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Export Price Variability, Government Interventions and Producer Welfare: The Case of Egyptian Cotton

Abstract: This paper examines the effects of government interventions during 1965–91 on short-run price stability and long-run price incentives, as well as the further repercussions on producer income and welfare, for the main agricultural export crop (cotton) in Egypt. In contrast to most existing studies on agricultural pricing policies in developing countries that focus on either price stability or producer incentives as the central policy goal, the analysis considers the simultaneous effects of alternative policy regimes on those two objectives. In fact, what matters to risk-averse producers is not price variability *per se* but the variability of their income. The analysis finds that the pure stabilization benefit from government interventions is heavily dominated by the transfer benefit so that producer welfare is significantly improved in moving to either of the two counterfactual regimes of sectoral and economywide free trade.

INTRODUCTION

Government market interventions that create a wedge between domestic and foreign (or border) prices are often rationalized in terms of the need to reduce product-price variability for domestic producers in the face of uncertain and volatile world commodity prices.[1] For export crop producers in developing countries (LDCs), where capital markets are typically underdeveloped, domestic price stability can reduce the riskiness of income and promote consumption smoothing over time. Dampening world price fluctuations, however, is seldom unbiased; LDC governments have tended to reduce the peaks without raising prices in the troughs. This would explain, in part, the general empirical finding that government price interventions in developing countries have had the effect of reducing the average relative price of major agricultural products, especially of export crops (Krueger, Schiff and Valdés, 1988; and Bautista and Valdés, 1993).

It is useful to distinguish between government interventions that influence relative agricultural prices directly, that is, policies specifically aimed at the agricultural sector and indirectly, that is, those aimed at other production sectors (particularly, manufacturing) and macroeconomic policies that affect agricultural prices through the real exchange rate. They can be referred to simply as *direct* and *indirect* interventions. The actual (or historical) policy regime can then be compared with two counterfactual policy regimes: (a) sectoral free trade, in which there is an absence of direct interventions; and (b) economywide free trade, in which there is an absence of total (direct and indirect) interventions.

In this paper we examine the effects of government interventions in Egypt on the average level of producer prices of cotton, the country's most important export crop, and on their variability. Our approach is based on comparisons of historical (or actual) price data with the equilibrium values associated with the two hypothetical policy regimes of sectoral free trade and economywide free trade. In contrast to most existing studies that

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assume either short-run price stability or long-run price incentives as the central policy goal, our analysis considers the simultaneous effects of government interventions on these two policy objectives. We also make an assessment of the income effects, in terms of average income and income variability, and of the repercussions on producer welfare based on the methodology developed by Newbery and Stiglitz (1981). The paper ends with some concluding comments on the implications of our findings for agricultural pricing policy in Egypt.

PRICE EFFECTS OF GOVERNMENT INTERVENTIONS

Since the early 1960s when the cotton sector was nationalized in Egypt, direct intervention has consisted of government controls on area planted to various cotton varieties, determination of the amount and varieties for export and domestic use, and crop procurement at fixed producer prices. There were insignificant increases in cotton procurement prices during the 1960s. Procurement prices have increased measurably since 1974, the year when 'Infitah' or open-door policy was declared. However, the average farmgate price of cotton continued to be much lower than the border price at the official exchange rate (Dethier, 1989).

Even with the comprehensive policy liberalization programme initiated in 1986, in which many aspects of government control on agricultural production, marketing and prices were dismantled, cotton continued to be subject to fixed producer prices and crop procurement. While decontrol and liberalization of the cotton sector have been delayed, large increases in the procurement price began in 1989. More recently, the government has developed a Cotton Liberalization Implementation Plan that will establish a 'free-market system for cotton production and marketing'.

The terms of trade for cotton corresponding to the historical and sectoral free-trade regimes can be represented, respectively, by:

$$(1) \quad P_1 = P_h / P_{na} \text{ and } P_2 = P_{bo} / P_{na}$$

where P_h is the historical average procurement price of cotton, P_{bo} is the border price equivalent at the official exchange rate (E_o) and P_{na} is the non-agricultural price index. Since the entire cotton output is sold to the government during the period of analysis (1965–91), the farmgate (producer) price is equal to the procurement price. The weighted average of procurement prices for major cotton varieties is used here,[2] the weights based on the production of lint and waste (following Dethier, 1989, pp.50–52).

Domestic relative prices of tradable agricultural products are influenced not only by sector-specific policies but also — and more importantly and generally adversely (see Krueger *et al.*, 1988) — by economywide trade, fiscal, monetary, and nominal exchange rate policies. In Egypt, import restrictions to protect domestic industry and expansionary macroeconomic management have caused significant real exchange rate overvaluation, especially from 1979 until recently. The relative price of cotton under the policy regime of economywide free trade is given by:

$$(2) \quad P_3 = P_b^* / P_{na}^*$$

where P_b^* is the border price of cotton evaluated at the 'equilibrium' exchange rate (E^*), and P_{na}^* is the non-agricultural price index with the tradable goods component calculated at border prices using the equilibrium exchange rate. The equilibrium exchange rate is defined as the exchange rate that would have prevailed under conditions of unrestricted foreign trade and balance-of-payments equilibrium (that is, no unsustainable imbalance in the current account).

Table 1 *Relative Producer Price of Cotton under Alternative Policy Regimes,*
1965–91 (Egyptian pounds/tonne)

	Historical (P_1)	Sectoral free trade (P_2)	Economy wide free trade (P_3)
1965	196	292	422
1966	187	260	394
1967	199	374	394
1968	174	230	323
1969	173	255	372
1970	174	255	391
1971	174	256	418
1972	188	258	381
1973	182	477	450
1974	215	572	626
1975	221	493	589
1976	269	419	680
1977	265	519	829
1978	244	314	584
1979	298	618	744
1980	273	559	614
1981	329	546	726
1982	292	372	524
1983	320	388	576
1984	273	396	734
1985	301	367	845
1986	299	395	804
1987	305	340	736
1988	340	555	1301
1989	416	1212	2922
1990	465	1438	2063
1991	474	1269	1797

Source: Authors' calculations.

Notes: P_1 = Producer price of cotton deflated by P_{na}.

P_2 = Border price of cotton evaluated at official exchange rate deflated by P_{na}.

P_3 = Border price of cotton evaluated at equilibrium exchange rate deflated by P_{na}^*.

Base year for P_{na} and P_{na}^* is 1979.

The annual values of P_1, P_2 and P_3 are shown in Table 1, based on the annual estimates of Dethier (1989) for 1965–84 and of the authors for 1985–1991 using the Krueger *et al.* (1988) methodology. The upper part of Table 2 contains the average price levels and instability values. Our measure of price instability is the detrended standard deviation, representing the dispersion of observed annual values around the trend line. In terms of average price incentives, it is evident that domestic cotton producers would have been better off without the direct or total interventions of the government during 1965–91. Table 2 also indicates that the adverse incentive effects of both sector-specific and economywide policies had been quite significant.

Did government interventions result in a less unstable domestic price for cotton producers? It would appear from Table 2 that sectoral policies were highly price stabilizing; by contrast, indirect interventions served to reduce only slightly the variability of domestic cotton prices. Overall, government interventions did lead to a much lower price instability for Egyptian cotton, the relative product price under each of the two counterfactual free-trade regimes being about three and a half times more unstable than the historical price.

Clearly, there has been a trade-off between long-run (average) price incentives and short-run (inter-year) price variability. The Egyptian government has managed to reduce substantially the volatility of annual world cotton prices but at a cost of significantly lowering the price incentives for domestic cotton producers.

EFFECTS ON PRODUCER INCOME AND WELFARE

What matters to risk-averse producers is not the price variability *per se* but the variability of their income. The supply response to the price changes associated with each policy regime is therefore an important consideration. In view of interdependencies in the production of cotton, rice, wheat, and maize in Egypt (Dethier, 1989), it is necessary to make the comparisons of producer income and welfare under the three alternative policy regimes based on the simultaneous presence or absence of government interventions affecting all four crops. Thus, in the sectoral free-trade regime, the interpretation would be that direct interventions in all four crops are absent.

Supply parameter estimates derived in Dethier (1989, Appendix I) are used in calculating annual values of producer income (value added) during 1965–91 under each of the two free-trade regimes. The calculated average level and instability index for each policy scenario are given in the lower part of Table 2. It is notable that cotton producer income during 1965–91 would have been significantly higher without direct interventions. Also, the removal of total interventions would have more than doubled the historical average income. In terms of income instability, Table 2 shows that sectoral policies had been effective in dampening income fluctuations markedly, and that economywide policies had a significant income-destabilizing effect for cotton producers.

Turning now to the evaluation of the effect on producer welfare associated with a shift from the historical policy regime to either of the two counterfactual regimes, we assume a von Neumann–Morgenstern utility function of income $U(Y)$ for the representative cotton producer.[3] Let Y_i and Y_j denote the income variables corresponding to the prices P_i and P_j associated with any two alternative policy regimes. The means of Y_i and Y_j are $\overline{Y}_i$ and $\overline{Y}_j$, respectively, the standard deviations are σ_{yi} and σ_{yj}, respectively.

Table 2 *Average Levels and Instability Indexes of Relative Cotton Prices and Producer Incomes, 1965 –1991*

	Average level	Instability (percent)
Relative prices		
P_1	268	14.2
P_2	497	49.1
P_3	787	53.7
Producer incomes		
Y_1	2614	17.8
Y_2	4329	42.5
Y_3	6663	23.3

Source: Authors' calculations.

Notes: P_1, P_2 and P_3 as defined in the notes to Table 1.

Y_1 = Value added measured at actual domestic prices.

Y_2 = Value added measured at border prices at official exchange rate deflated by P_{na}.

Y_3 = Value added measured at border prices at equilibrium exchange rate deflated by P_{na}^*.

Prices are in Egyptian pounds/tonne. Income is in Egyptian pounds.

The monetary benefit to the producers of a change from Y_i to Y_j is given by B in the following equation:

$$(3) \quad EU(Y_i) = EU(Y_j - B)$$

where E is the expectation operator. As shown by Newbery and Stiglitz (1981, p.93), using a Taylor series approximation for Equation (3) leads to:

$$(4) \quad \frac{B}{Y} = \frac{\overline{Y}_j - \overline{Y}_i}{Y_i} - \frac{1}{2} r \, (\sigma_{yj}^2 - \sigma_{yi}^2)$$

where r is the Arrow–Pratt measure of relative risk aversion.

The first term in the right-hand side of Equation (4) represents the 'transfer benefit', indicating the increase (or decrease) in average income associated with the shift from one policy regime to another. Table 2 shows, for example, that policy reform toward freer trade during 1965–91 would have produced a positive transfer benefit for cotton producers. The second term represents the pure stabilization benefit, or 'risk premium', indicating the monetary gain (loss) from a reduction (increase) in income instability. The higher the degree of risk aversion the greater is the relative importance of the risk premium to the total producer benefit from a policy change.

Table 3 presents estimates of the transfer benefit, risk premium, and net benefit for cotton producers resulting from a hypothetical change from the historical policy regime during 1965–91 to each of the two counterfactual regimes of sectoral and economywide free trade. The three alternative values assumed for the coefficient of relative risk aversion, 1.0, 1.5, and 2.0, are deemed reasonable (Binswanger, 1980; and Newbery and Stiglitz, 1981). A striking observation from Table 3 is that the risk premium is consistently

dominated by the transfer benefit, so that producer welfare is improved in the policy shift toward either of the two free-trade regimes. The net benefit to cotton producers is quite substantial: removal of *direct* and *total* interventions will lead to increases in average income of more than 50 percent and 150 percent, respectively. Among the three alternative policy regimes, therefore, cotton producers would have gained the most from economywide free trade.

Table 3 *Calculated Producer Benefits, 1965–91 (percent)[a]*

	Transfer benefit	Risk premium	Net benefit
Sectoral free trade			
r=1.0	65.6	–7.5	58.1
r=1.5	65.6	–11.2	54.4
r=2.0	65.6	–14.9	50.7
Economy wide free trade			
r=1.0	154.9	–1.11	53.7
r=1.5	154.9	–1.71	53.1
r=2.0	154.9	–2.31	52.6

Source: Authors' calculations.
Notes: [a] Percentage of actual average income in 1965–91. r = coefficient of relative risk aversion.

CONCLUDING REMARKS

The results of our analysis indicate that cotton producers in Egypt have been penalized heavily by the distortionary price effects of sectoral policies, in particular the low procurement prices of cotton. Moreover, the economy wide policies adopted, including import protection to promote domestic industry and macroeconomic policies that overvalued the real exchange rate, exacerbated the incentive bias against cotton production.

On the other hand, government policies toward the cotton sector have been successful in reducing significantly the price variability for cotton producers. However, the amount of the risk premium (pure stabilization benefit) associated with the reduced income variability due to government interventions compared unfavourably with the negative transfer benefit resulting from the reduced average income for cotton producers. Our assessment, therefore, is that the removal of policy-induced biases against cotton production would have had a significantly positive effect on producer welfare.

These findings suggest to us that delays in implementing government plans to liberalize cotton production and marketing in Egypt will likely continue the welfare bias of sectoral policies against cotton producers. With respect to economywide policies, it is important that the recently initiated trade reforms toward lower tariff and non-tariff barriers (especially on highly protected manufactured products) be intensified and that prudent fiscal and monetary policies to strengthen the country's external account continue to be adopted. Among other things, this will reduce the degree of real exchange rate

overvaluation, benefiting not only producers of cotton and other export goods but also those of import-competing products in agriculture and the rest of the economy.

NOTES

[1]   According to Dethier (1989, p.41), 'stabilizing producer prices to insulate producers from instability in world prices has been a predominant objective of Egyptian agricultural policy'.
[2]   That the aggregation bias is not a significant problem in the use of a weighted average farmgate price in the present study is suggested by the more or less parallel movement of the procurement prices for the major cotton varieties during 1983–91.
[3]   In view of this, the distribution of producers' income and their differential aversion to risk are not taken into account in our analysis.

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DISCUSSION OPENING — Paul W. Heisey *(International Maize and Wheat Improvement Center, Mexico)*

This interesting and well-written paper measures the effects of both direct and indirect policy measures on the level and stability of both producer prices and producer incomes. My remarks are directed less to criticism of the paper than to possible future research avenues that might lead both to more precise definition of the problem and to greater policy relevance.

In one sense the choice of country and crop (Egyptian cotton) makes it almost inevitable that one would find evidence suggesting very high levels of discrimination against export-crop producers. In situations in which discrimination is less obvious, would there be need for even more precise measurement of the price and other policy variables used in the analysis? Are there situations in which stabilization and incentive objectives are less obviously in conflict, and could in fact be pursued simultaneously?

There are several methodological questions whose answers might be useful to researchers attempting to duplicate or extend such a study. First, are there commodities for which world prices themselves are so distorted that they might be less relevant as a basis for welfare analysis? Second, the historical policy regime was marked by three separate phases. Although data may not allow it, it would be interesting to see if policy effects on

levels and stability of price and income variables changed significantly from one historical regime to the next. Third, when regimes do change, how fast do producers adjust their expectations? The implicit assumption in the paper appears to be that they adjust immediately.

The paper adds to a very large body of literature demonstrating that governments in developing countries appear to discriminate systematically against agricultural producers. Presumed stability goals have only been partially met, and both prices and incomes are far below what they would have been in the absence of intervention. Given the analysis in the paper, the conclusions are not surprising. The authors suggest the Egyptian government should not delay, as it appears to be doing, further liberalization of the cotton market.

To give such conclusions greater policy relevance, further analysis might take a political economy perspective. Why did the government behave the way it did? Did it have objectives other than stabilization or producer incomes? Why has it started to change its policies? Are policy makers becoming more intelligent about how policies contribute to or detract from development goals? Do farmers now have a greater weight in the social welfare function? Or are policy makers' incentives now different from what they used to be? Finally, why has the government delayed its stated changes in policy?