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MODIFIED PRICE, PRODUCTION AND INCOME IMPACTS OF FOOD AID UNDER MARKET DIFFERENTIATED DISTRIBUTION

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16. Abstract:

Estimation of negative production impacts of food aid rests heavily on measurement of resulting price changes. Previous studies assumed an exogenous shift in supply resulting from distribution of imported commodities but ignored the income effect on demand. Distribution of food aid commodities to consumers at concessional prices provides an increase in real income and corresponding shift in demand for food. The shift in demand compensates for part of the exogenous shift in supply, reducing the price impact on domestic prices. Based on market differentiation, the production impact in India is estimated at one tenth of previous estimates. For policy formulation and application, this analysis concludes that the negative impact of P.L. 480 on domestic prices and supply can be reduced if the commodities are distributed in a way that creates new demand rather than competing with the existing demand. Distribution through fair price shops in India has increased consumption by 92 percent of the amount imported. Since such distribution is at a lower price than the open market price, distribution through these shops has increased consumer welfare by increasing consumption and lowering price. The distribution of P.L. 480 commodities has depressed domestic prices in the open market by only two hundredths of 1 percent.

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Modified Price, Production, and Income Impacts of Food Aid Under Market Differentiated Distribution*

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Estimation of negative production impacts of food aid rests heavily on measurement of resulting price changes. Previous studies have assumed an exogenous shift in supply resulting from distribution of the imported commodities but have ignored the income effect on demand. Distribution of food aid commodities to consumers at concessional prices provides an increase in real income and corresponding shift in demand for food. The shift in demand compensates for part of the exogenous shift in supply, reducing the potential impact on domestic prices. Based on market differentiation, the production impact in India is estimated at one tenth of previous estimates.

FOOD aid financed under P.L. 480 has helped to bridge the food gap in recipient countries for a decade and a half. For countries in early developmental stages, it has helped meet expanded consumer demand. As Witt and Eicher [18] indicate, it has helped avoid alternative measures such as (a) higher prices and/or rationing to adjust use to existing food supplies, or (b) use of more foreign exchange for purchase of imported foods.

Serious questions have been raised, however, about potential negative impacts of food aid on recipient countries. Schultz [16] expressed apprehension about price disincentive effects of food aid on agricultural production in recipient countries. Others disagreed with him by either (a) denial of production responsiveness to price changes in developing countries, which rules out any disincentive effects [3, 8, 14], or (b) acceptance of production responsiveness but disagreement on the degree of such response. Fisher argues that Schultz and others have overstated the negative price effects of food aid by implicitly assuming (a) that the elasticity of domestic supply is zero and (b) a single market for imported and domestic commodities so that distribution of concessional imports substitutes directly for domestic demand [5]. In the face of increasing evidence to the contrary, the proposition that production in developing countries is not price responsive has little basis [1, 2, 3, 4, 9, 10]. On the second count, there is evidence that markets for domestically produced commodities and for the same commodity supplied through imports are not perfectly homogeneous; hence, demand for domestic commodities is not directly substituted by imported foodgrains, particularly in India, which Schultz used as an illustration. Finally, Fisher argues that the negative impact of food aid can be reduced if it is distributed outside the market for domestic production so that distribution creates additional demand [5].

Estimation of negative production impacts resulting from surplus commodity distribution thus rests heavily on measurement of price changes and related production response. Only a few quantitative studies have been made to test the hypothesis put forth by Schultz. One such study by Mann [11] used an econometric model to test the price and production effects of P.L. 480 impacts on the Indian economy. Although his model confirmed a negative impact of food aid on prices and agricultural production in India, it contained only one demand equation. He implicitly assumed P.L. 480 import demand to be homogeneous with demand for domestic commodities and that P.L. 480 commodities enter the market in the same way as domestically produced commodities. However, as pointed out elsewhere [6, 12, 15, 17] P.L. 480 commodities enter the market in many countries through a concessional market. As will be discussed later in this paper, there is strong evidence that the distribution of food aid commodities through a concessional market provides for market differentiation and, in turn, expanded demand as a result of a real income effect of lower prices in the concessional market as compared to open market.

The availability of food to some consumers at a lower price represents an increase in real income to consumers in the aggregate and

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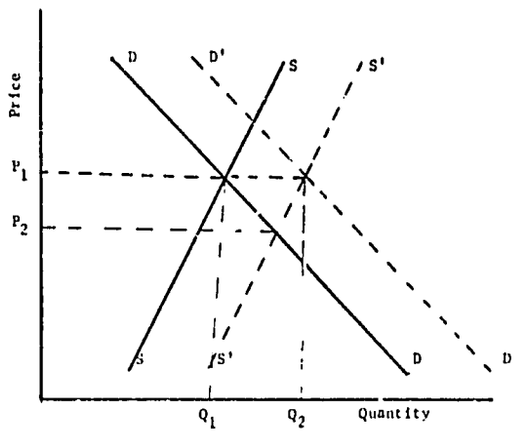

Figure 1. Aggregate food supply and demand equilibrium

implies a shift in the aggregate demand curve. In Figure 1, for example, P.L. 480 imports equal to Q_1Q_2 would depress prices from P_1 to P_2 without a demand shift. However, if demand shifts from D to D', due to the income effects of food aid, price is not depressed. This is a possibility that should be examined. Mann's study, in overlooking the presence of a differentiated market, overstated the negative price and production effect of food aid. For the same reasons, it likely underestimated the positive contribution of the aid.

Objectives, Data, and Framework

The objective of this paper is to develop a theoretical model to test Fisher's hypothesis; namely, that the negative effect of food aid on prices and production is much less (or could be absent) under a differentiated market situation. If Fisher's theoretical argument can be supported empirically, previous analytical work, which neglected the real income effect on demand, promises to have overestimated the negative impact of P.L. 480.

The data used in the analysis relate to India for 1956–67, but the framework is of wider interest because it can be used both to make improved estimates of the impact of aid on recipient countries which do have a differentiated market situation and as a guide for administering food aid to minimize negative price and production effects in recipient countries while maximizing beneficial effects.

The concept of market differentiation is incorporated into Mann's analytical framework by including an additional equation so that the system provides for cereal purchases on both the open market and the concessional market at lower prices. Incorporating a second "demand" equation and modifying various other equations in the basic Mann model brings stronger causal relationships and improves their reliability. The model is specified by defining several *a priori* functional relationships that are presumed to exist as indicated by economic theory.

Model for Analyzing P.L. 480 Impact Under Market Differentiation

The model includes a supply equation, an open market demand equation, a concessional market distribution equation,[1] an income equation, a commercial import equation, a withdrawal from stocks equation, and an excess demand equation. The reduced form of the system of seven equations provides estimates for the quantitative impact of P.L. 480 shipments of cereals distributed through a concessional market arrangement. Specification of these relationships is explained below.

Supply of cereals in the current period

The quantity available for consumption from domestic production in a particular year is primarily the result of production decisions, weather conditions, and available technology before and during the growing season. Supply from the domestic sources in period t is a function of production during the agricultural year $t-1$ (1970–71, July–June), and production, in turn, has been found to be a function of price in the preceding agricultural year (say, 1969–70).

[1] The concessional distribution equation represents demand under fixed price and controlled supply conditions, consequently, designated distribution rather than demand.

In developing countries which lack an effective market forecasting system, the cultivators' primary source of information is prices received for the previous crop. Thus, supply becomes a function of prices in period $t-2$. Rainfall in period $t-1$ (R_{t-1}) and cereal yield (T_{t-1}), as a proxy for technology, have a direct impact on production. T_{t-1} and R_{t-1} are used to account for the contribution of both factors to production.[2] The theoretical supply function thus is specified as

$$(1) \qquad Q_t^s = f_1(P^c_{t-2}, R_{t-1}, T_{t-1})$$

where

Q_t^s = per capita quantity of cereals available from domestic production for consumption in period t,

P^c_{t-2} = a deflated index of wholesale prices of cereals in the period before production,

R_{t-1} = a rainfall index as a proxy for weather conditions during the producing season, and

T_{t-1} = cereal yield as a proxy for other factors affecting adoption of technology.

Open market demand for cereal

Economic theory states that quantity demanded per capita is a function of the price of the commodity itself, the price of related commodities, and income level. Thus, the open market demand equation is specified as:

$$(2) \qquad Q_t^d = f_2(P_t^c, P_t^r, Y_t)$$

where

Q_t^d = per capita quantity of cereals demanded in the open market for consumption in period t,

P_t^c = the index of deflated wholesale prices of cereal in the period t,[3]

P_t^r = the deflated price of noncereal foods in period t, and

Y_t = deflated per capita consumer income in period t.

Distribution from the concessional market

Distribution of P.L. 480 imports through the concessional market is a function of economic variables at the minimum level and, because of the fixed price offering, physical restraint at the upper level. Some consumers consider imported cereals an inferior commodity and continue to purchase cereals in the open market even when there is some price differential between open and concessional markets. As the two prices diverge, however, more and more consumers are willing to substitute imported cereals for domestic cereals. Consequently, the demand for cereals through the concessional market is a function of price at the concessional market itself, price of substitute cereals in the open market, and the income level of consumers. At the upper limit, price adjustment cannot serve as a balancing mechanism to equate demand with a limited supply because the price is fixed by the government and has been held relatively constant. Consequently, the upper limit on distribution through the fair price shops is the quantity that the government chooses to release for distribution. Since the primary source of commodities for distribution through the fair price shops has been P.L. 480 imports, the quantity of imports is entered in the concessional distribution equation as a proxy for the maximum quantity available for distribution.[4] The concessional distribution equation is specified as

$$(3) \qquad Q_t^c = f_3(P_t^p, P_t^c, Y_t, M_t^p)$$

where

Q_t^c = per capita quantity of cereals distributed through the concessional market in period t,

P_t^p = predetermined cereals price charged in the concessional market (deflated by a consumer price index) in period t,

[2] Although rainfall and yield would appear to create a problem of multicollinearity, the basic data indicate that the correlation between the two variables is only 0.10.

[3] Strictly speaking, the supply equation is formulated in terms of wholesale prices and the demand equation in terms of retail prices. But with an assumption about constant marketing margins, a demand function can be derived in terms of wholesale prices.

[4] M_t^p (per capita P.L. 480 imports in Kgs) and d_t^c (per capita issues from fair price shops in Kgs) are as follows for the years 1956-1967:

		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
M_t^p		5.23	6.70	4.85	7.53	10.03	5.27	6.37	8.60	10.73	12.46	16.81	12.23
d_t^c		0.39	7.52	9.61	12.19	11.40	8.99	9.64	11.17	18.24	20.70	28.22	25.76
M_t^p/d_t^c	100	7.45	89.09	50.47	61.77	87.89	58.17	66.07	76.99	58.66	60.19	59.69	47.47

Excluding 1956 (when P.L. 480 imports were very small), the correlation of these two series is 0.9219.

M_t^p = per capita quantity of concessional imports of cereal under P.L. 480 in period t.

Income

The economy usually is dominated by the agricultural sector in developing countries. Hence, agricultural output constitutes a very large portion of national income, and fluctuations in this output have a significant impact on aggregate income. The sector that is second in importance in the Indian economy is industry. The third major income source in India is government expenditure, particularly through the involvement of the government in financing development investments. Thus, the income equation is specified as

$$(4) \qquad Y_t = f_4(Q_t^a, Q_t^i, G_t)$$

where

Q_t^a = the value of per capita industrial output (deflated by the consumer price index),
G_t = deflated per capita government expenditure in period t.

Commercial imports

Commercial imports of cereals in India serve as a government policy investment to relieve inflationary pressure on food prices when and where domestic food shortages occur. In this role, the government imports food to satisfy consumer demand, and commercial import of cereals are effectively a function of the same factors that determine the demand for cereals in the open market. The commercial import equation is specified as

$$(5) \qquad M_t^c = f_5(P_t^c, P_t^r, Y_t)$$

where

M_t^c = per capita quantity of commercial import of cereals in period t.

Withdrawal from government stocks

Withdrawal from government stock provides a residual source of cereals to balance other government programs. As the government increases internal procurement of domestic cereals to support prices, the need for net withdrawals to control inflation of cereal prices and to satisfy other government demand (such as feeding military personnel and inhabitants of public institutions) decreases. In the opposite direction, as the government increases the availability of cereals for distribution through the concessional market, withdrawals from government stocks must increase if other sources of supply remain constant. Finally, commercial and concessional imports are alternative sources for satisfying government demand for various programs so that withdrawals from the government stock are a function of the level of import activities. The withdrawal equation is defined as

$$(6) \qquad W_t = f_6(Q_t^s, M_t^c, M_t^p, C_t^p)$$

where

W_t = per capita net withdrawals of cereals from government stocks in period t,
C_t^p = per capita internal procurement of cereals by the government in period t.

Market clearing

The last equation is a market identity equation to close the system by forcing excess demand for cereals to be equal to zero and is specified as

$$(7) \qquad Q_t^d + Q_t^s - Q_t^a - M_t^p - M_t^c - W_t = 0.$$

The model consists of seven equations and 16 variables. Since the purpose of this model is to evaluate the economic impact of P.L. 480 imports on prices and domestic supply of cereals, certain variables are treated as predetermined or given outside the system. The predetermined or exogenous variables include T_{t-1}, R_{t-1}, P_t^r, P_t^p, C_t^p, M_t^p, G_t, P_{t-2}^r, and Q_t^i. The values for these variables are given at a particular point in time and are not subject to determination by the econometric model. Seven variables, including Q_t^a, Q_t^d, Q_t^s, P_t^c, Y_t, M_t^c, and W_t, are classified as endogenous.

Empirical Results

The seven structural equations provide the joint interactions of the variables in the system. To provide for independent examination and analysis of the jointly determined variables, the system is solved to obtain the reduced form in which each endogenous variable is uniquely defined as a function of the exogenous variables and the constraints of the system in the derived reduced form.

Equations 2 through 6 are overidentified [7]. Under conditions of overidentification, the two stage least squares method of regression provides consistent estimates of coefficients of the structural form. With estimates of the coeffi-

cients for the endogenous variables (β's) and the predetermined variables (Γ's), the reduced form coefficients can be derived as

$$\hat{\pi} = \hat{\beta}^{-1}\hat{\Gamma} \tag{8}$$

where

$\hat{\pi}$ = the matrix of estimated reduced form coefficients,

$\hat{\beta}$ = the matrix of estimated coefficients of endogenous variables, and

$\hat{\Gamma}$ = the matrix of estimated coefficients of predetermined variables.

The structural equations of models have been estimated by using data from the Indian economy during 1956-67 and collected from a number of published sources. Except for equation (1), two stage least squares method was used to estimate coefficients for the structural equations. Because equation (1) contains no endogenous variables as independent variables, ordinary least squares were used to estimate the associated coefficients. The estimated coefficients for the structural equations are presented in Table 1. The variables are as defined earlier. Signs of nearly all coefficients for the estimated equations agree with economic theory.

The supply equation has positive signs for all three independent variables, indicating that the supply of cereals (Q_t^s) reacts positively to increases in the weather variables (R_{t-1}), the proxy for technology (T_{t-1}), and price (P^c_{t-2}). The estimated price elasticity of supply at the mean is 0.156, which compares with National Council of Applied Economic Research estimates of 0.22 for rice, 0.16 for wheat, and 0.16 for barley [13].

The open market demand equation has signs on all coefficients that agree with economic theory, indicating that demand for cereals (Q_t^d) is positively correlated with price of other food (P_t^f) and changes in income (Y_t).[5] The estimated price elasticity of demand is -0.39, slightly higher than the National Council's estimate of -0.34.

The concessional market distribution equation indicates that Q_t^c is positively correlated with the price of cereals in the open market (P_t^c) and negatively correlated with income level (Y_t) and the price of cereals at the fair price shops (P_t^p).[6] The relatively large coefficient on M_t^p supports the arguments that distribution through the concessional market is highly correlated with imports under P.L. 480 and associated decisions to make these commodities available for distribution through the fair price shops.

The income equation indicates that an increase in (Y_t) is positively correlated with agricultural (Q_t^a) and industrial supply (Q_t^i) but negatively correlated with government expenditure (G_t). The sign on government expenditure is not in conformity with the logic of economic theory. In examining the correlation matrix (Table 2) for the variables in the equation, it was noted that government expenditure has been positively correlated with both aggregate income and per capita income but negatively correlated with the deflated or

Table 1. Two stage least squares estimates of structural equations

Equation number	Estimated equation
1[a]	$Q_t^s = -13.89343 + 0.69118\,T_{t-1} + 0.56808\,R_{t-1}$ (0.02665) (0.12615) $+ 0.24424\,P^c_{t-2}$ (0.31964)
2	$Q_t^d = -10.54661 - 0.553321\,P_t^f + 0.72847\,Y_t$ (0.34411) (0.14954) $+ 0.047698\,P_t^f$ (0.28149)
3	$Q_t^c = 60.91986 + 0.209881\,P_t^c - 0.251656\,Y_t$ (0.23572) (0.09075) $- 0.22217\,P_t^p + 0.89376\,M_t^p$ (0.14373) (0.389855)
4	$Y_t = 118,91530 + 0.80042\,Q_t^a + 0.28586\,Q_t^i$ (0.39448) (0.25924) $- 0.00092\,G_t$ (0.00089)
5	$M_t^o = 27.84066 + 0.09045\,P_t^c - 0.14698\,Y_t$ (0.10881) (0.04729) $+ 0.03172\,P_t^f$ (0.08901)
6	$W_t = 1.52758 + 0.97393\,Q_t^c - 0.53602\,M_t^o$ (0.17889) (0.39028) $- 1.62118\,C_t^p - 0.89938\,M_t^p$ (0.47693) (0.22458)

Asymptotic standard errors are given in parentheses below the estimated coefficients.

[a] Coefficients estimated by ordinary least squares.

[5] An alternative formulation of the open market demand equation was considered which included the price charged at the fair price shops, but the regression coefficient was insignificant even at low levels. Consequently, the concessional price was excluded from the final equation.

[6] An alternative formulation of the concessional distribution equation included price of other food, but the regression coefficient was insignificant even at low levels and caused the ratio of regression sum of squares to residual sum of squares to decrease.

Table 2. Correlation coefficients for government expenditure and income

	Government expenditure	Deflated government expenditure
Aggregate income	0.9625	0.7633
Per capita income	0.9515	0.7483
Deflated per capita income	−0.5568	−0.2228

real income. If the sign is opposite for per capita income and per capita income divided by price, price level must be increasing faster than per capita income to make real per capita income decline. This is interpreted to mean that although government expenditure has caused an increase in money incomes, it has also caused prices to rise enough to force up the consumer price index faster than money income with a negative impact on real income for the period under study.

The commercial import equation indicates that imports vary inversely with per capita income level (Y_t) and directly with prices of cereals (P_t^c) and other food (P_t^r).[7] This further supports the contention that imported cereals are substitutes for domestic food and not complements. The stock equation indicates that withdrawals (W_t) are directly related to distribution through the fair price shops (Q_t^c) and inversely related to commercial imports (M_t^o), internal procurement (C_t^p), and P.L. 480 imports (M_t^p).[8]

The estimated reduced form coefficients (Table 3) of particular interest to this study are those associated with variable M_t^p or P.L. 480 imports. The coefficients or impact multipliers from the reduced form model indicate that increasing P.L. 480 imports by one kilogram per capita depresses cereal prices by 0.1314 unit ($\hat{\pi}_{47}$) of the price index, increases demand by 0.0727 kilogram per capita ($\hat{\pi}_{27}$), and increases concessional distribution by 0.8557 kilogram per capita ($\hat{\pi}_{37}$).[9] Consequently, 92.84 percent of the increase in P.L. 480 imports would result in increased consumption. As an example, data indicate that P.L. 480 imports for 1967 (4.055 million metric tons) increased consumption by 3.771 million metric tons or about 7.38 kilograms per capita for the year. Associated with a one kilogram per capita increase in P.L. 480 imports was a 0.0119 kilogram ($\hat{\pi}_{67}$) decrease in commercial imports and a 0.0597 kilogram ($\hat{\pi}_{77}$) withdrawal from government stocks. Due to the time lag in supply response, supply is unaffected in period t.

To measure the price impact in succeeding years, it is necessary to use a delay multiplier that equals $\hat{\pi}_{47}\hat{\pi}_{49}^{1P}$, where $P=0, 2, 4 \cdots$, because of a two-year lag between P_t^c and $P^c{}_{t-2}$ [11]. Therefore, the delay multiplier for cereal price is 0.020039 in the second year, −0.003056 in the fourth year, and 0.000466 in the sixth year. The first delay multiplier represents a change of less than three hundredths of 1 percent, using the mean values of the price index, and the multiplier values in the succeeding years are essentially zero.

The impact on supply (Table 4) is measured by the delay multiplier $\hat{\pi}_{19}\hat{\pi}_{47}\hat{\pi}_{49}^{1P-1}$, where $P=2, 4, 6 \cdots$, because of the time lag of price impact on production [11]. Evaluated at $P=2$ to measure the impact of a change in price during the period when P.L. 480 imports occur upon production two years later, the delay

[7] Alternative forms of the impact equation were considered which included concessional imports and the ratio of cereal prices to other food prices, but regression coefficients for both were insignificant even at low levels.

[8] Alternative forms of the withdrawal equation were considered which included consumer demand factors such as prices of cereals and other food and income levels, but none of the regressions of this nature produced ratios of regression to residual sum of squares which exceeded 1.0, and consequently were insignificant.

[9] The mean population of India for the period under consideration was 450.48 million, so that imports of one kilogram per capita involves 450,480 metric tons of cereal.

Table 3. Estimated reduced form coefficients to measure impact of P.L. 480 imports on the Indian economy, 1956–67

	Intercept	T_{t-1}	R_{t-1}	P_t^r	P_t^p	C_t^p	M_t^p	G_t	$P^c{}_{t-2}$	Q_t^c
Q_t^s	−13.8934	0.0912	0.5681	0.0	0.0	0.0	0.0	0.0	0.2442	0.0
Q_t^d	−5.9595	0.0847	0.5275	0.0168	0.6054	−1.5250	0.0727	0.0	0.2268	−0.0043
Q_t^c	7.2528	−0.0349	−0.2173	0.0162	−0.2250	0.7989	0.8557	−0.0001	−0.0934	0.0391
P_t^c	133.6264	−0.0569	−0.3547	0.5578	−0.0098	2.7561	−0.1314	−0.0012	−0.1525	0.3815
Y_t	107.7947	0.0730	0.4547	0.0	0.0	0.0	0.0	−0.0009	0.1955	0.2839
M_t^o	24.1866	−0.0158	−0.0985	−0.0368	−0.0009	0.2493	−0.0119	0.0	−0.0424	−0.0070
W_t	56.2758	−0.0256	−0.1593	−0.0038	−0.2189	−0.9754	−0.0597	−0.6001	−0.0685	0.0418

Table 4. Total effect of P.L. 480 imports on domestic production in India

Year	Delay multipliers	Cumulated multipliers
2	−0.032088	−0.032088
4	0.004893	−0.027195
6	−0.000746	−0.027941
8	0.000114	−0.027827
10	−0.000017	−0.027844
12	0.000003	−0.027841
14	—	−0.027841

multiplier is −0.032088. In other words, each ton per capita of cereals supplied through P.L. 480 to India depresses the domestic supply by 0.032088 ton per capita during the production season two years later. Similarly, at $P=4$ the multiplier is 0.004893 so that the impact of one ton of P.L. 480 cereals results in 0.004893 ton per capita of increased cereal production. At $P=6$, the multiplier is again negative at −0.000746. In quantity terms at the mean population of India for the period under consideration, P.L. 480 imports of one kilogram per capita (450,480 metric tons) of cereals are estimated to have depressed domestic production by 14,445 metric tons two years later, increased production by 2,204 metric tons four years later, and depressed production by 336 metric tons six years later.

The net impact on supply is most accurately measured by the cumulated multipliers over several years. Each kilogram of P.L. 480 cereals is estimated to have depressed production of cereals by 0.027841 kilogram so that for each 450,480 metric tons of imports production was depressed by 12,600 metric tons over a 14-year period, with the major impact coming as a result of the first and second round of price changes. Comparing the authors' estimated multipliers with Mann's (Fig. 2), the cumulative impact of distribution through a differentiated market is about one tenth the impact with a nondifferentiated market.

Summary

The model developed and evaluated in this paper differs uniquely from previous attempts to evaluate the impact of P.L. 480 imports on recipient economies. It explicitly incorporates variables to account for the case where P.L. 480 imports are distributed to consumers in a manner such that there is a shift in demand as well as a shift in total supply.[10] With the shift in demand as well as supply allowed, the impact of P.L. 480 on domestic supply is estimated to be less than 9 percent of the magnitude estimated by Mann [11], who assumed only a shift in supply. In contrast to a reduction in domestic supply of 143,200 metric tons as estimated by Mann, the revised cumulated multiplier derived in the current study implies a negative impact of only 12,600 metric tons on domestic supply over a 14-year period.

For policy formulation and application, the conclusion of this analysis indicates that the negative impact of P.L. 480 on domestic prices

[10] For a price elasticity of demand of −0.39 a decrease in price of 0.1314 implies a change in quantity demanded of 0.07227 kilogram per capita if adjustments were made along the demand curve as compared to the actual increase of 0.9284 kilogram per capita implying a shift in demand.

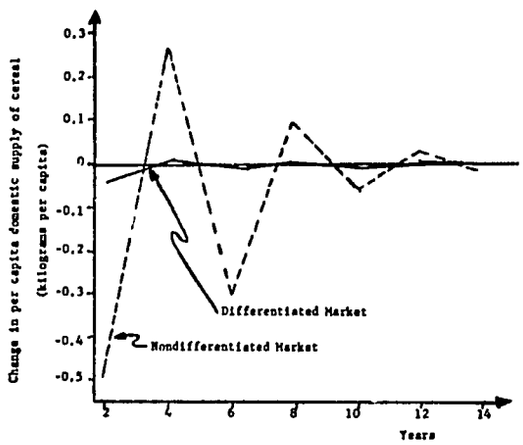

Figure 2. Multiperiod production impact of distributing P.L. 480 cereal (one kilogram per capita) under alternative market conditions

and supply can be significantly reduced if the commodities are distributed in the recipient economy in a way that creates new demand rather than substituting or competing with the existing demand. The analysis indicates that distribution through fair price shops in India has provided for increased consumption amounting to 93 percent of the amount imported. Since fair price shop distribution is at a lower price than the open market price, distribution through these shops has increased consumer welfare by increasing consumption and lowering price. At the same time, the distribution of P.L. 480 commodities has depressed domestic prices in the open market by only two hundredths of 1 percent. Thus, the analysis supports Fisher's theoretical hypothesis that distribution under a differentiated market situation will minimize price and production impacts of food aid and implies that previous studies have underestimated the net contribution of food aid to domestic supply because the income effect of distributing food aid at concessional prices has been ignored.

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