-0.406	0.685	**-0.02**	31.004	0.333	0.740	**0.01**	0.096	0.971	0.333	**0.10**
	('000)	.(-0.095)				.(93.120)				.(0.097)			
Ramadan	Dummy	39.956	0.658	0.511	**0.04**	106.948	0.775	0.440	**0.05**	0.097	0.665	0.507	**0.10**
	variable	.(136.681)				.(138.040)				.(0.146)			
R-Squared (adj.)		0.439				0.431				0.228			
Standard Error		613.174				617.203				0.654			
Durban-Watson		0.950				0.963				1.103			

APPENDIX

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

Variable	Description
Ramadan	Value of 1 if the Moslem fasting month of Ramadan falls during two or more weeks of this calendar month, 0 otherwise
Tourist	Number of non-resident tourist nights ('000)
Q Potato W	Quantity of potatoes sold in the Tunis wholesale market (tons)
P Potato W	Average potato price in the Tunis wholesale market (current Dinars/ton)
P Potato R	Average retail potato price in Tunis (current Dinars/ton)
P Cereal	Index of retail cereal prices in Tunis
P Meat	Index of retail meat prices in Tunis (includes beef, lamb and poultry)
P Veg	Index of retail vegetable prices in Tunis
CPI	Consumer price index for Tunis (July, 1983 = 100)
POP	National population of Tunisia ('000)
GDP	Gross Domestic Product of Tunisia (million Dinars)
PC-GDP	Per Capita Gross Domestic Product of Tunisia (Dinars/person)

Data Sources

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-- retail consumer prices and indices

Groupement Interprofessionel des Legumes (GIL), Ministere de l'Agriculture, Tunisie (unpublished data)

-- wholesale quantity and price series for potatoes

World Bank Tables, World Bank, Washington, D.C.

-- Total population and GDP for Tunisia

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

Year	Month	Ramadan	Tourist	Q Potato W	P Potato W	P Potato R	P Cereal	P Meat	P Veg	CPI
			'000	Tons	Dinar/ton	Dinar/ton	Index	Index	Index	Index
1975	1	0	249.3	2573	64	77	63.6	44.0	38.1	50.0
1975	2	0	270.7	2118	70	96	63.6	45.9	40.5	50.9
1975	3	0	564.3	2478	85	112	63.6	46.5	39.6	51.0
1975	4	0	603.4	2572	72	94	63.6	46.8	39.6	52.3
1975	5	0	886.6	2995	59	86	73.3	44.0	47.0	51.0
1975	6	0	968.3	2548	60	80	73.3	43.5	43.3	52.8
1975	7	0	1349.9	2188	68	99	73.3	45.8	45.5	53.0
1975	8	0	1462.5	1320	96	137	73.3	46.3	43.2	53.9
1975	9	0	998.9	1575	110	147	73.3	45.4	46.3	54.3
1975	10	0	720.7	1075	148	179	73.3	43.5	48.1	54.1
1975	11	1	419.4	1978	115	140	73.3	43.6	47.3	53.9
1975	12	0	393.8	2223	94	134	73.3	43.7	45.3	55.5
1976	1	0	332.3	2344	79	110	73.3	47.8	49.4	55.4
1976	2	0	377.6	2338	87	120	73.3	48.4	50.0	55.8
1976	3	0	626.4	2367	89	128	73.9	48.2	44.1	55.0
1976	4	0	810.3	2331	81	112	73.9	48.2	44.3	55.0
1976	5	0	854.5	2684	73	89	73.9	47.9	45.0	54.9
1976	6	0	956.0	2603	65	87	73.9	46.2	47.9	55.1
1976	7	0	1264.9	2102	81	105	73.9	45.9	46.9	55.4
1976	8	0	1394.1	1800	101	159	73.9	47.3	47.6	55.9
1976	9	0	958.5	1577	93	173	73.9	47.5	48.0	55.9
1976	10	1	698.3	2658	86	136	73.9	47.8	47.8	55.9
1976	11	1	330.5	2578	88	129	73.9	48.9	48.3	56.0
1976	12	0	307.8	2236	80	128	73.9	49.0	48.6	56.2
1977	1	0	246.3	2234	93	129	73.9	49.0	47.5	57.0
1977	2	0	329.3	2075	93	123	73.9	49.0	46.9	57.4
1977	3	0	534.4	1051	113	162	73.9	46.8	47.4	57.1
1977	4	0	744.0	1625	162	191	73.9	46.1	49.2	57.3
1977	5	0	721.3	2048	132	170	73.9	45.6	49.7	57.9
1977	6	0	792.8	1703	137	177	74.1	46.1	51.7	59.1
1977	7	0	1212.1	1359	100	212	74.1	49.1	54.9	60.1
1977	8	0	1332.9	872	235	236	74.1	48.0	56.1	60.6
1977	9	0	857.4	139	176	210	74.1	47.7	58.6	60.9
1977	10	1	701.0	136	115	112	74.1	48.6	59.2	60.9
1977	11	0	332.9	1111	101	129	74.1	49.4	59.2	61.1
1977	12	0	275.5	1628	100	126	74.1	51.4	59.7	61.7
1978	1	0	243.0	536	100	127	74.1	51.6	60.7	62.3
1978	2	0	306.0	113	120	125	74.6	52.7	64.6	62.9
1978	3	0	573.0	123	114	97	74.5	52.1	66.5	63.0
1978	4	0	681.3	151	120	103	74.5	50.0	66.3	62.9
1978	5	0	798.7	2096	90	100	74.3	46.6	63.2	62.4
1978	6	0	793.4	2553	75	84	74.3	46.3	59.4	62.1
1978	7	0	1488.7	2450	79	112	74.5	49.6	63.4	63.0
1978	8	0	1466.3	2090	82	121	74.5	49.5	64.1	63.2
1978	9	1	1013.9	2195	83	127	74.3	50.0	64.0	63.4
1978	10	1	787.2	2303	138	159	74.3	49.9	64.9	63.8
1978	11	0	434.0	1595	149	197	74.4	51.3	66.7	64.4
1978	12	0	375.6	1946	107	119	74.3	54.0	67.5	65.0

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

Year	Month	Ramadan	Tourist	Q Potato W	P Potato W	P Potato R	P Cereal	P Meat	P Veg	CPI
			'000	Tons	Dinar/ton	Dinar/ton	Index	Index	Index	Index
1979	1	0	327.6	2229	88	133	74.0	57.5	67.8	65.9
1979	2	0	396.5	1827	102	144	74.0	56.4	66.8	65.9
1979	3	0	631.9	2166	126	155	74.0	54.4	67.2	65.8
1979	4	0	1003.3	2200	108	142	74.0	54.5	66.9	66.0
1979	5	0	962.4	2716	72	113	82.0	56.5	65.9	67.5
1979	6	0	1169.3	2477	65	106	82.0	57.4	65.2	67.7
1979	7	0	1562.3	2177	76	136	81.9	61.4	60.9	68.1
1979	8	0	1684.5	1694	102	165	82.0	64.9	61.6	68.9
1979	9	1	1292.5	2132	148	159	82.0	65.7	63.1	69.5
1979	10	0	1032.4	1699	203	265	82.3	66.6	67.8	70.2
1979	11	0	591.9	1961	123	159	82.3	66.6	70.1	70.6
1979	12	0	485.1	2416	96	134	82.3	68.3	71.9	71.2
1980	1	0	417.0	2421	91	136	85.7	68.3	75.0	72.9
1980	2	0	475.8	1984	107	154	93.5	64.5	76.7	74.0
1980	3	0	789.8	1751	126	165	93.7	62.1	77.9	74.0
1980	4	0	1021.2	2419	120	162	93.7	62.3	77.5	74.1
1980	5	0	1072.8	2635	85	130	93.8	61.7	74.2	73.9
1980	6	0	1284.4	2446	87	114	93.7	62.5	69.6	73.6
1980	7	0	1601.1	2239	93	157	93.8	65.9	72.2	74.6
1980	8	1	1802.6	1934	143	172	93.7	67.3	73.4	75.0
1980	9	1	1423.0	2252	132	170	93.9	68.0	73.7	75.5
1980	10	0	1122.0	2737	113	159	93.9	68.5	74.8	76.3
1980	11	0	594.7	2627	121	140	94.0	69.3	77.6	77.0
1980	12	0	493.6	2559	108	155	94.1	71.9	79.6	78.2
1981	1	0	434.8	2455	110	163	94.1	74.5	83.2	79.8
1981	2	0	431.7	1754	147	192	94.1	75.8	85.9	80.3
1981	3	0	703.3	1035	194	223	94.3	73.9	87.8	80.4
1981	4	0	1143.2	2415	113	130	94.4	68.3	89.3	79.7
1981	5	0	1098.9	2804	95	120	94.3	67.0	87.2	79.4
1981	6	0	1332.1	2734	71	92	94.2	68.3	85.1	79.4
1981	7	0	1659.5	2338	82	123	94.4	69.7	79.8	79.5
1981	8	1	1903.0	2340	88	140	94.4	72.3	83.4	81.3
1981	9	0	1569.1	2585	101	147	94.4	73.2	87.5	82.7
1981	10	0	1168.7	1521	140	176	94.6	75.4	93.1	84.3
1981	11	0	552.0	792	152	227	94.9	78.5	95.0	85.6
1981	12	0	450.2	2107	142	193	94.9	80.3	96.1	87.0
1982	1	0	375.0	2117	153	205	95.3	84.0	96.6	88.2
1982	2	0	427.0	1963	165	209	95.3	85.5	95.5	88.8
1982	3	0	752.0	1752	175	270	95.3	82.5	96.0	89.4
1982	4	0	1039.0	118	171	236	95.3	78.3	96.0	88.8
1982	5	0	1063.0	2763	143	199	95.3	79.8	95.5	90.0
1982	6	0	1149.0	2391	114	179	95.3	85.5	97.7	91.2
1982	7	1	1473.0	1791	150	240	95.3	89.9	97.1	93.0
1982	8	1	1755.0	1026	157	242	95.3	95.5	98.8	94.2
1982	9	0	1246.3	297	170	257	95.3	96.6	101.5	95.4
1982	10	0	1035.0	80	179	280	95.3	98.1	102.6	96.6
1982	11	0	474.0	1197	207	287	95.3	99.6	101.5	98.4
1982	12	0	371.0	1540	198	265	96.0	100.2	102.6	99.6

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

Year	Month	Ramadan	Tourist	Q Potato W	P Potato W	P Potato R	P Cereal	P Meat	P Veg	CPI
			'000	Tons	Dinar/ton	Dinar/ton	Index	Index	Index	Index
1983	1	0	330.0	1179	188	276	96.0	101.1	103.1	99.6
1983	2	0	412.0	429	195	239	96.8	95.1	103.6	99.0
1983	3	0	635.0	197	217	274	96.8	97.7	102.6	99.6
1983	4	0	918.0	1673	132	275	96.8	96.1	102.0	99.0
1983	5	0	945.0	2714	130	175	96.8	93.3	102.6	99.0
1983	6	0	1041.0	2421	105	149	96.8	94.2	105.3	100.2
1983	7	1	1392.0	2092	144	183	96.8	96.4	104.7	100.2
1983	8	0	1663.0	2453	136	194	96.8	100.7	104.7	101.4
1983	9	0	1151.0	2289	139	124	96.8	101.1	103.6	102.6
1983	10	0	954.0	1899	231	283	97.5	102.8	104.7	103.2
1983	11	0	480.0	2678	189	257	97.5	103.9	105.8	103.8
1983	12	0	397.0	1492	219	285	97.5	108.3	106.9	105.6
1984	1	0	285.0	290	250	334	98.2	110.7	108.0	106.2
1984	2	0	362.0	54	250	360	98.2	112.3	109.6	106.8
1984	3	0	597.0	330	463	595	98.2	109.5	114.5	107.4
1984	4	0	958.0	2282	226	316	99.0	107.2	116.7	108.0
1984	5	0	911.0	3246	154	194	99.0	106.6	116.1	108.0
1984	6	1	958.0	2304	136	195	99.0	107.1	117.2	108.0
1984	7	1	1289.0	2482	147	186	108.5	107.1	123.2	109.8
1984	8	0	1643.0	1816	195	230	109.2	110.9	122.6	110.4
1984	9	0	1182.0	1050	211	248	109.2	110.8	123.7	111.0
1984	10	0	1021.0	1170	292	447	109.2	114.3	124.3	112.2
1984	11	0	538.9	2089	239	247	110.0	113.8	127.0	112.8
1984	12	0	509.0	2055	250	335	110.0	117.6	127.0	114.0
1985	1	0	348.0	2337	221	323	110.0	123.9	127.0	115.0
1985	2	0	404.0	1456	276	354	110.0	120.7	128.0	115.0
1985	3	0	798.0	719	303	373	110.0	116.1	126.0	115.0
1985	4	0	1095.0	2712	192	264	110.0	112.7	125.0	115.0
1985	5	0	1189.0	2878	144	186	110.0	109.6	126.0	115.0
1985	6	1	1371.0	2238	153	195	110.0	109.7	126.0	115.0
1985	7	0	1703.0	2450	148	183	113.0	114.0	126.0	117.0
1985	8	0	1988.0	1481	157	209	117.0	127.7	126.0	119.0
1985	9	0	1433.0	951	194	273	117.0	130.1	126.0	119.0
1985	10	0	1174.0	1030	251	347	117.0	131.5	124.0	119.0
1985	11	0	646.0	2544	185	250	117.0	133.4	123.0	120.0
1985	12	0	522.0	2929	143	184	117.0	136.0	124.0	121.0
1986	1	0	374.0	2636	138	192	117.0	137.0	125.0	122.0
1986	2	0	429.0	2350	148	211	118.0	135.4	126.0	122.0
1986	3	0	826.0	2926	134	200	118.0	133.4	128.0	122.0
1986	4	0	966.0	3288	115	192	118.0	132.3	129.0	122.0
1986	5	1	1082.0	3108	110	213	118.0	129.3	127.0	122.0
1986	6	1	1218.0	2912	115	167	118.0	130.0	127.0	122.0
1986	7	0	1662.0	2930	140	181	118.0	129.5	127.0	122.0
1986	8	0	1969.0	2320	193	284	131.0	130.9	128.0	124.0
1986	9	0	1470.0	2034	225	294	131.0	136.8	130.0	125.0
1986	10	0	1288.0	1734	276	401	131.0	141.7	132.0	127.0
1986	11	0	714.0	2996	222	315	132.0	141.9	134.0	128.0
1986	12	0	537.0	3080	140	186	132.0	142.9	133.0	129.0

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

Year	Month	Ramadan	Tourist	Q Potato W	P Potato W	P Potato R	P Cereal	P Meat	P Veg	CPI
			'000	Tons	Dinar/ton	Dinar/ton	Index	Index	Index	Index
1987	1	0	472.0	3046	138	202	132.0	150.6	133.0	130.0
1987	2	0	548.0	2291	185	246	133.0	147.8	131.0	131.0
1987	3	0	891.0	2416	255	384	133.0	139.7	130.0	131.0
1987	4	0	1589.0	2335	304	467	133.0	126.8	131.0	130.0
1987	5	1	1763.0	2547	218	325	133.0	128.3	134.0	130.0
1987	6	0	2034.0	3120	159	240	133.0	136.4	135.0	132.0
1987	7	0	2384.0	2775	189	250	133.0	137.4	136.0	132.0
1987	8	0	2510.0	2085	221	334	133.0	141.4	138.0	133.0
1987	9	0	2024.0	2484	223	332	133.0	147.5	140.0	135.0
1987	10	0	1666.0	2366	238	313	133.0	150.5	141.0	136.0
1987	11	0	949.0	3140	186	281	133.0	153.3	141.0	136.0
1987	12	0	652.0	3331	149	221	133.0	149.9	144.0	137.0
1988	1	0	608.0	3204	144	216	134.0	151.5	145.0	137.0
1988	2	0	710.0	2710	143	212	134.0	148.9	146.0	138.0
1988	3	0	1220.0	3105	186	313	136.0	144.0	150.0	138.0
1988	4	1	1605.0	3076	192	338	136.0	140.8	152.0	138.0
1988	5	1	1832.0	3236	191	345	136.0	144.1	153.0	139.0
1988	6	0	2150.0	3111	209	315	136.0	143.0	156.0	140.0
1988	7	0	2616.0	2188	267	365	136.0	143.5	160.0	141.0
1988	8	0	2775.0	1834	312	422	136.0	148.4	164.0	142.0
1988	9	0	2273.0	1310	370	548	136.0	154.1	169.0	144.0
1988	10	0	1276.0	2535	294	752	136.0	154.0	171.0	145.0
1988	11	0	1051.0	3602	211	314	137.0	153.1	174.0	146.0
1988	12	0	747.9	3867	178	248	137.0	154.3	174.1	148.0
1989	1	0	720.9	3329	179	250	137.0	155.1	174.0	148.1
1989	2	0	825.3	3042	242	317	137.1	156.5	174.8	148.7
1989	3	0	1390.2	2643	283	393	137.0	155.1	172.7	148.6
1989	4	1	1454.6	2720	311	353	137.3	153.3	174.9	149.1
1989	5	0	1856.6	3181	247	353	137.3	150.4	175.5	149.3
1989	6	0	1880.0	3084	220	353	137.4	147.2	174.8	149.3
1989	7	0	2422.0	2246	284	410	137.4	148.9	176.9	149.7
1989	8	0	2742.8	2684	286	394	159.4	155.7	175.8	153.7
1989	9	0	2122.7	2962	283	398	159.4	160.1	173.6	154.8
1989	10	0	1860.0	2743	308	397	159.5	159.1	175.2	155.3
1989	11	0	957.7	3589	205	316	159.5	159.6	175.2	155.8
1989	12	0	724.4	3981	131	210	159.8	160.4	174.5	156.8
1990	1	0	706.7	3243	162	233	159.8	162.8	175.1	157.6
1990	2	0	780.1	2845	167	247	160.0	165.4	175.3	158.5
1990	3	1	1225.6	2845	217	308	160.0	162.8	176.3	158.9
1990	4	1	1681.9	2320	234	347	160.0	156.6	177.4	158.9
1990	5	0	1607.5	3228	218	326	159.9	155.8	177.4	159.2
1990	6	0	1914.0	3452	192	269	159.9	155.4	177.0	159.4
1990	7	0	2400.0	2432	234	383	160.0	155.9	175.2	159.6
1990	8	0	2797.0	2610	278	363	175.9	173.9	174.1	163.9
1990	9	0	2149.5	1707	329	423	176.0	182.2	172.3	165.4
1990	10	0	1805.9	604	336	430	176.0	181.7	172.3	166.0
1990	11	0	991.1	1710	274	375	176.5	183.9	175.9	167.2
1990	12	0	765.3	2572	272	351	176.6	185.7	181.8	168.5

TIME SERIES STATISTICS ON POTATO DEMAND, TUNISIA

YEAR	POP ('000)	GDP current (million Dinars)	GDP DEFLATOR	GDP constant (million Dinars)	PC-GDP current (Dinars/person)	PC-GDP constant (Dinars/person)
1975	5611	1741	53	3286	310	586
1976	5775	1933	55	3489	335	604
1977	5927	2192	60	3647	370	615
1978	6067	2484	63	3943	409	650
1979	6220	2922	68	4291	470	690
1980	6392	3541	75	4746	554	742
1981	6565	4162	80	5235	634	797
1982	6726	4804	93	5166	714	768
1983	6840	5497	100	5486	804	802
1984	7034	6240	110	5683	887	808
1985	7261	6910	117	5906	952	813
1986	7465	7004	122	5741	938	769
1987	7639	7958	132	6029	1042	789
1988	7770	8606	141	6104	1108	786
1989	7910	9402	150	6281	1189	794
1990	8050	10287	160	6445	1278	801