

University of Missouri, St. Louis

IRL @ UMSL

UMSL Global

1-1-1978

Effects of E.E.C. Agricultural Policy on International Trade in Meat, Dairy Products and Eggs

Emilio Pagoulatos

Angelos Pagoulatos

David L. Debertain

Follow this and additional works at: <https://irl.umsl.edu/cis>



Part of the [International and Area Studies Commons](#)

Recommended Citation

Pagoulatos, Emilio; Pagoulatos, Angelos; and Debertain, David L., "Effects of E.E.C. Agricultural Policy on International Trade in Meat, Dairy Products and Eggs" (1978). *UMSL Global*. 112.

Available at: <https://irl.umsl.edu/cis/112>

This Article is brought to you for free and open access by IRL @ UMSL. It has been accepted for inclusion in UMSL Global by an authorized administrator of IRL @ UMSL. For more information, please contact marvinh@umsl.edu.

EFFECTS OF E.E.C. AGRICULTURAL POLICY
ON INTERNATIONAL TRADE IN MEAT, DAIRY
PRODUCTS AND EGGS

Emilio Pagoulatos

David Debertain

Angelos Pagoulatos

EFFECTS OF E.E.C. AGRICULTURAL POLICY ON INTERNATIONAL
TRADE IN MEAT, DAIRY PRODUCTS AND EGGS

Emilio Pagoulatos, David Debertin and Angelos Pagoulatos*

Abstract

This study attempts to estimate the quantitative effect of the "variable levy" protection system in the European Community based on an econometric model describing the operation of markets for meat, dairy products and eggs in the E.E.C. The estimated model contains 21 behavioral and 5 technical relationships and is based on annual data covering the 1953-72 period. Simulating with the model under free trade conditions and comparing with observed trade values, we conclude that the adoption of "variable levies" has stimulated imports from other common market members and has led to considerable trade diversion away from non-E.E.C. sources. Furthermore, trade diversion was particularly severe in the case of butter and milk, where protection has been the highest.

* Emilio Pagoulatos is Associate Professor of Economics and Research Associate of the Center for International Studies of the University of Missouri-St. Louis; David Debertin and Angelos Pagoulatos are, respectively, Associate and Assistant Professor of Agricultural Economics at the University of Kentucky.

EFFECTS OF E.E.C. AGRICULTURAL POLICY ON INTERNATIONAL
TRADE IN MEAT, DAIRY PRODUCTS AND EGGS

Emilio Pagoulatos, David Debertain and Angelos Pagoulatos*

Trade in temperate zone agricultural products has largely remained outside the trend towards liberalization that has characterized international trade in the last thirty years. One of the most debated issues in this regard has been the European Community's Common Agricultural Policy (CAP) and its effects on world trade. While several studies have suggested that the adoption of the CAP has stimulated internal trade and slowed down third countries' farm exports to the EEC, their estimates were not derived from a model that takes account of supply, consumption and trade relationships [1, 4, 10, 11].

It is the objective of this paper to evaluate the impact of the CAP on production, consumption and intra-EEC and world trade, based on an econometric model describing the operation of markets for meat, dairy products and eggs in the European Community. The model contains twenty one behavioral and five technical relationships and is based on annual data covering the 1953-72 period. The parameters of the structural relationships are simultaneously determined and are estimated by three-stage least squares.

We begin with a brief description of agricultural and trade policies in the EEC. Next we discuss the theoretical specification of the model and the statistically estimated equations. Finally, we evaluate the model's forecasting ability within the sample period and an attempt is made to capture the effect of the adoption of the CAP on world trade.

AGRICULTURAL AND TRADE POLICIES IN THE E.E.C.

Protection of the European Community's market for agricultural commodities is based on the Common Agricultural Policy (CAP), which was adopted in 1962 and became fully operative by 1968.¹ The CAP was designed to assure the maintenance of high farm incomes through a variety of regulations that differ between commodities. These regulations constitute the CAP's "market" or "price" policy and involve support prices fixed well above world market prices, variable levies on imported agricultural products from extra-EEC sources and the exporting of surplus production with the aid of export subsidies (or "restitutions"). The costs of financing this system are met through a common fund established from the proceeds of the import levies and contributions from the member governments.

Even though the market or price policies of the CAP differ from commodity to commodity, there are some common features which result in free trade between member states, a common system of protection against non-member countries and a common price and income policy internally. The common price policy relies, basically, on a "variable-levy" system of protection which is applied to all commodity groups included in this study.²

The calculation of the "variable levies" to be applied on imports from non-EEC countries involves three steps: (1) a "target" or "indicative price" is determined and is a theoretical price towards which the common market price should tend;³ (2) a "threshold price" is fixed at which imports from non-member countries can enter the EEC and which is lower than the target price by the transportation cost from the port of entry;⁴ and

(3) the "import levy" is computed on a daily basis as the difference between the threshold price for a commodity and the world price.

Along with the variable levies, "intervention prices" are employed to ensure that a satisfactory level of prices is achieved in the EEC. The intervention price is between 90-95 percent of the target price and constitutes a guaranteed price at which government agencies will undertake support buying if the market price shows a tendency to fall below the intervention price. In conclusion, the CAP keeps market prices within two limits; the upper limit is the threshold price and the lower limit is the intervention price. If excess demand or rising costs in the market for an agricultural commodity tend to raise the market price above the threshold price, then imports from extra-EEC sources enter the community to fill the gap in demand. If an excess supply causes the market price to fall below the intervention price, the EEC Commission will have to enter the market and support the price.

One effect of the adoption of the CAP has been to raise internal producer prices (threshold prices) above world market (or import) prices, which approximates the degree of import protection in the EEC. The degree of protection has been particularly high in the case of butter, milk, cheese, poultry meat, wheat, oats and rye [7, 8, 9]. In addition to resulting in higher prices for farm products and a higher degree of protection, the adoption of the CAP has stimulated domestic production. As a result the overall degree of self-sufficiency has increased for most agricultural commodities and growing surpluses have accumulated for grains, dairy products and sugar. The increase in agricultural self-sufficiency, the rise in the degree of import protection and the removal of nearly all trade barriers between member nations

has reduced net import requirements of temperate zone goods from non-members, while the growing surpluses of several commodities and the policy of export restitutions has stimulated agricultural exports.

GENERAL MODEL SPECIFICATION

The agricultural sector in the EEC can be disaggregated into several commodity groups for which sub-models are established. The estimated model includes five commodity groups selected on the basis of data availability, and the fact that all are covered by the variable-levy protection system.⁵

Each commodity sub-model includes a domestic supply equation, a market demand equation, a change in stocks equation (where applicable), an export to non-EEC countries equation, and an intra-EEC import equation. Specification of these relationships is explained below.

Domestic Production

The theory underlying the domestic supply side is the traditional agricultural response to price. The quantity of domestic production in a particular year is primarily the result of farmer's production decisions and available technology. Lack of data for the EEC on some inputs (e.g. labor employed in each product category) prevented the use of the production function approach. Production out of domestic sources in period t is a function of the product price (P_t), input prices (INP_t), such as the price of feedstuffs, and selected inputs (IN_t), like the total livestock numbers in EEC. Thus, the supply function is specified as

$$(1) \quad Q_t = f_1 (P_t, INP_t, IN_t)$$

Prices of the various commodities are treated as exogenously determined, since they are fixed each year by decisions made by the EEC Commission.

Domestic Demand

Economic theory suggests that quantity demanded per capita is a function of the income level and the price of the commodity. Thus the per capita market demand equation is specified as

$$(2) \text{PCC}_t = f_2 (\text{YP}_t, P_t)$$

where YP_t is the real EEC per capita GNP, and P_t is the product price.

Change in Stocks

Changes in stocks are expected to be a function of current prices, and a general shift variable such as the level of commodity consumption. Consequently, the specification of the function of changes in stocks is

$$(3) \text{DST}_t = f_3 (C_t, P_t)$$

where C_t is the level of demand at time t , and P_t is the price. A change in stocks equation is included only in the case of butter, since changes in stocks for the remaining products were negligible.

Exports and Intra-EEC Imports

Imports represent an additional source of agricultural supply, while exports constitute another component of the demand for agricultural products. Consequently, exports are specified as a function of a time trend (TIME), and the product price

$$(4) X_t = f_4 (\text{TIME}, P_t)$$

and intra-EEC imports are treated as a function of real per capita GNP (YP_t), and price

$$(5) \text{ECM}_t = f_5 (\text{YP}_t, P_t)$$

An identity that defines imports from non-EEC sources completes the model

$$(6) M_t = \text{PCC}_t \times \text{POP}_t - Q_t + \text{DST}_t + X_t - \text{ECM}_t$$

where POP_t is total population in the EEC.

The model specified above was estimated by three-stage least squares using annual data from 1953-72. The estimated equations, the identities and variable definitions are presented in Table 1.

MODEL VALIDATION AND PREDICTION

An extensive number of validation measures were calculated to evaluate the efficacy of the model as a predictive device within the sample period. Values for key validation measures are presented in Table 2. The comparatively low Root Mean Square Errors for all equations suggest that the model would reproduce sample data with a high degree of accuracy. The Theil coefficients were near zero except for the intra-EEC imports of milk and butter. The correlations between actual and predicted values were high for all equations of the model predicting also a high proportion of turning points (except the equations for the per capita consumption of butter and the intra-EEC imports of eggs) over the period 1953-72.

THE EFFECT OF THE CAP

In order to obtain an approximate order of magnitude of the quantitative effects of the CAP, the estimated model was used to derive for the years 1968-72 (the period when the single market stage of the CAP was in operation), the value of total EEC imports (TM), imports from intra-EEC (ECM) and from non-EEC sources (M) under free-trade conditions. The free-trade ideal situation was approximated by equating domestic prices in the Common Market to world prices (Table 3). By comparing the difference between the hypothetical import figures (e.g. \hat{M}) under free-trade, and the actual (observed) values, one can make use of the classification scheme of the effects of integration proposed by the EFTA Secretariat.

TABLE 1: THREE-STAGE LEAST-SQUARES ESTIMATE OF THE COMMON
MARKET AGRICULTURE MODEL (1953-72) AND LIST OF VARIABLES

(standard errors in parentheses)

I. Meat

$$(I.1) \text{ AQ}_t = -1463.63 + 29.45 \text{ LIVE}_t - 138.41 \text{ AP5}_t + 26.27 \text{ AP1}_t - 35.12 \text{ AP3}_t$$

(639.17) (1.76) (108.03) (2.99) (7.31)

$$(I.2) \text{ PCAC}_t = 208.5 + 369.80 \text{ YP}_t - .040 \text{ AP1}_t - 1.29 \text{ AP3}_t$$

(11.74) (9.47) (.095) (.153)

$$(I.3) \text{ AX}_t = 195.20 + 7.72 \text{ TIME} - .829 \text{ AP9}_t$$

(44.68) (2.09) (.606)

$$(I.4) \text{ AECM}_t = -526.92 + 819.99 \text{ YP}_t + 2.23 \text{ AP1}_t - 5.54 \text{ AP3}_t$$

(108.55) (87.44) (.867) (1.44)

$$(I.5) \text{ AM}_t = \text{PCAC}_t \times \text{POP}_t - \text{AQ}_t + \text{AX}_t - \text{AECM}_t$$

where:

- AQ = EEC meat production at time t (1000 m.t.)
- PCAC = EEC meat consumption per capita
- AX = EEC meat exports to non-EEC countries (1000 m.t.)
- AECM = intra-EEC meat imports (1000 m.t.)
- AM = extra-EEC meat imports (1000 m.t.)
- LIVE = total livestock numbers in the EEC (million heads)
- YP = real GNP per capita in the EEC
- TIME = t = (0,1,2,...,n)
- AP5 = price of feedstuffs at time t in the EEC (cents/kgr)
- AP1 = wholesale beef price at time t in the EEC (cents/kgr)
- AP3 = wholesale pigmeat price at time t in the EEC (cents/kgr)
- AP9 = average wholesale meat price at time t in the EEC (cents/kgr)

II. Milk

$$(II.1) \text{ LQ}_t = -53844.80 + 5325.86 \text{ COW}_t - 24.19 \text{ AP5}_t + 825.22 \text{ LP2}_t$$

(6539.66) (409.94) (643.68) (193.53)

$$(II.2) \text{ PCLC}_t = 2934.26 + 975.01 \text{ YP}_t - 47.49 \text{ LP2}_t$$

(101.82) (106.58) (12.23)

$$(II.3) \text{ LX}_t = 126.30 + 31.32 \text{ TIME} + 9.19 \text{ LP2}_t$$

(62.51) (3.32) (7.05)

$$(II.4) \text{ LECM}_t = -978.49 + 338.001 \text{ YP}_t + 69.85 \text{ LP2}_t$$

(90.47) (95.36) (10.99)

$$(II.5) \text{ LM}_t = \text{PCLC}_t \times \text{POP}_t - \text{LQ}_t + \text{LX}_t - \text{LECM}_t$$

where:

- LQ = EEC milk production (1000 m.t.)
- PCLC = EEC milk consumption per capita
- LX = EEC milk exports to non-EEC countries
- LECM = intra-EEC milk imports
- LM = extra-EEC milk imports
- COW = total EEC number of cows at time t (million heads)
- LP2 = producer fluid milk price in the EEC (cents/kgr)

(continued)

III. Butter

production (III.1)
$$UQ_t = -106.97 + 598.9 UP1_t - 28.88 LP1_t + 56.59 TIME$$

 (256.81) (142.3) (10.78) (5.65)

consumption per capita (III.2)
$$PCUC_t = 66.24 + 24.64 YP_t - .226 UP2_t$$

 (8.81) (4.63) (.062)

change in stocks (III.3)
$$DUST_t = 1026.22 - .252 UC_t - 456.4 UP1_t$$

 (120.06) (.040) (56.6)

exports to non-EEC countries (III.4)
$$UX_t = 339.02 + .087 UOWQ_{t-1} - 242.59 UP1_t$$

 (61.34) (.049) (32.39)

intra-EEC imports (III.5)
$$UECM_t = -134.37 + 75.59 YP_t + .387 UP2_t$$

 (29.05) (14.50) (.222)

extra-EEC imports (III.6)
$$UM_t = PCUC_t \times POP_t - UQ_t + DUST_t + UX_t - UECM_t$$

where:

UP1 = EEC producer butter price
 UP2 = EEC wholesale butter price

LP1 = EEC producer milk price
 UOWQ₋₁ = butter production in other CECD countries at time t-1

IV. Cheese

production (IV.1)
$$CQ_t = 627.49 + 5.13 CP5_t + 48.02 TIME$$

 (38.95) (.695) (2.86)

consumption per capita (IV.2)
$$PCCC_t = 9.93 + 46.81 YP_t + .186 CP5_t$$

 (2.44) (3.65) (.050)

exports to non-EEC countries (IV.3)
$$CX_t = 29.16 + 2.12 TIME + .426 CP5_t$$

 (6.71) (.465) (.112)

intra-EEC imports (IV.4)
$$CECM_t = -144.21 + 97.77 YP_t + 1.64 CP5_t$$

 (7.66) (10.96) (.149)

extra-EEC imports (IV.5)
$$CM_t = PCCC_t \times POP_t - CQ_t + CX_t - CECM_t$$

where:

CP5 = EEC producer cheese price

V. Eggs

production (V.1)
$$EQ_t = 959.53 + 6.13 CHIC_t - 14.96 EP1_t$$

 (634.19) (.841) (5.04)

consumption per capita (V.2)
$$PCEC_t = 111.78 + 35.49 YP_t - .517 EP2_t$$

 (9.95) (3.27) (.091)

exports to non-EEC countries (V.3)
$$EX_t = 10.41 + .764 TIME - .032 EP2_t$$

 (11.39) (.261) (.133)

intra-EEC imports (V.4)
$$EECM_t = 347.40 - 19.26 YP_t - 2.31 EP2_t$$

 (70.10) (24.27) (.628)

extra-EEC imports (V.5)
$$EM_t = PCEC_t \times POP_t - EQ_t + EX_t - EECM_t$$

where:

EP1 = EEC producer egg price
 CHIC = number of live poultry in the EEC
 EP2 = EEC wholesale egg price

Table 2.--Validation of Three Stage Least Squares Model

Equation Variable	Root Mean ^a Square Error	Correlation Between Actual and Predicted	New Theil ^b Coefficient
AQ	289.9	.99	.027
PCAC	0.0007	.99	.011
AECM	67.7	.98	.123
LQ	1620.3	.98	.023
PCLC	0.01	.90	.028
LECM	100.3	.95	.028
UQ	52.4	.97	.047
PCUC	0.0006	.69	.097
UECM	17.9	.88	.308
CQ	34.4	.99	.021
PCCC	0.0002	.99	.027
CECM	8.5	.99	.053
EQ	108.5	.97	.053
PCEC	0.0004	.95	.038
EECM	36.7	.36	.239

^aThe figures are expressed in 1000 metric tons except PCAC, PCLC, PCUC, PCCC, PCEC which are in 1000 metric tons per person.

$$b \sqrt{\frac{\sum (P_i - A_i)^2}{\sum A_i^2}}$$

The results of Table 3 lead to the following conclusions:

(a) trade diversion, where intra-EEC imports increase due to a shift from low-cost producers outside the European Community to higher-cost producers within the Community, was the common experience of all commodity groups under consideration; and (b) the extent of diversion of trade from non-EEC sources was particularly severe in the case of milk and butter, as recent estimates of the degree of CAP protection have suggested [9].

The above evidence suggests that the adoption of the CAP has affected the pattern of farm trade flows between the Common Market and the rest of the world. A qualification that must be kept in mind is a crucial assumption of our methodology, that existing world prices would have prevailed even under free-trade conditions for agricultural products.

TABLE 3: Estimates of Trade Diversion in the EEC as Compared
to Free Trade (1000 metric tons)

Commodity	Year	Total Imports			Intra-EEC Imports			Non-EEC Imports			
		TM	\hat{TM}	$TM - \hat{TM}^1$	ECM	\hat{ECM}	$ECM - \hat{ECM}$	M	\hat{M}	$M - \hat{M}$	
Meat	68	1381	2219	-838	708	773	-65	673	1446	-773	TD ²
	69	1576	2283	-707	768	859	-91	808	1424	-616	TD
	70	1702	2860	-1158	906	909	-3	796	1951	-1155	TD
	71	1840	3246	-1406	1033	964	69	807	2282	-1475	TD
	72	2258	4163	-1905	1123	997	126	1135	3166	-2031	TD
Milk	68	564	7204	-6640	531	239	292	33	6965	-6932	TD
	69	737	7756	-7019	699	276	423	38	7480	-7442	TD
	70	690	13302	-12612	659	337	322	31	12965	-12934	TD
	71	831	11636	-10805	800	444	356	31	11192	-11161	TD
	72	1214	13644	-12430	1195	519	676	19	13125	-13106	TD
Butter	68	83	938	-855	66	33	33	17	905	-888	TD
	69	76	986	-910	69	41	28	7	945	-938	TD
	70	146	977	-831	142	49	93	4	928	-924	TD
	71	130	708	-578	117	65	52	13	643	-630	TD
	72	128	718	-590	119	73	46	9	645	-636	TD
Cheese	68	271	317	-46	191	186	5	80	131	-51	TD
	69	292	380	-88	223	201	22	69	179	-110	TD
	70	328	415	-87	244	213	31	84	202	-118	TD
	71	360	412	-52	282	245	37	78	167	-89	TD
	72	390	421	-31	310	273	37	80	148	-68	TD
Eggs	68	156	195	-39	116	195	-79	40	0	40	NE ²
	69	183	203	-20	151	203	-52	32	0	32	NE
	70	197	202	-5	179	202	-23	18	0	18	NE
	71	209	290	-81	187	194	-7	22	96	-74	TD
	72	218	515	-297	197	182	15	21	333	-312	TD

¹ \hat{TM} , \hat{ECM} , and \hat{M} are imports estimated under world prices. TM, ECM and M are actual imports.

²TD denotes trade diversion, and NE, no integration effect.

FOOTNOTES

* Emilio Pagoulatos is Associate Professor of Economics and Research Associate of the Center for International Studies of the University of Missouri-St. Louis; David Debertin and Angelos Pagoulatos are, respectively, Associate and Assistant Professor of Agricultural Economics at the University of Kentucky. Financial support from the Kentucky Agricultural Experiment Station and the Center for International Studies of the University of Missouri-St. Louis is gratefully acknowledged.

¹ Prior to the formation of the European Community, the six original members had engaged in different policies directed toward protection of the farm sector through price supports, subsidy measures and import controls. The adoption of the C.A.P. was largely an attempt to eliminate the diversity of pre-EEC farm support systems of the individual members and still preserve their protectionist nature. Furthermore, not all of the original six were equally protectionist. The Netherlands, for example, has traditionally had the least protected agriculture as compared to the other members.

² For a detailed discussion of the set of policy measures and the institutional arrangements of the CAP, see [3, 5, 7].

³ These prices are known as "target (or indicative) prices" for cereals and milk; "basic prices" for pigmeat; and "guide prices" for beef and veal.

⁴ "Threshold prices" are minimum duty-paid import prices for cereals, dairy products and beef and veal; and are known as "sluicgate prices" for pigmeat, poultry, meat and eggs.

⁵ The individual products included in this study are: meat, milk, butter, cheese and eggs. Data sources are [6, 12].

REFERENCES

- [1] Carney, M.K., "Agricultural Trade Intensity: The European Markets and the U.S.", *American Journal of Agricultural Economics*, 55 (November 1973): 637-640.
- [2] E.F.T.A. Secretariat, *The Trade Effects of EFTA and the EEC: 1959-67*, Geneva: E.F.T.A., 1972.
- [3] Hudson, J.F., *The Common Agricultural Policy of the European Community*, Foreign Agricultural Service M-255, U.S.D.A., Washington, D.C.: November, 1973.
- [4] Knox, F., *The Common Market and World Agriculture: Trade Patterns in Temperate Zone Foodstuffs*, New York: Praeger Publishers, 1972.
- [5] Marsh, J. and C. Ritson, *Agricultural Policy and the Common Market*, London: P.E.P., Chatham House, 1971.
- [6] O.E.C.D., *Food Consumption Statistics*, Paris: O.E.C.D. (various issues)
- [7] O.E.C.D., *Agricultural Policy of the European Economic Community*, Paris: O.E.C.D., 1974.
- [8] Pagoulatos, E., "The Effect of E.E.C.'s Common Agricultural Policy on United States Farm Exports: An Empirical Estimate", *Rivista Internazionale di Scienze Economiche e Commerciali*, 24 (March 1977): 220-231.
- [9] Sampson, G.P. and A.J. Yeats, "An Evaluation of the Common Agricultural Policy as a Barrier Facing Agricultural Exports to the European Economic Community", *American Journal of Agricultural Economics*, 59 (February, 1977): 99-106.
- [10] Sorenson, V.L. and D.E. Hathaway, *The Grain-Livestock Economy and Trade Patterns of the EEC*, Michigan State University, Research Report No. 5, 1968.

- [11] Thorbecke, E. and E. Pagoulatos, "The Effects of European Economic Integration on Agriculture" in Bela Balassa, (ed.) *European Economic Integration*, Amsterdam: North-Holland, 1975.
- [12] U.N., F.A.O., *Monthly Bulletin of Agricultural Economics and Statistics*, Rome: F.A.O. (various issues).