



THE IMPACT OF WTO AGREEMENTS ON
MEAT DEMAND IN THE CARIBBEAN

by

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Abstract

One of the agreements that emanated from the Uruguay Round of negotiations was to “bound” tariffs on all agricultural products and to reduce these tariffs by 24% over the 10 year period 1995-2004 in the case of developing countries. This process could have implications for the demand of most agricultural products. This paper therefore examines the potential impact of these changes in Caribbean countries trading regimes on the demand for meat. This is done by estimating five types of differential demand systems and thereafter using the results to simulate the impact of the tariff rate changes on price and the demand for beef, mutton, pork and poultry. The paper finds that given the high price elasticity of demand for poultry in the Caribbean any reduction in its price could lead to a significant increase in the demand for poultry in the region. However, this would also result in reduced demand for the other types of meat such as beef, pork and mutton.

JEL classification: Q11

Keywords: Meat Demand Analysis; Forecasting

1. Introduction

Before the Uruguay Round of negotiations, countries could use non-tariff barriers to trade to protect domestic producers. However, one of the commitments emanating from the Uruguay Round was that all non-tariffs barriers to trade on agricultural goods should be converted to their tariffs equivalents and these rates should be “bound” or fixed. In addition, over a ten-year period (1995-2004) these tariffs should be decreased by 24% from their base level. This process has the potential to reduce the price that the average consumer in the Caribbean pays for meat and could cause a shift in the consumption patterns in the region.

In addition to the possible shift in consumption patterns that are likely due to the changes in the trading regime, many regional producers have also been expecting a significant reduction in consumption of locally produced meats as cheaper imports become available. An examination of the demand for meat in these countries would also allow one to assess whether these expectations are rational.

This study therefore examines the demand for four types of meat (beef, poultry, pork and mutton) in 14 Caribbean countries with a goal of simulating the possible implications of these agreements. The paper uses the general differential demand system (GDS) developed by Barten (1993), and utilised by authors such as Lee, Brown and Seale (1994) and Craigwell and Moore (2001), to choose between the various empirical demand specifications (the differential almost ideal demand system (AIDS), the Netherlands Central Bureau of Statistics (CBS) model, the Rotterdam model and the Netherlands National Bureau of Research (NBR) model). The

approach involves estimating the GDS model, which encompasses the other four demand models mentioned above, and utilising a likelihood ratio test to select the model that fits the data best. Although the GDS model lacks firm theoretical justification, as argued by Tridimas (2000), it allows one to assess the validity of competing models with different dependent variables unlike the non-nested approach proposed by Deaton (1978).

The structure of the paper is as follows. Section 2 examines the data on the demand for meat in the Caribbean. Section 3 presents the empirical models utilised, while section 4 presents the estimation results and forecasts. Section 5 concludes.

2. Meat Consumption in the Caribbean

The Caribbean consists of a diverse group of countries. Most of the economies within the region can be classified as being small and open. For example, eight out of the fourteen countries studied have a population below one million persons. Despite these physical limitations, a number of economies within the region have been able to achieve a relatively high standard of living. The Bahamas, for example, has a GNP per capita (Atlas Method)² of approximately US\$ 12,000 (see Table 1) and ranks 42nd in the United Nations human development index. In fact, only Haiti and Guyana have a per capita income level below \$1,000.

A large part of these countries output is generated in the agricultural sectors, with agriculture value added above 10% of GDP in nine out of the 14 countries studied. However, within recent years the services sectors, mainly tourism and offshore financial services have

begun to play a significant role in these economies. Nevertheless, agriculture still accounts for approximately 20% of individuals employed in these countries.

This study uses annual time series data on four categories of meat – beef, mutton, pork and poultry – which are obtained from the Food and Agriculture Organisation of the United Nations (FAO). The data was collected for the period 1961-1996, for 14 Caribbean countries: Bahamas, Barbados, Belize, Cuba, Dominica, Dominica Republican, Grenada, Guyana, Haiti, Jamaica, Saint Lucia, Saint Vincent, Surinam, and Trinidad and Tobago.

Table 2 shows that total meat consumption in the Caribbean in 1996 was twice the size it was in 1961. This rise was driven by increased consumption in all the countries, especially the Dominica Republican whose share of total meat consumed ranged from 13% in 1961 to approximately 33% in 1996. Dominica Republican's position as the largest consumer of meat in the region was partially due to its high rate of population growth, almost 2.5% per year, compared to 1.3% for the region as a whole. Dominica, Belize, Grenada and Saint Vincent, in spite of an expansion in meat consumption from 1961 to 1996, remained the smallest meat consumers, accounting for less than 1% of total meat consumed regionally.

Utilising the World Bank's income classification of countries, one can also examine the consumption of meat between countries with differing income levels. This analysis indicates that lower income countries were the largest consumers of beef, mutton and pork, while upper middle income countries were, on average, the largest consumers of poultry.

The rise in total meat consumed during the sample period reflects, to a large extent, higher levels of poultry consumption. For example, while the average budget share of poultry in 1961 was only 16%, by 1996 it had risen to 48% (see Table 3). Pork consumption also increases but only from 3 percent from 1961 to 1996. In contrast, the consumption shares of beef and mutton

² Atlas Method, is a special conversion used by the World Bank to smooth fluctuations in prices and exchange rates.

were lower in most Caribbean countries. The budget share of beef decreased from 55% in 1961 to 25% in 1996 and mutton's share fell from 3% to 2%.

Jamaica was the country where poultry consumption increased the most, with the budget share of this meat rising from 13.6% in 1961 to 74.8% in 1996. The largest consumer of beef in 1961 was Cuba, however, by 1996 Haiti had assumed this position. In this latter year, Haiti was also the biggest pork consumer, overtaking Barbados who was the largest pork consumer in 1961. In the case of mutton, while Jamaica was the leading consumer in 1961, by 1996 Barbados had taken over this position.

Producer prices of meat rose in all of the 14 countries studied over the period 1966-1995 (see Table 4), reflective of the restrictive trade regimes implemented in these countries to protect local producers. Suriname and Guyana recorded the highest rate of producer price increases. In Suriname, the rise was breathtaking, being more than a 1000 times higher in 1995 than it was in 1966 and was largely due to large devaluations. Making an analysis between the price and the consumption, one notices that for eight countries, the consumption of the various varieties of meat were closely related to price. For example, in the Bahamas the average price of poultry was lower than all the other categories of meat, which resulted in the budget share of poultry rising than 14% in 1961 to 48% by 1996. A similar pattern is found for virtually all of the other countries.

3. Empirical Models

Several systems are used for consumer demand analysis. These include the Rotterdam model, the Working model, the Translog model, the AIDS, the GDS, and two mixed demand systems: the CBS and the NBR. This paper utilises differential versions of five of these -- the Rotterdam, the AIDS, the CBS, the NBR and the GDS models. Generally, these models specify the budget shares and consumption of a given type of meat as a function of the division quantity index of meat and prices.

The GDS developed by Barten (1993), takes the following form:

$$w_i d \log q_i = a_i + (d_i + \delta_1 w_i) d \log Q + \sum_j [e_{ij} - \delta_2 w_i (\delta_{ij} - w_j)] d \log p_j + \varepsilon_i \quad (1)$$

$$d_i = \delta_1 \beta_i + (1 - \delta_1) \theta_i$$

$$e_{ij} = \delta_2 \gamma_{ij} + (1 - \delta_2) \pi_{ij}$$

where δ_{ij} is the Kronecker delta equal to unity if $i = j$, w_i is the budget share of good i , p_i is the price of good i , q_i is the quantity of good i , Q is the total real expenditure defined by $d \log Q = \sum_i w_i d \log q_i$, $(d_i + \delta_1 w_i)$ is the marginal budget share, $e_{ij} - \delta_2 w_i (\delta_{ij} - w_j)$ are the Slutsky coefficients, a_i are constants which capture possible trend effects, ε_i is the error term and d represents the differential.

Barten (1993) showed that this model nests the other four models, using the two additional parameters to be estimated, δ_1 and δ_2 . When $\delta_1 = 0$ and $\delta_2 = 0$, one obtains the Rotterdam model, which was first proposed by Barten (1964) and Theil (1965). The CBS model, which has the features of the Rotterdam and the Working system is defined when $\delta_1 = 1$ and $\delta_2 = 0$, (see Keller and Van Driel, 1985). When $\delta_1 = 1$ and $\delta_2 = 1$ one obtains a differential version of the Deaton and Muellbauer (1980) AIDS model. The AIDS model is one of the most

popular of all the demand systems, given its ease of estimation and interpretation. Finally, with the parameters $\delta_j = 0$ and $\delta_2 = 1$, the NBR model of Neves (1987) is defined. This model has the Rotterdam income coefficients but the AIDS price coefficients.

Consumer demand theory requires that the adding-up restrictions $\sum_i d_i = 1 - \delta_i$ and $\sum_i e_{ij} = 0$, the homogeneity restrictions $\sum_j e_{ij} = 0$ and the symmetry restriction $e_{ij} = e_{ji}$ are upheld. In essence these should be tested before imposition. This is done using a likelihood ratio test (LRT) which allows one to choose the model that fits the data best. The form of the likelihood ratio test statistic is given below:

$$\text{LRT} = -2[\log L(\theta^*) - \log L(\theta)] \sim \chi^2(q) \quad (2)$$

where θ^* is the vector of parameter estimates of either the Rotterdam, the AIDS, or their variants, and θ the vector of parameter estimates of the general model. The test statistic has a chi-square distribution with q degrees of freedom, which is equal to the difference between the number of parameters in the general model and another model.

Finally, the income and price elasticities are calculated from the estimation results obtained from the chosen model. An estimate of income elasticity for a particular type of meat can be obtained by using the expression below

$$\eta_i = [(d_i + \delta_i w_i) / w_i] + 1 \quad (3)$$

while the compensated own and cross price elasticities which capture possible substitution effects are calculated as follows

$$\eta_{ij} = [e_{ij} - \delta_j w_j (\delta_j - w_j)] / w_i \quad (4)$$

4. Empirical Results and Forecasts

4.1 Results

The estimation of the five econometric models required the use of the three-stage least squares, whose estimators are far easier to compute than those of the Full-Information Maximum Likelihood (FIML) method and with normally distributed errors, are equivalent to FIML. The log-likelihood test statistic for each of the systems show that the general system rejects the four other models which implies that the GDS fits the data the best (see Table 5). Accordingly, all of the results have been based on the GDS model. The homogeneity restriction is accepted for all the countries implying that all the explanatory variables are exogenous (Chamber 1990; Attfield 1985) or more specifically that the $d \log Q$ term and the disturbance terms are uncorrelated. One can notice that for the Bahamas, Barbados, the Dominican Republic, Grenada and Saint Lucia, the symmetry restriction is also accepted, signifying that the GDS model with homogeneity and symmetry imposed is the preferred model for five of these countries. The rejection of symmetry for the other countries implies that there is some conflict between the data and the theory of a representative consumer maximising a static utility function.

Table 6 presents income elasticities derived using equation (3). In six out of the 14 countries examined, the income elasticity of beef was above one, which implies that beef can be considered a luxury item in these countries. However, in most of the other Caribbean economies, it exhibited the characteristics of a normal good. In four of the countries examined pork was found to be a luxury. However, this result is limited, for the most part, to the poorer Caribbean countries like Haiti and the Dominican Republic. Surprisingly, given the budget share of poultry, in 12 out of the 14 countries studied, poultry was classified as a luxury while mutton consumption

exhibited the characteristics of a Giffen good, reflective of the decline in mutton consumption registered over the sample period.

Compensated own and cross price elasticities are given in Table 6. In Belize, Cuba, Dominica and Trinidad and Tobago the demand for beef was highly price elastic, with negative own price elasticity estimates above one. In the case of pork none of negative own price elasticity estimated were above one. Only in Cuba and Dominica were the negative own-price elasticities greater than one. These results seem to indicate that, for the most part, meat demand is not very responsive to price, which perhaps, is reflective of its growing share in the average consumer's budget.

4.2 Forecasts

To make an out-of-sample forecast for meat consumption in the Caribbean the preferred GDS model of each country was utilised. The lack of data forced the author to use differing periods for the simulation. For eight countries the period was from 1995 to 1999, from 1994 to 1998 for five countries and from 1992 to 1996 for Saint Vincent³. The results are given in Table 7. The forecast in this Table are calculated assuming that the budget share remain constant, the average expenditure on meat remains unchanged and that prices decline by a cumulative amount of 24% (6% per year, in line with the WTO arrangements) for the differing periods quoted above. A comparison of these simulated growth rate with those of the previous four-years are calculated by the model.

³ It is hoped that by the second draft of this paper additional data could be obtained to allow the post 1995 period to be used in the simulations.

The results show that a decrease in price as recommended under the WTO agreements would lead to increased consumption of poultry for nine countries. Among the nine countries, four of them have a growth rate higher than that registered during the previous four-year period, five recorded slightly lower rates of growth, and in the remaining five countries consumption of poultry declines.

Consumption of pork would expand in seven countries, with two countries registering significant increases compared to the previous four-year period. In the other countries the consumption of pork declined with six decreasing significantly in comparison with the four previous years. In most of the countries studied, the consumption of beef falls, which seems to be reflective of a shift in meat consumption from beef to poultry. The significant contractions in beef were also suggestive of the high price elasticity of demand for beef. It was found that a fall in price would not significantly affect mutton consumption regionally.

5. Conclusion

This study has examined the pattern of consumer demand for beef, mutton, pork and poultry in the Caribbean during the period 1961 to 1995. Five differential demand systems were estimated and through the use of a likelihood ratio test, it was found that a general demand system developed by Barten (1993) fits the data better than the others models. It was therefore used to simulate the possible changes in the consumption of meat that could occur in the Caribbean as a result of the tariff rate changes. In most Caribbean countries, poultry was classified as a luxury while the results for beef, pork and mutton were mixed. As a result, it was found that a reduction in prices due to changes in the trading regimes of regional economies,

would result in increased consumption of poultry in most countries and reduced consumption of most other meats especially beef.

These findings indicate that the demand for most meats, except poultry is highly price elastic. Thus, regional producers of pork, beef and mutton fears about a flood of cheap imports should, in most instances, not materialise given the low price elasticity of demand. However, the simulation seems to indicate that regional poultry producers need to remain price competitive or they might experience a significant reduction in demand for their output if the tariff barriers on imported meats are removed.

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Table 1

Summary Statistics for the Caribbean

	Bahamas	Barbados	Belize	Cuba	Dominica	Dominica R.	Grenada	Guyana	Haiti	Jamaica	St Lucia	St Vincent	Suriname	Trinidad-T
Agriculture value added (% of GDP - 1996)	2.0	5.8	18.9	n.a	21.5	13.3	10.6	36.2	38.8	8	10.9	14.9	26	2.3
GDP per capita (US\$ - 1995)	11,830	6,610	2,650	n.a	2,900	1,390	2,840	630	300	1,580	3,580	2,320	880	3,860
Labor force in agriculture (% of total - 1990)	5.2	6.7	33.6	18.1	n.a	24.8	n.a	21.8	67.8	24.8	n.a	n.a	21.3	11.0

Source: World Development Indicator (2000)

Table 2

Meat Consumption in the Caribbean (metric tonnes)

	Bahamas	Barbados	Belize	Cuba	Dominica	Dominica R.	Grenada	Guyana	Haiti	Jamaica	St Lucia	St Vincent	Suriname	Trinidad-T	Total
1961	7364	8707	2302	218000	1198	52000	1092	8786	39000	29702	1386	746	7929	22625	400837
1970	14429	15889	4100	303000	2139	70000	2427	15052	54000	56838	3453	1572	10138	28658	581095
1980	20828	19967	5580	329000	2158	142000	3003	14652	64000	82000	5226	2872	14674	47521	753481
1990	26597	26410	8851	414000	3808	208000	3656	7115	57000	105000	9110	5980	16332	38316	930175
1996	27472	21360	8994	243000	4836	295000	5285	20148	72000	131000	12745	6991	16050	42526	907407

Source: Food and Agriculture Organisation (FAO)

Table 3

Budget Shares of Meat in the Caribbean

Countries	Beef		Mutton		Pork		Poultry	
	1961	1996	1961	1996	1961	1996	1961	1996
<i>High income</i>								
Bahamas	0.48	0.29	0.06	0.04	0.31	0.19	0.14	0.48
<i>Upper middle income</i>								
Barbados	0.32	0.15	0.03	0.09	0.58	0.21	0.07	0.55
Grenada	0.39	0.19	0.02	0.02	0.21	0.26	0.23	0.51
St Lucia	0.27	0.12	0.07	0.08	0.52	0.14	0.14	0.63
Trinidad-T	0.25	0.12	0.04	0.03	0.27	0.10	0.41	0.75
<i>Lower middle income</i>								
Belize	0.50	0.23	0.00	0.00	0.39	0.27	0.11	0.50
Cuba	0.66	0.28	0.00	0.01	0.12	0.33	0.10	0.32
Dominica	0.25	0.15	0.06	0.02	0.43	0.15	0.15	0.59
Dominica R.	0.44	0.27	0.02	0.01	0.17	0.21	0.37	0.51
Guyana	0.56	0.17	0.03	0.04	0.15	0.03	0.21	0.76
Jamaica	0.52	0.15	0.10	0.04	0.22	0.06	0.14	0.75
St Vincent	0.29	0.07	0.05	0.02	0.42	0.20	0.15	0.70
Suriname	0.49	0.26	0.01	0.00	0.03	0.09	0.46	0.64
<i>Lower income</i>								
Haiti	0.36	0.40	0.08	0.06	0.44	0.36	0.05	0.08
Average	0.55	0.25	0.03	0.02	0.19	0.22	0.16	0.48

Source: Food and Agriculture Organisation (FAO)

Table 4

Price average for four categories of meat (U.S. dollars)

	Beef			Mutton			Pork			Poultry		
	1967	1995	Average	1967	1994	Average	1967	1995	Average	1967	1994	Average
Bahamas	848	8900	3518.37	901	8500	3498.25	678	5900	2442.93	394	3600	1427.07
Barbados	1967	1995	Average	1967	1994	Average	1967	1995	Average	1967	1995	Average
	1200	10200	5372.03	790	11900	5257.14	720	10600	5689.27	660	4600	2982.79
Belize	1966	1995	Average	1966	1994	Average	1966	1995	Average	1966	1995	Average
	970	4300	2458.33	1100	4400	2670.00	1420	5100	3262.00	710	3900	1977.93
Cuba	1967	1995	Average	1967	1995	Average	1967	1995	Average	1967	1995	Average
	475	2500	1280.51	336	2300	1024.60	427	2300	1194.20	570	2900	1589.89
Dominica	1967	1995	Average	1967	1994	Average	1967	1994	Average	1967	1995	Average
	1660	15800	7114.13	1490	15400	6523.21	1590	15200	6817.50	1030	10900	4609.31
Dominica R.	1966	1995	Average	1966	1995	Average	1966	1995	Average	1966	1995	Average
	1000	32000	9701.10	1050	20000	5990.03	700	30000	8669.96	868	16000	4479.43
Grenada	1966	1995	Average	1966	1995	Average	1967	1995	Average	1966	1995	Average
	1390	10500	5974.10	1260	2957	5991.13	1110	5300	3575.72	1890	8600	5708.06
Guyana	1966	1995	Average	1966	1995	Average	1966	1995	Average	1966	1995	Average
	1708	348000	68453.40	2957	812000	136318.00	1602	526000	102524.90	4620	780000	153802.20
Haiti	1967	1995	Average	1967	1995	Average	1967	1995	Average	1967	1995	Average
	1750	29392	11307.86	1400	42000	10633.93	2275	36278	11618.97	2136	32450	10611.62
Jamaica	1966	1994	Average	1966	1994	Average	1966	1994	Average	1966	1994	Average
	578	45000	10031.59	600	47000	11597.59	322	27000	7037.82	529	32000	7056.51
St Lucia	1967	1995	Average	1967	1995	Average	1967	1995	Average	1967	1995	Average
	1320	8500	4997.24	2640	15500	9665.35	1030	12500	5790.00	2110	9200	6449.79
St Vincent	1967	1992	Average	1967	1992	Average	1967	1995	Average	1967	1995	Average
	1460	9800	4270.76	3590	8900	5754.23	1030	7400	3380.00	2040	10500	4882.75
Suriname	1966	1995	Average	1966	1995	Average	1966	1995	Average	1966	1995	Average
	1570	600000	37966.33	1000	1000000	39246.90	1490	700000	41697.00	1150	500000	31687.67
Trinidad-T	1966	1995	Average	1966	1995	Average	1966	1995	Average	1966	1995	Average
	1808	16840	8524.80	1900	16950	8452.41	1852	8070	4881.80	1279	8500	3806.90

Source: Food and Agriculture Organisation (FAO)

Table 5

Results of the likelihood ratio test : $LRT = -2[\log L(\theta^*) - \log L(\theta)]^a$

Model	Constraints on the price effects	Bahamas Barbados Belize Cuba Dominica Dominica R. Grenada Guyana Haiti Jamaica St Lucia St Vincent Suriname Trinidad-T											
GDS	Unrestricted												
	Homogeneity	3.597	1.250	1.093	4.890	0.4346	1.281	2.845	3.633	3.419	5.961	3.148	3.164
	Symmetry & homogeneity	5.156	3.004	32.785	6.497	7.0564	1.988	4.672	11.127	64.788	10.012	5.427	22.406
Rotterdam	Unrestricted	73.277	77.623	86.585	78.906	75.825	80.017	75.583	71.518	116.115	93.617	77.189	68.109
	Homogeneity	71.813	83.768	86.102	79.000	76.109	79.550	75.238	74.267	117.159	90.415	77.211	67.825
	Symmetry & homogeneity	71.784	82.853	100.316	77.694	73.713	79.721	75.065	71.818	93.349	89.423	76.701	60.757
CBS	Unrestricted	73.785	74.497	82.423	74.986	76.407	82.560	73.611	114.393	108.967	93.445	77.926	72.377
	Homogeneity	72.281	79.113	82.128	75.264	76.682	81.860	73.928	116.637	110.811	89.313	77.867	75.572
	Symmetry & homogeneity	71.932	78.359	89.437	74.344	75.440	82.279	73.834	117.704	100.006	87.864	79.153	79.134
AIDS	Unrestricted	74.772	79.639	82.152	74.774	76.788	85.577	73.544	116.402	109.204	108.084	78.198	72.242
	Homogeneity	84.131	86.013	82.128	81.738	80.296	132.891	74.195	114.979	222.629	125.341	75.760	75.675
	Symmetry & homogeneity	89.128	101.985	143.072	85.461	75.172	141.568	74.606	134.444	165.422	121.834	77.164	67.918
NBR	Unrestricted	74.118	83.255	86.275	78.906	76.020	83.059	75.583	76.994	116.176	110.106	77.468	68.109
	Homogeneity	82.720	88.966	86.328	84.349	77.973	128.442	75.266	80.047	223.991	130.870	76.707	67.825
	Symmetry & homogeneity	88.118	106.007	150.341	85.907	73.426	138.246	75.855	98.469	170.901	128.098	75.098	57.540

^aTable value for $\chi^2(2)=5.991$ at the 5% level

Table 6

Estimated income and price elasticities for each country.

Table 6.1 Bahamas

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.79920	0.35664	-0.06531	-0.24550	-0.04583
Pork	0.23058		-0.01435	0.06276	0.05091
Poultry	1.7751			0.27154	0.00132
Mutton	-2.00729				0.08900

Table 6.2 Barbados

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	1.22807	-0.24127	0.08895	0.21329	-0.06097
Pork	0.84370		0.03952	-0.07085	-0.03322
Poultry	1.11392			-0.13126	0.03223
Mutton	-2.18570				0.26668

Table 6.3 Belize

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	1.14324	-3.71738	-0.48175	0.02905	4.17008
Pork	0.82495	-0.01708	0.00369	0.08556	-0.07217
Poultry	1.04956	2.89090	0.36675	-0.09503	-3.16262
Mutton	-2.01775	-9.00414	-0.89648	-0.49500	10.39562

Table 6.4 Cuba

GDSAII

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.71845	-1.06281	-1.49980	2.34043	0.22219
Pork	1.50313	0.66140	4.99822	-4.37288	-1.28574
Poultry	1.23658	1.67394	-0.59800	-1.57277	0.49682
Mutton	-2.45816	1.87927	-5.07819	1.88618	1.31275

Table 6.5 Dominica Republican

GDSAHS

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.47803	0.02336	-0.03233	0.01110	-0.00213
Pork	1.31615		0.36862	-0.29272	0.00024
Poultry	1.33300			0.09063	0.00143
Mutton	-2.12718				0.00745

Table 6.6 Dominica

GDSAII

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	1.29807	-1.89500	0.10246	1.69239	0.10015
Pork	-0.18216	3.46238	0.96975	0.33159	-4.76372
Poultry	2.12063	-0.97983	-0.73852	-1.18836	2.90672
Mutton	-2.23654	-9.30550	0.46807	4.56401	4.27341

Table 6.7 Grenada

GDSAHS

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	2.07433	0.47020	0.13845	-0.51771	-0.09094
Pork	0.12211		-0.44178	0.26969	-0.00690
Poultry	0.78616			0.13662	0.03061
Mutton	-1.98260				0.45918

Table 6.8 Guyana

GDSAII

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.54907	-0.45418	-0.00129	0.25599	0.19949
Pork	0.13380	-0.01340	0.13399	0.64086	-0.76146
Poultry	1.62649	0.31551	-0.12130	-0.32416	0.03702
Mutton	-1.30936	-0.01104	-0.00898	0.00241	0.06275

Table 6.9 Haiti

GDSAII

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.12619	0.65310	-0.18398	0.19317	-0.66229
Pork	2.03998	-0.90692	0.28662	-0.03518	0.65548
Poultry	1.13540	1.29007	-0.04687	-0.54606	-0.65715
Mutton	-2.30158	-0.31524	-0.48037	-0.18478	0.98039

Table 6.10 Jamaica

GDSAII

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.91253	-0.02280	0.02663	0.01940	-0.02323
Pork	0.86721	-0.49178	-0.14745	0.27694	0.36229
Poultry	1.08382	0.09048	0.05778	-0.09449	-0.05377
Mutton	-1.86357	0.33370	-0.44799	0.24874	-0.13444

Table 6.11 Saint Lucia

GDSAHS

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	1.47472	0.16271	0.27903	0.32946	-0.77120
Pork	0.69716		-0.64725	0.20946	0.17219
Poultry	1.02010			-0.28853	0.03054
Mutton	-2.19198				2.32145

Table 6.12 Saint Vincent

GDSAH

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.05794	0.88366	0.10628	-0.40165	-0.58829
Pork	1.27902	0.81061	0.43552	-0.11427	-1.13186
Poultry	1.19290	-0.69617	-0.27382	0.16890	0.80109
Mutton	-1.52987	-0.29598	0.19892	0.40018	-0.30312

Table 6.13 Suriname

GDSAH

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	1.64352	-0.06434	0.13673	-0.09902	0.02663
Pork	-0.20226	-0.43171	-0.35374	0.15998	0.62547
Poultry	0.78702	0.10846	-0.03297	0.03859	-0.11409
Mutton	-1.22828	-0.16420	0.10088	-0.06218	0.12550

Table 6.14 Trinidad and Tobago

GDSAH

Type of meat	Income elasticities	Compensated own and price elasticities			
		Beef	Pork	Poultry	Mutton
Beef	0.83936	-2.18378	0.01429	-0.29494	2.46443
Pork	0.93778	-0.02279	-0.48040	0.54023	-0.03704
Poultry	1.07830	1.07981	0.15068	0.01632	-1.24681
Mutton	-1.85543	-2.12773	-0.28435	-0.61002	3.02209

Table 7

Forecast of cumulative growth in the meat demand

	Bahamas	Barbados	Belize	Cuba	Dominica R.	Dominica	Grenada	Guyana	Haiti	Jamaica	St. Lucia	St. Vincent	Suriname	Trinidad-T.
Beef	Previous four years	5.757	-12.980	-18.812	-27.778	9.859	-3.653	117.519	25.786	0.000	-4.762	6.785	7.266	-21.263
	Simulated price decline	-0.877	-14.078	-0.842	-21.972	7.666	-0.649	-18.416	-9.859	8.264	-9.537	-20.310	-12.418	-13.373
Pork	Previous four years	4.750	4.008	4.632	-18.478	60.526	-31.114	5.471	-19.778	50.000	-11.111	27.247	50.472	-46.423
	Simulated price decline	4.234	-14.648	2.692	12.185	-3.064	48.375	3.602	-15.942	-10.949	0.932	-5.776	-39.751	0.860
Poultry	Previous four years	1.291	-20.313	-3.110	-46.358	21.053	39.352	6.989	200.400	16.667	36.667	12.771	29.097	-12.199
	Simulated price decline	-2.187	11.068	-1.568	9.139	-3.018	-5.113	9.425	3.603	11.608	-10.664	5.354	18.503	5.987
Mutton	Previous four years	21.100	-18.875	-40.625	-50.000	50.000	2.273	15.957	1.299	0.000	33.333	4.572	-9.709	-7.865
	Simulated price decline	0.000	-0.002	0.984	-0.023	0.001	-0.032	-0.185	0.000	-3.502	143.339	0.001	-0.006	0.032