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Measuring the Effectiveness of the Export Enhancement Program for Poultry

Stephen L. Haley

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Abstract

This report examines the economic effects of the Export Enhancement Program (EEP) for poultry meat for 1987. Total exports have increased 79,000 metric tons due to the program. These numbers imply that every metric ton of poultry meat subsidized has resulted in an additional 0.83 metric ton of poultry meat exports at an average cost of \$761 per metric ton. Considering that the average unit export value for all U.S. poultry exports was \$1,038, the program has expanded poultry exports at relatively high cost. Although U.S. poultry exports have increased, other poultry exporters (including the EC) have not been significantly affected. U.S. producers have gained marginally, while U.S. consumers have lost an equivalent amount of welfare through higher domestic poultry prices. The primary beneficiaries have been consumers in the countries targeted for the EEP, primarily Iraq and Egypt. Additional analysis indicates that U.S. poultry production and exports probably would be somewhat higher if there were no EC policies affecting the world poultry and corn markets. Even with these policies in place, however, a slightly lower world price for poultry meat caused by these policies benefits U.S. consumers as much as it hurts U.S. producers. From the perspective of poultry markets, the effect of these EC policies on the United States is very small.

Keywords: Export enhancement, international trade, poultry meat

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Country Codes

Poultry exporters

BZ = Brazil
EC = European Community
HG = Hungary
TH = Thailand
US = United States
RW = Rest of the World

Poultry importers

AF = Sub-Saharan Africa
CR = Caribbean Islands
EC = European Community
EG = Egypt
GS = Gulf States
HK = Hong Kong
IQ = Iraq
JP = Japan
SA = Saudi Arabia
SV = Soviet Union
RW = Rest of the World

Measuring the Effectiveness of the Export Enhancement Program for Poultry

Stephen L. Haley

Introduction

The United States, through the Export Enhancement Program (EEP), subsidizes exports of frozen poultry to selected foreign markets. The primary motive of this program has been to meet competition from subsidizing countries, especially those in the European Community (EC). A related political goal has been to encourage subsidizing exporters to negotiate agricultural problems within the framework of the General Agreement on Tariffs and Trade (GATT). To date, there has been little research on the effectiveness of the EEP for poultry. This report evaluates the effect the EEP had on the international poultry market in 1987. The analysis focuses on economic effects. No attempt is made to evaluate the political ramifications of the program. A related objective is to gauge the relative effects of U.S. and EC poultry and feed grain policies on international markets.

This report can be seen as an extension of the prior work of Harling and Thompson (10) and of Alston and Scobie (1).¹ Harling and Thompson, using data from 1975-77, studied effective rates of protection for poultry meat in Britain, Canada, and West Germany. Their work emphasized that the analysis of government intervention on an industry that is a heavy user of intermediate inputs requires the examination of distortions in final product and intermediate inputs markets. Alston and Scobie analyzed the effect of EC policies on the U.S. poultry market. They examined EC poultry export restitutions along with the EC grain policies, which the restitutions are presumably designed to offset. Their results indicated that the effects of EC policies are restricted to the EC. A slightly lower world poultry price, resulting from EC policies, tends to benefit U.S. consumers as much as it hurts U.S. producers. A retaliatory U.S. subsidy would expand U.S. poultry exports, but would scarcely affect the EC, and the U.S. budget cost would be high.

Since Alston and Scobie wrote their paper, the United States has instituted the EEP for a variety of commodities, including poultry meat. According to their predictions, the poultry EEP should expand U.S. exports, but the effect on the EC should be small. This report evaluates Alston and Scobie's prediction.

¹Underscored numbers in parentheses refer to sources listed in the References.

EEP and the International Poultry Market

EEP was created in May 1985 primarily to help U.S. agricultural exporters match price competition of subsidizing exporters in targeted markets. The chief subsidizing competitor was the EC.² At the time, high fixed loan rates and the high value of the U.S. dollar made it very difficult for the United States to be competitive. Although loan rates on grains and the value of the dollar have declined since then, the EC has continued and even expanded its high level of subsidization. Another objective of EEP has been to encourage the EC, as well as other subsidizing exporters, to negotiate at the Uruguay Round of the GATT.

Fiscal 1988 EEP sales were about \$3.3 billion. The sales included 26 million metric tons of wheat, 1.7 million metric tons of barley, and lesser amounts of barley malt, dairy cattle, flour, frozen poultry, rice, sorghum, table eggs, and vegetable oil. The Soviet Union, North Africa, and China were the chief targets for wheat. Saudi Arabia was the chief EEP destination for barley. Sales of whole chickens and leg quarters to Iraq and Egypt accounted for more than 90 percent of EEP poultry meat sales.

EEP operates as a two-step, competitive bid process to help U.S. exporters compete, while minimizing bonuses from Commodity Credit Corporation (CCC) stocks. The CCC targets a country for a specific commodity. U.S. exporters then compete for sales to the targeted market. U.S. exporters offer competitive prices to the targeted market knowing that they might receive a bonus from the CCC. Because the sale is contingent on receiving the bonus, U.S. exporters bid against each other for the bonus. The CCC evaluates both the sales price to the foreign purchaser and the bonus bids. The bonus is awarded to the exporter whose sales price and bonus bid falls within pre-determined ranges. The selected exporter completes the sale, presents proof of arrival of the commodity at its destination, and then receives the CCC bonus in the form of a generic certificate redeemable for CCC commodities. The exporter can either sell the generic certificate or redeem it for any CCC commodity in stock.

Although the EEP poultry program is small compared with that for wheat, EEP bonuses are important to the U.S. poultry and egg industries. EEP poultry shipments accounted for 25 percent of total U.S. poultry exports in 1987. EEP shipments of table eggs were 60 percent of total table egg exports. Through December 1988, 152,000 metric tons of poultry meat were shipped under the program. Total poultry bonuses amounted to \$99.26 million, which is a unit export subsidy of \$652 per metric ton. Considering that the unit export value of U.S. poultry meat was \$1,038 per metric ton in 1987, the level of the unit export subsidy has been high.

Table 1 shows a trade flow matrix for trade in poultry meat for 1984-87. Table 2 shows exporters' shares of poultry import markets for the same time period. Major changes in exporter market share occurred in only a few instances. The United States increased its share of the Iraqi market from zero in 1986 to 76 percent in 1987. At the same time, Brazil's share of that

² It is alleged that Brazil, in addition to the EC, has subsidized its poultry meat exports. Data on Brazilian subsidy levels are generally not available. Therefore, there is no analysis of the effect of Brazilian policies on world poultry markets.

Table 1--International trade flow for poultry meat

Exporters	Importers											Total
	SA	GS	IQ	EG	AF	SV	EC	CR	JP	HK	RW	
<u>1,000 metric tons</u>												
US:												
1984	3.6	2.3	0	6.3	1.4	0	7.9	45.7	55.2	33.9	73.7	230.0
1985	3.1	1.9	0	10.1	.3	0	6.0	45.9	47.4	42.8	74.4	231.9
1986	2.5	1.5	0	29.7	.3	0	12.4	52.8	78.8	37.1	79.1	294.5
1987	2.4	1.1	58.4	27.4	.8	0	14.6	50.8	80.1	57.3	87.3	380.2
Average	2.9	1.7	14.6	18.4	.7	0	10.2	48.8	65.6	42.8	78.7	284.2
EC:												
1984	119.9	105.6	.3	8.5	43.3	0.5	--	20.7	2.1	6.5	45.1	352.5
1985	98.4	91.6	.4	2.1	50.3	2.4	--	20.1	2.8	8.4	65.3	341.8
1986	82.5	75.8	.2	4.5	55.7	22.3	--	17.2	3.5	7.8	79.5	349.0
1987	103.7	46.2	4.8	6.7	85.1	0	--	3.7	2.9	13.4	108.8	375.3
Average	101.1	79.8	1.4	5.5	58.6	6.3	--	15.4	2.8	9.0	74.7	354.7
BZ:												
1984	92.8	31.7	47.5	63.3	2.5	0	13.0	0	10.5	.4	18.6	280.3
1985	86.0	35.2	65.6	50.5	2.0	0	18.2	0	15.3	2.5	4.2	279.5
1986	92.9	43.0	25.0	5.5	5.5	0	17.7	0	17.2	2.2	71.6	280.6
1987	92.3	40.6	13.4	.3	10.6	0	8.7	0	22.1	4.8	23.2	216.0
Average	91.0	37.6	37.9	29.9	5.2	0	14.4	0	16.3	2.5	29.4	264.1
HG:												
1984	15.8	2.7	0	5.0	5.0	60.7	19.0	5.0	0	.6	48.2	162.0
1985	8.8	2.0	0	5.0	5.5	63.8	35.0	5.5	0	.8	29.6	156.0
1986	2.5	1.0	0	2.4	0	101.0	31.0	0	0	0	43.1	181.0
1987	2.4	1.9	0	4.2	0	110.0	36.0	0	0	0	55.5	210.0
Average	7.4	1.9	0	4.2	2.6	83.9	30.3	2.6	0	.4	44.1	177.3
TH:												
1984	0	.5	0	0	0	0	0	0	31.1	.1	3.1	34.8
1985	0	.2	0	0	0	0	0	0	33.2	.6	3.8	37.8
1986	0	.6	0	0	0	0	.9	0	57.6	1.8	4.8	65.7
1987	0	.5	0	0	0	0	.7	0	79.9	1.3	4.6	87.0
Average	0	.5	0	0	0	0	.4	0	50.5	1.0	4.1	56.3
Total:												
1984	232.1	142.8	47.8	83.1	52.2	61.2	39.9	71.4	98.9	41.5	188.7	1,059.6
1985	196.3	130.9	66.0	67.7	58.1	66.2	59.2	71.5	98.7	55.1	177.3	1,047.0
1986	180.4	121.9	25.2	42.1	61.5	123.3	62.0	70.0	157.1	48.9	278.4	1,170.8
1987	200.8	90.3	76.6	38.6	96.5	110.0	60.0	54.5	185.0	76.8	279.4	1,268.5
Average	202.4	121.5	53.9	57.9	67.1	90.2	55.3	66.9	134.9	55.6	231.0	1,136.5

-- = Not applicable.

Note: Country codes are listed on page iv.

Source: (17).

Table 2--Exporter share of poultry import market

Exporters	Importers											Total
	SA	GS	IQ	EG	AF	SV	EC	CR	JP	HK	RW	
	<u>Percent</u>											
US:												
1984	2	2	0	8	3	0	20	64	56	82	39	22
1985	2	1	0	15	1	0	10	64	48	78	42	22
1986	1	1	0	71	0	0	20	75	50	76	29	25
1987	1	1	76	71	1	0	24	93	43	75	31	30
Average	1	1	19	41	1	0	19	74	49	77	35	25
EC:												
1984	52	74	1	10	83	1	--	29	2	16	24	33
1985	50	70	1	3	87	4	--	28	3	15	37	33
1986	46	62	1	11	91	18	--	25	2	16	29	30
1987	52	51	6	17	88	0	--	7	2	17	39	30
Average	50	64	2	10	87	6	--	22	2	16	32	31
BZ:												
1984	40	22	99	76	5	0	33	0	11	1	10	26
1985	44	27	99	75	3	0	31	0	16	5	2	27
1986	51	35	99	13	9	0	29	0	11	4	26	24
1987	46	45	17	1	11	0	15	0	12	6	8	17
Average	45	32	79	41	7	0	27	0	12	4	12	24
HG:												
1984	7	2	0	6	10	99	48	7	0	1	26	15
1985	4	2	0	7	9	96	59	8	0	1	17	15
1986	1	1	0	6	0	82	50	0	0	0	15	15
1987	1	2	0	11	0	100	60	0	0	0	20	17
Average	3	2	0	7	5	94	54	4	0	1	19	16
TH:												
1984	0	0	0	0	0	0	0	0	31	0	2	3
1985	0	0	0	0	0	0	0	0	34	1	2	4
1986	0	0	0	0	0	0	1	0	37	4	2	6
1987	0	0	0	0	0	0	1	0	43	2	2	7
Average	0	0	0	0	0	0	1	0	36	2	2	5

-- = Not applicable.

Note: Country codes are listed on page iv.

Source: (17).

market decreased from 99 percent to 17 percent. Most of the U.S. gain resulted from increased Iraqi imports rather than a displacement of Brazilian imports. Although Iraqi imports from the United States grew from zero to 58,400 metric tons in 1987, total Iraqi imports increased 51,400 metric tons. The United States increased its share of the Egyptian market from 15 percent in 1985 to 71 percent in 1986 and 1987. Egyptian imports, however, declined during the period. The export loser was Brazil. Brazil's market share of Egypt's imports decreased from 76 percent in 1984 to 1 percent in 1987, a decrease of 63,000 metric tons.

In the Gulf States market, the Brazilian share rose, the EC share fell, and the U.S. share remained fairly small. The Gulf States market, however, has declined from 142,800 metric tons in 1984 to 90,300 metric tons in 1987. In the Caribbean market, the United States increased its market share to 93 percent in 1987, while the EC's market share declined to 7 percent. These changes took place in a declining market, with EC imports declining the most. The United States lost some of the Japanese market (declining from 50 to 43 percent) even though poultry exports increased to 80,100 metric tons in 1987. Thai exports to Japan increased 22,300 metric tons in 1987, thereby, increasing its market share from 37 percent in 1986 to 43 percent in 1987.

The other import markets did not change much with regard to exporter market shares. The level of poultry imports increased in several markets. Sub-Saharan Africa increased its imports during 1984-87, with the EC increasing its level of exports the most, almost 41,800 metric tons in 1987. The Soviet Union increased its imports through 1986, and Hungary supplied nearly all of its imports in 1986. Hong Kong increased its imports 27,900 metric tons in 1987. Both the United States and the EC increased their exports to Hong Kong, but their respective market shares remained about the same as the 1986 levels.

These trends imply several hypotheses regarding the poultry EEP:

- o EEP has expanded the volume of U.S. poultry exports.
- o The United States has expanded its share in the Iraqi, Egyptian, and Caribbean markets. The U.S. gain has been the result of import market expansion rather than the displacement of competitors.
- o To the extent that competitors have been displaced, Brazil has been more affected than the EC. The only market where the United States has displaced the EC is the Caribbean, where EEP bonuses have been low.

The rest of this report develops a formal economic model that replicates a 1987 base year for poultry meat and corn (the primary feed input). The purpose of the model is to evaluate the hypotheses. Econometric hypothesis testing is not possible because EEP has not been in existence long enough to provide sufficient observations for parameter estimation. The alternative is to develop a simulation model in which the behavior of major poultry exporters and importers is modeled through supply and demand equations. Validation is achieved through sensitivity analysis.³ Assumptions regarding U.S. poultry

³Sensitivity analysis entails building several versions of the model. The versions differ from each other in the values assigned to certain key model parameters. The key parameter in this analysis is the elasticity of substitution

EEP bonuses and EC poultry export restitutions, as well as U.S. and EC policies affecting corn, are embedded within the model. Analysis consists of changing one or more of the assumptions underlying the base model. A change in any assumption (such as the removal of an EEP bonus) provides a "shock" to the model which forces it to adjust to a new equilibrium. The analysis proceeds by comparing the altered equilibrium solution with the actual 1987 base.

The Model

We used two modeling approaches with respect to demand analysis in this report. The principal modeling approach is the Armington-variant of the constant elasticity net trade model (2). Armington models have been extensively used in agricultural trade analysis.⁴ Poultry products are differentiated by country of origin in this model. There are 6 exporters and 11 importers of poultry meat. Exporters and importers are listed in the country codes on page iv. (Note that two regions--EC and the rest of the world--both export and import poultry meat.) Each importer has a separate demand schedule for poultry from each of the exporting regions, and each importer's demand for domestically produced poultry is not distinguished from imports from the rest of the world.

The Armington approach to demand analysis assumes that the utility of a country's representative consumer is weakly separable so that the consumer's decision process occurs in two stages. First, the consumer decides how much of a commodity (poultry) to consume. Then, the consumer allocates his consumption among the competing suppliers.

Weak separability means that the marginal rate of substitution between any two kinds of poultry meat is independent of the consumption of any other good. Simplifying the modeling procedure, one assumes that the total quantity of poultry to be consumed is a constant elasticity of substitution (CES) index of the quantities supplied domestically and from abroad. This assumption implies that the elasticity of substitution between any two kinds of poultry meat is constant, and that the elasticity of substitution between two kinds of poultry meat in a particular market is the same as the elasticity between any other poultry meat in the same market.

The concept of an elasticity of substitution relates the percentage change in the ratio of quantities of two types of poultry meat to the percentage change of the ratio of their prices. Let Q and p represent the quantity and price of poultry meat, and let the subscripts h and k index the types of poultry meat. The elasticity of substitution is defined mathematically:

between differing country sources of poultry meat. Results obtained from each model version are compared. This process helps to establish a range of values for model output.

⁴See Thompson (15) for a review of Armington models applied to agricultural trade. See Dixit and Roningen (5) for an application of the Armington models to the SWOPSIM modeling framework. See Dixit (4) and Krissoff and Ballenger (12) for examples of the Armington approach in SWOPSIM.

$$\sigma_{kh} = \frac{\Delta(Q_k/Q_h)/(Q_k/Q_h)}{\Delta(p_h/p_k)/(p_h/p_k)}$$

This elasticity relationship is constant within a country or region of the model, and the elasticity holds for all pairings of poultry meat within a country or region. This latter assumption allows the kh subscript to be replaced by a single index, which corresponds to the country or region. Own- and cross-price demand relationships are determined as follows:

$$\eta_{ikk} = -(1-S_{ik})\sigma_i + S_{ik}\eta_{ik} \quad (1)$$

$$\eta_{ikh} = S_{ih}(\sigma_i + \eta_i) \quad (2)$$

where η_{ikh} = elasticity of demand in country i for poultry from country k with respect to the price of poultry from country h,

σ_i = elasticity of substitution for country i,

η_i = overall demand elasticity for poultry in country i,

S_{ih} = expenditure share of poultry from country h in country i.

The Armington approach (weak separability in particular) implies that the summation of own- and cross-price elasticities for any poultry meat is equal to the overall demand elasticity for poultry meat within the country:

$$\begin{aligned} \eta_{ik} &= \sum_{h=1}^n \eta_{ikh} = -(1-S_{ik})\sigma_i + S_{ik}\eta_i + \sum_{h \neq k} S_{ih}(\sigma_i + \eta_i) \quad (3) \\ &= \left[\sum_{h=1}^n S_{ih} - 1 \right] \sigma_i + \sum_{h=1}^n S_{ih} \eta_i \\ &= \eta_i \quad \text{because } \sum_{h=1}^n S_{ih} = 1 \end{aligned}$$

A change in the price of a particular type of poultry meat relative to the other types does not affect the overall demand for poultry meat.

One problem with the Armington approach is that if there is no original consumption of a particular type of poultry meat, no amount of a relative price change will ever cause poultry meat to be consumed. This restriction is serious because the number of poultry import markets shared by exporters is not large for 1987. Therefore, an alternative modeling approach, which does not distinguish between poultry meat from differing regions, will be used for

comparison with the Armington results.⁵ One consequence of this latter approach is that the ability to account for bilateral poultry trade flows is lost.

The models used in this report include supply and demand for corn, in addition to poultry meat. Corn is the primary feed ingredient for poultry production. As emphasized by Harling and Thompson (10) and Alston and Scobie (1), policies designed to affect corn will also affect poultry production. Both the United States and the EC intervene heavily in their respective domestic corn markets.

Corn demand is approximated in a constant elasticity specification by including the supply quantity of poultry meat as a variable in the corn demand equation where the share of corn demanded for producing poultry serves as the constant elasticity.⁶ The consumption price of corn enters into the poultry supply equation. The price is weighted by the elasticity of poultry supply with respect to the consumption price of corn. This elasticity is derived via the symmetry conditions implied by profit maximization.⁷

The supply and demand elasticities for poultry and corn are from the Trade Liberalization (TLIB) model of USDA's Economic Research Service (8). The elasticities are listed in table 3, and base poultry and corn quantity data are listed in table 4. Production and trade data are from the Food and Agriculture Organization (FAO).⁸ Data for the EC and U.S. corn stock changes are from USDA. FAO did not separate out intra-EC trade. Except for the EC and the rest of the world, net trade is used instead of actual export and import totals.⁹

Table 5 shows the poultry trade flow matrix used in the model. The trade flows are similar to those reported in table 1 for 1987. A problem with joining two sets of data from different sources is that the totals do not always match. The procedure followed here is adjust trade flows to and from the rest of the world region to arrive at totals that correspond to the trade numbers in table 4.

⁵This alternative approach is the equivalent of specifying an infinite elasticity of substitution between all pairings of poultry products. Perfect substitutability allows all poultry meat to be summed into a single product.

⁶See (14), pages 3-4, for more detailed specifications.

⁷See (9), pages 6-7, for the derivation from a representative profit function.

⁸Production and imports for the rest of the world region are calculated by subtracting the sum of the other regions' production and imports from the world totals. This procedure is modified for exports by subtracting the sum of other regions' exports from the world import total. This procedure assures that world supply and demand for poultry meat and corn balance in spite of small FAO data imbalances.

⁹If a region exports 100 metric tons and imports 1,000 metric tons, the table shows the region importing 900 metric tons.

Table 3--Model elasticities

Region or country	Poultry			Corn		Share
	Supply	Cross ¹	Demand	Supply	Demand ²	
BZ	0.56	-0.12	-0.33	0.33	-0.31	0.15
CR	.26	-.04	-.34	.12	-.11	.06
EG	.56	-.08	-.25	.18	-.37	.10
EC	.52	-.06	-.24	.30	-.15	.10
GS	.31	-.07	-.35	.30	-.23	.40
HK	.35	-.06	-.73	.32	-.25	.37
HG	.38	-.14	-.10	.16	-.16	.11
IQ	.31	-.07	-.35	.30	-.23	.40
JP	.69	-.16	-.64	.30	-.16	.14
SA	.31	-.07	-.35	.30	-.23	.40
AF	.46	-.12	-.43	.32	-.17	.10
TH	.60	-.12	-.80	.44	-.17	.70
SV	.22	-.04	-.10	.12	-.13	.10
US	.48	-.11	-.41	.29	-.10	.10
RW	.42	-.05	-.42	.31	-.28	.06

¹poultry elasticity with respect to the price of corn.

²Share of total corn consumption demanded by domestic poultry sector.

Source: (8).

Table 4--Base poultry and corn quantity data

Region and country	Production	Imports	Exports	Change in stocks	Consumption
<u>1,000 metric tons</u>					
Poultry:					
BZ	1,800	0	216	0	1,584
CR	177	72	0	0	249
EG	170	43	0	0	213
EC	3,791	60	375	0	3,476
GS	37	90	0	0	127
HK	54	77	0	0	131
HG	475	0	210	0	265
IQ	150	190	0	0	340
JP	1,340	192	0	0	1,532
SA	300	201	0	0	501
AF	1,046	143	0	0	1,189
TH	464	0	87	0	377
SV	3,000	169	0	0	3,169
US	7,368	0	380	0	6,988
RW	10,541	322	301	0	10,572
Total	30,713	1,569	1,569	0	30,713
Corn:					
BZ	26,787	871	1	0	27,657
CR	229	585	0	0	814
EG	3,619	2,200	0	0	5,819
EC	25,639	8,780	7,775	0	26,644
GS	3	153	0	0	156
HK	0	191	0	0	191
HG	7,187	102	188	0	7,101
IQ	35	440	0	0	475
JP	1	16,504	0	0	16,505
SA	1	555	0	0	556
AF	16,044	2,055	753	0	17,346
TH	2,781	0	1,628	0	1,153
SV	14,808	9,238	257	0	23,789
US	179,437	50	40,906	-19,000	157,581
RW	181,487	23,058	13,274	0	191,271
Total	458,058	64,782	64,782	-19,000	477,058

Sources: (6), (7).

Table 5--Base trade flow matrix for poultry

Importers	Exporters						Total
	US	EC	BZ	HG	TH	RW	
	<u>1,000 metric tons</u>						
BZ	0	0	0	0	0	0	0
CR	51	4	0	0	0	18	72
EG	27	7	0	4	0	4	43
EC	15	0	9	36	1	0	60
GS	1	46	41	2	1	0	90
HK	57	13	5	0	1	0	77
HG	0	0	0	0	0	0	0
IQ	58	5	13	0	0	113	190
JP	80	3	22	0	80	7	192
SA	2	104	92	2	0	0	201
AF	1	85	11	0	0	47	143
TH	0	0	0	0	0	0	0
SV	0	0	0	110	0	59	169
US	0	0	0	0	0	0	0
RW	87	109	23	56	5	53	332
Total	380	375	216	210	87	301	1,569

Note: Country codes are listed on page iv.
Source: (Z).

Analysis of U.S. Poultry EEP

EEP bonuses amounted to over \$60 million in 1987. Table 6 shows the targeted regions and countries, the dates of the EEP sales, the quantities sold and shipped, and the average bonus for each sale. The next to last column shows the ratio of the quantity sold under EEP to the total sold for the entire year. EEP sales accounted 100 percent of all U.S. sales to Iraq and Egypt. The last column shows the average bonus for each region with sales in 1987. The base model was constructed incorporating the EEP bonuses from the last column of table 6 as consumer price wedges in the targeted regions.

Table 6--U.S. poultry EEP bonuses, 1987

Region and country	Date of sales	Quantity	Bonus	EEP sales as a ratio of region sales	Regional bonus
		<u>Metric tons</u>	<u>Dollars per metric ton</u>		<u>Dollars per metric ton</u>
Gulf States:					
Bahrain	December 31	250	562.18	0.227	128
Iraq	February 13	25,000	727.53	--	--
	June 1	20,000	669.31	--	--
	June 2	15,000	719.80	--	--
Total	--	60,000	--	1.000	706
Egypt					
	February 4	12,500	457.90	--	--
	June 2	10,000	473.99	--	--
	June 16	2,500	502.00	--	--
	September 10	4,000	771.61	--	--
	September 11	2,000	810.20	--	--
Total	--	31,000	-	1.00	530
Caribbean:					
Dominican Republic					
	August 20	306	573.20	--	--
	August 21	60	573.20	--	--
Total	--	366	-	.007	4
Rest of the world:					
Canary Islands					
	May 5	1,000	440.92	--	--
	August 4	1,000	264.55	--	--
	October 20	1,000	165.35	--	--
Singapore	November 19	120	297.62	--	--
	December 11	100	457.90	-	--
Total	--	3,220	--	0.037	14

-- = Not applicable.

EEP bonuses are paid in the form of generic certificates that are eventually redeemed for commodities from CCC stocks. In this modeling exercise, it is assumed that all generic certificates issued as poultry EEP bonuses were redeemed for corn from CCC stocks. Release of the corn drives down its price, thus benefiting the poultry producer who uses corn as a feed input. This assumption allows the EEP to have an additional favorable effect on poultry producers in addition to the direct subsidy effect.

The EC provides restitutions or subsidies to promote the sale of its poultry for export. Table 7 shows FAS estimates of EC poultry export restitutions for 1987. From September through December 1987, the EC increased its restitutions to regions targeted by the United States for EEP bonuses. It is assumed that the EC increased the restitution levels because of EEP. Therefore, in this modeling exercise (which is gauging the effect of EEP), EC restitutions are lowered to their January-September levels.

Three versions of the model were constructed for this analysis. The first two versions are based on the Armington formulation. In addition to the demand elasticities listed in table 3, an elasticity of substitution to operationalize the model is needed. Unlike price elasticities, there are no estimates of these elasticities of substitution for poultry meat. Thompson (15) and Dixit and Roningen (5) report that in the absence of better information, other studies have tended to use an elasticity of 3 for analysis. This report uses 3 for the "low"-elasticity solution. The second version of the model doubles the elasticity figure to 6 for the "high"-elasticity solution. The third version of the model has an implied elasticity of substitution of infinity. Poultry is an undifferentiated product in the third version. The ability to track trade flows is lost in this case.

Table 7--EC poultry export restitutions, 1987

Item	January-September	September-December	
		A ¹	Other ²
		<u>ECU per 100 kilograms</u>	
Whole poultry:			
70 percent chicken, with giblets	37	45	37
65 percent chicken, without giblets	37	49	37
Poultry parts:			
Quarters	43	53	43
Legs	55	69	55

¹Includes Egypt, Iraq, Canary Islands, Ceuta and Melilla, Saudi Arabia, and Gulf States (Kuwait, Bahrain, and United Arab Emirates).

²Other destinations, except the United States.

Table 8 shows the solution trade flow matrix for the first two versions of the model. Both versions show the United States losing most of its poultry meat exports to the most heavily subsidized markets of Iraq and Egypt. Total U.S. trade losses are in the neighborhood of 79,000 metric tons. Losses to the Iraqi and Egyptian markets account for practically all of the total U.S. loss. The EC does not gain at the U.S. expense. In fact, the EC exports 4,000 to 8,000 metric tons less because of reduced restitutions to EEP countries formerly targeted by the United States. Brazil exports 6,000 to 15,000 metric tons more than the base solution. These results more or less agree with the analysis presented earlier of historical trade flows from 1984-87 (tables 1 and 2).

Table 9 presents summary results for all three versions of the model (including the infinite elasticity of substitution version). All three versions are in agreement as to the effect of the poultry EEP on the U.S. poultry sector. The poultry EEP probably increased U.S. poultry prices anywhere from \$12.51 to \$13.69 per metric ton. These increases represent a 1.2- to 1.3-percentage-point increase in the price that existed with no EEP. Production increased an average of 42,000 metric tons, and, as mentioned previously, trade increased in the neighborhood of 80,000 metric tons. The infinite elasticity version shows less effect on exports, but the difference (6,000-8,000 metric tons) is not large. Producer gains and domestic consumer losses as measured by changes in producer and consumer surpluses, respectively, offset each other. Considering the cost of the EEP bonuses (\$60.1 million), U.S. net welfare losses are about \$58 million dollars.

In summary, an average of 95,000 metric tons of poultry meat have been subsidized through the EEP at an average bonus level of \$634 per metric ton (\$60.1 million divided by 95,000 metric tons). Model results suggest that total exports increased 79,000 metric tons (an average of 74,000, 80,000 and 82,000 metric tons from table 9) as a result of EEP. These numbers imply that every metric ton of poultry meat subsidized has resulted in an additional 0.83 metric ton of poultry meat exports at an average subsidy cost of \$761 per metric ton. Although U.S. poultry exports have increased, other poultry exporters (including the EC) have not been significantly affected. U.S. producers have gained marginally, while U.S. consumers have lost an equivalent amount through higher domestic poultry prices. The primary beneficiaries have been consumers in the countries targeted for the EEP.

Measuring Distortions in the International Poultry Market

One of the objectives of the EEP has been to meet competitive pressures from other subsidizing agricultural exporters, especially those in the EC. Analysis in the preceding section has shown that the EEP has expanded U.S. poultry exports at high cost without significantly affecting other poultry exporters. However, this conclusion does not negate the assertion that EC policies have distorted the international poultry market to its own presumed benefit and to the detriment of the United States and other exporters. Analysis in this section tries to gauge the relative effects of U.S. and EC policies on world poultry trade and production.

Table 8--Solution trade flow matrix

Exporters	Importers											
	EC	SA	GS	IQ	EG	AF	SV	CR	JP	HK	RW	Total
<u>Million metric tons</u>												
US:												
Low	14.97	2.07	0.72	2.23	3.57	1.01	0	50.99	80.88	57.31	84.59	298.34
Change	0	0	0	-56	-23	0	0	0	1	0	-2	-80
High	14.98	2.22	.53	.09	.5	1.06	0	52.28	84.42	58.58	85.04	299.7
Change	0	0	0	-58	-27	0	0	1	4	2	-2	-80
EC:												
Low		95.76	43.69	5.21	7.01	86.01	0	4.05	3.03	13.07	110.39	368.22
Change		-8	-2	0	0	1	0	0	0	0	-1	-8
High		90.66	42.46	5.73	7.35	89.84	0	4.2	3.17	13.36	115.59	372.36
Change		-13	-4	1	0	5	0	0	0	0	7	-4
BZ:												
Low	8.95	94.38	43.38	15.08	0	10.99	0	0	21.97	4.97	23.01	222.73
Change	0	2	2	2	0	0	0	0	0	0	0	6
High	8.85	96.62	45.59	17.94	0	11.01	0	0	21.99	4.87	23.1	229.97
Change	0	5	5	5	0	0	0	0	0	0	0	15
HG:												
Low	35.86	2.06	2.12	0	4.48	0	110.15	0	0	0	56.21	210.88
Change	0	0	0	0	0	0	0	0	0	0	0	0
High	35.52	2.11	2.24	0	5.09	0	110.41	0	0	0	56.56	211.93
Change	0	0	0	0	1	0	0	0	0	0	1	2
TH:												
Low	1	0	1.06	0	0	0	0	0	80.36	1	5.03	88.45
Change	0	0	0	0	0	0	0	0	0	0	0	0
High	.99	0	1.14	0	0	0	0	0	81.88	.97	5.14	90.12
Change	0	0	0	0	0	0	0	0	2	0	0	2
RW:												
Low	0	6.48	1.06	154.16	23.13	40.97	53.67	17.09	-3.47	.61	-293.43	.27
Change	0	6	0	41	19	-6	-5	-1	-10	-1	-45	-2
High	0	11.14	3.64	209.02	46.93	32.5	47.78	14.48	-16.67	-2.14	-346.69	-.01
Change	0	11	4	96	43	-15	-11	-4	-24	-2	-99	-1
Total:												
Low	60.78	200.75	92.03	176.68	38.19	138.98	163.82	72.13	182.77	76.96	-14.2	1188.89
Change	0	0	0	-13	-4	-5	-5	-1	-9	-1	-46	-84
High	60.34	202.75	95.6	232.78	59.87	134.41	158.19	70.96	174.79	75.64	-61.26	1204.07
Change	0	3	5	44	17	-10	-11	-3	-18	0	-93	-66

Low = Low-elasticity solution.

High = High-elasticity solution.

Change = Change from model base solution.

Table 9--Model estimates of the effect of removing EEP on U.S. poultry, 1987

Item	Low elasticity	High elasticity	Infinite elasticity
<u>1,000 metric tons</u>			
Effect on production:			
Level	7,325	7,325	7,329
Change from base	-43	-43	-39
Effect on trade:			
Level	298	299	306
Change from base	-82	-80	-74
<u>Dollars per metric tons</u>			
Producer price:			
Change in level	-13.69	-13.44	-12.51
Percentage change	-1.3	-1.3	-1.2
<u>Million dollars</u>			
Change in welfare components:			
Producer surplus	-98	-97	-90
Consumer surplus	96	94	57
Total U.S. welfare	58	57	58

EC Poultry and Corn Policy

Although the EC does not formally intervene to purchase poultry meat, it provides export restitutions to offset the difference between EC and world prices. In addition, poultry imports are subject to a basic variable levy. The levy is meant to equal the difference in the cost of production within the EC, with EC grain prices and production costs at world grain prices plus 7 percent (13). Because EC grain prices are set higher than world levels, the poultry levy compensates producers for policy-induced high production costs.

EC grain policies cause the consumption price of corn for feed to exceed world levels. As part of its overall grains program, the EC is obligated to purchase all domestically produced corn that meets minimum standards at intervention prices that are fixed annually.¹⁰ National intervention agencies hold stocks purchased at the intervention level. Surpluses are exported with restitutions that are set weekly to meet changes in world prices. In 1987, the EC exported 7.8 million metric tons of corn (see table 4). In spite of this export level, the EC is basically a net importer of corn. EC imports exceeded exports by more than 1.0 million metric tons in 1987. Imported corn, as well as other types of grain, is priced at a minimum import level or threshold price. The threshold price is set higher than the EC intervention price and is enforced by a variable levy that is adjusted daily to equal the difference between threshold and world prices. The levy is applied to the grain content of processed products as well. In short, EC corn policies cause both producer and consumer corn prices to be higher than world levels. EC poultry producers are implicitly taxed as corn consumers, although EC poultry policies offset this tax to some degree.

U.S. Corn Policy

Corn policies in the United States affect poultry producers, but in an altogether different way than in the EC. Producer incomes are supported through deficiency payments to corn producers. The unit deficiency payment is equal to the difference between the target price and the higher of either the loan rate or the market price in the first 5 months of the marketing year. Corn price supports are maintained through nonrecourse loans to producers at the effective loan rate. The corn crop serves as collateral. If the market price falls below the loan rate, the producer may pay off the loan by forfeiting the crop. The nonrecourse loan program supports production by providing market stability with an effective price floor. Exports can be reduced, however, if the loan rate exceeds the world price. Then, production in excess of domestic demand is channeled into public stocks rather than world markets. To be eligible for the deficiency payments and loan privileges, participants in the Government program may be required to reduce a portion of base acreage from production under the land set-aside and acreage reduction provisions of the 1985 Food Security Act.

¹⁰A coresponsibility levy or production tax reduces effective receipts by 3 percent on marketed corn. There are production control measures as well. A production threshold is set. If actual production exceeds the threshold, price support levels are to be adjusted downward, although annual price setting remains the prerogative of the EC Council of Agricultural Ministers. See (13) for more on EC policies. This source also compares EC policies to their counterparts in the United States.

The effect of U.S. corn policies on poultry producers is theoretically ambiguous. On one hand, deficiency payments and the nonrecourse loan program lead to expanded corn supply. The loan rate, however, limits the downward adjustment of corn prices to expanded supply. On the other hand, acreage reduction programs limit the corn supply, although the effectiveness of these programs has been widely questioned.¹¹ One interpretation of set-aside programs is that they are short-term remedies to limit the excessive buildup of public stocks and to limit Government budget expenditure for deficiency payments. This report concurs with this view and emphasizes the effect of deficiency payments as an indirect subsidy to poultry producers. Subsequent analysis therefore ignores changes in acreage set-asides, interpreting them to affect flows into public stocks rather than into domestic consumption demand.

Table 10 shows summary support measures for U.S. and EC corn. In 1987, U.S. corn producers received direct Government support payments of nearly \$7.3 billion based on the production of over 179 million metric tons. The unit subsidy (not differentiating between program and nonprogram participants) was nearly \$41 per metric ton. This amount has been incorporated as a producer price wedge for corn in the model. The average threshold price for corn was almost \$285 per metric ton in 1987. The average cif Rotterdam price EC corn was over \$90 per metric ton. These amounts imply an average 1987 corn variable levy of \$195 per metric ton. This amount has been incorporated as a tax on corn imports into the EC.

Model Scenarios

Analysis proceeds by first removing all U.S. and EC policy price wedges from the model, and solving for a new, undistorted equilibrium. The analysis emphasizes changes in U.S. and EC production and trade of both poultry meat and corn. The relative contribution of the policies can be approximated by

Table 10--Support for U.S. and EC corn

United States: ¹	
Total deficiency and diversion payments:	\$7,281 million
Total production:	179.44 million metric tons
Unit support (producer subsidy):	\$40.58 per metric ton
European Community: ²	
1987 average dollar threshold price:	\$284.95 per metric ton
1987 average Rotterdam cif corn price:	\$90.30 per metric ton
Unit support (import tax):	\$194.65 per metric ton

¹ Source: (16).

² Source: (3).

¹¹See (11) for a discussion of incorporating set-asides in the context of trade liberalization modeling.

removing each of the policies one at a time.¹² Table 11 shows the "low" and "high" elasticity results for the United States, and table 12 shows the same for the EC.

The removal of all policies would cause U.S. production of poultry to decline between 63,000 and 90,000 metric tons. U.S. poultry and corn policies each contribute to more than half of the total effect, a decrease of between 43,000 and 46,000 metric tons. The effect of each policy is about equal. Removal of the EC corn levy has a strong negative effect on U.S. poultry production. Increased EC corn imports (almost 12,000 metric tons) puts upward pressure on world corn price. U.S. corn supply increases by 2.2 million metric tons, but exports increase by 3.2 million metric tons, leaving less for domestic consumption and putting more upward pressure on the domestic corn price. The only policy removal which is beneficial to U.S. poultry producers is the removal of EC poultry export restitutions. U.S. production increases by 13,000 to 43,000 metric tons, and U.S. poultry exports increase by 24,000 to 79,000 metric tons.

Table 11--Changes in U.S. poultry and corn production and trade

Change attributable to removal of policies	Production		Trade	
	Poultry	Corn	Poultry	Corn
	<u>1,000 metric tons</u>			
All subsidies:				
Low elasticity	-90	-13,671	-60	-10,594
High elasticity	-63	-13,604	-10	-10,557
U.S. poultry EEP:				
Low elasticity	-44	-141	-82	631
High elasticity	-44	-131	-82	645
U.S. corn deficiency payments:				
Low elasticity	-43	-16,237	-10	-14,717
High elasticity	-46	-16,238	-15	-14,714
EC poultry export restitutions:				
Low elasticity	13	30	24	18
High elasticity	43	83	79	36
EC corn levy:				
Low elasticity	-27	2,211	-8	3,150
High elasticity	-30	2,210	-12	3,153

¹²For instance, remove the price wedges which account for the EEP and observe the model changes. Then restore those wedges and remove those which account for corn deficiency payments. Continue in like fashion until each U.S. and EC sector affected by policy has been "shocked."

The net effect of EC poultry and corn policies on the U.S. poultry sector is somewhat ambiguous. The U.S. poultry export position has been hurt. For both versions of the model, the positive trade effects of removing the restitutions are greater than the negative effects of removing the corn levy. However, for the low-elasticity solution, poultry production would be reduced about 14,000 metric tons if the EC were not to intervene in the poultry and corn markets. Although not shown in the table, both model versions show U.S. producers gaining in terms of producer surplus by \$60 to \$121 million. These producer gains, however, are outweighed by consumer losses between \$80 to \$137 million. Net welfare losses, therefore, are \$16-\$19 million. From a welfare standpoint for poultry alone, EC policies have actually benefited the United States through lower consumer prices.¹³

Table 12 shows that the EC is affected almost solely by its own policies for both poultry meat and corn. Changes in U.S. policies affect them practically not at all. EC poultry restitutions have had a strong effect on both production (153,000 to 214,000 metric tons, or 4-5.5 percent of base production) and trade (216,000 to 296,000 metric tons). The EC remains a

Table 12--Changes in EC poultry and corn production and trade

Change attributable to removal of policies	Production		Trade	
	Poultry	Corn	Poultry	Corn
	<u>1,000 metric tons</u>			
All subsidies:				
Low elasticity	-83	-6,666	-211	-10,926
High elasticity	-141	-6,658	-289	-10,863
U.S. poultry EEP:				
Low elasticity	-3	-10	-4	-17
High elasticity	-8	-9	-11	-19
U.S. corn deficiency payments:				
Low elasticity	-0	248	0	376
High elasticity	1	248	5	375
EC poultry export restitutions:				
Low elasticity	-153	2	-216	113
High elasticity	-214	6	-296	163
EC corn levy:				
Low elasticity	76	-7,164	5	-11,969
High elasticity	81	-7,164	9	-11,973

¹³This result was also reached by Alston and Scobie in their earlier analysis of the effect of EC policies (1).

poultry meat exporter even after the removal of its poultry and corn policies. The effect of EC corn levy is only about half the effect of the restitution program, although opposite in its effect on production and trade. Arguments made to justify the restitution program as an offset to high EC grain prices receive no support here.¹⁴

Conclusions

This report reaches a number of conclusions regarding the poultry EEP:

- o In 1987, U.S. poultry exports increased in the neighborhood of 79,000 metric tons due to EEP.
- o Increased U.S. poultry exports have resulted from an expansion in world poultry markets rather than from a displacement of competitors.
- o U.S. poultry prices have increased about 1.2 percent due to the program.
- o For every metric ton of poultry meat subsidized, poultry exports increased by 0.83 metric tons.
- o It cost \$761 to expand U.S. poultry exports by 1 ton. With an average poultry meat unit export value of \$1,038, the cost of expanding poultry exports has been high (the ratio of the cost to the unit export value is 0.73).
- o The total welfare loss to the United States due to the program in 1987 was about \$58 million. This amount is nearly equal to the cost of the program in 1987. Small producer gains due to the program have been matched by equivalent consumer losses. The primary beneficiaries have been consumers in the countries targeted for the EEP, primarily Iraq and Egypt.

Additional analysis indicates that U.S. poultry production and exports probably would be somewhat higher if there were no EC policies affecting the world poultry and corn markets. Even with these policies in place, however, a slightly lower world price for poultry meat caused by these policies benefits U.S. consumers as much as it hurts U.S. producers. In any event, the effect of these EC policies on the United States is very small. The results of this report tend to agree with those reached by Alston and Scobie (1).

¹⁴A consideration of import policies on other feeds not a part of this analysis could perhaps make a better case for those arguments.

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