EFFECT OF DECREASING GOVERNMENT INVOLVEMENT IN THE U.S. COTTON INDUSTRY

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Abstract

With the passage of the 1996 "FAIR" Act, government involvement in the U.S. cotton industry has been reduced. The recent loss of "Step 2" payments has further reduced the role of the government in this industry. The effect of this decreased involvement has been a reduction in cotton price.

Introduction

Traditionally, the U.S. government policy toward the cotton industry has been one of providing farmers and exporters with various types of support and protection. Government loan programs, crop insurance, target prices, direct payments to cotton producers, handlers, and users, surplus disposal programs, marketing and import quotas, export subsidies, and export credit programs are among the many policy tools used by government to protect the industry and shield farmers against foreign competition. Government programs have restricted cotton supplies, raised the price of cotton sold for domestic consumption, lowered the price of cotton sold to export markets, stabilized cotton domestic prices and farm incomes, and restored and/or maintained international competitiveness of U.S. cotton. Their cost to the government was often high (Eisa et al., 1993).

With the 1996 FAIR Act, the government moved toward a policy of less government intervention in the cotton market. Income support is no longer tied to acreage restrictions, giving farmers the ability to respond more directly to market signals. More recently, in December of 1998, funding for the "Step 2" consumption subsidy was eliminated, when the program reached its maximum allowance of $701 million for fiscal years 1996 through 2002. These policy changes coincided with a period of technical change in the cotton industry, brought about by the expansion of the Boll Weevil Eradication program and the increased use of Bt cotton.

The purpose of this study is to investigate the impact of these policy changes on U.S. cotton price. The specific policy alternatives analyzed here are: 1) elimination of Step 2 of the marketing loan program, and 2) implementation of current market-oriented policies. A partial equilibrium model describing the U.S. cotton market behavior was developed to analyze these policies.

Background

"Fair"

The history of U.S. government intervention in the cotton industry is well documented (Starbird et al., 1987; Stults et al., 1990; Eisa et al., 1993; Cunningham, 1996; and Salathe and Langley, 1996). The current farm legislation is embodied in the Federal Agriculture Improvement and Reform (FAIR) Act, commonly referred to as the "1996 Farm Bill." Under FAIR, the level of income support is no longer tied to market prices, as under the previous target-price program, but is instead based on seven annual, fixed and declining production flexibility contract payments (USDA). Price support is still provided to program participants through non-recourse loans.

Under FAIR, farmers have greater production flexibility than in previous programs. Paid land diversion, base acreage, and acreage reduction policies which restricted the amount of land that program-participating farmers could plant were eliminated.

"Step 2"

The volatility of the world cotton market in the late 1980's led U.S. policy makers to seek ways of stabilizing domestic prices and enhancing the competitiveness of U.S. cotton internationally. The 1990 farm legislation introduced "Step 2," which provided subsidies to domestic cotton users and exporters. Under Step 2, the government made payments, either in cash or redeemable marketing certificates, to domestic users and exporters if the U.S. Northern Europe price of cotton exceeds the adjusted world price by more than 1.25 cents per pound, for a period of 4 consecutive weeks, so long as the adjusted world price does not exceed 130 percent of the current crop year loan rate. The program was limited to a total of $701 million, over the period 1996 through 2002. This limit was reached in mid-December of 1998. While Step 2 was in effect, subsidies ranged from a low of $2.80 to a high of $71.50 per bale. (Step 2 was recently restored.)

Methods and Results

Effect of Eliminating Step 2

This study builds on a partial equilibrium model of the effects of an export subsidy, developed by Duffy and Wohlgenant (1991). This model involved a series of equations in log differential form, which were solved to find the impact of the subsidy on the endogenous variables. In their study, Duffy and Wohlgenant assumed, pre-subsidy, an equality of U.S. domestic and prevailing world market prices. In the present paper, we modify this assumption and account for transportation and other costs in the price of U.S. cotton on the international market. Changing this assumption is essential because the payment rate under Step 2 provisions is a function of the price of U.S. cotton in Northern Europe (not the domestic price) and the international price of cotton (defined as the average price of cotton in Northern Europe). We also include inventory demand, which was not included in the Duffy-Wohlgenant model.

The structural model is described by equations (1) through (5):

(1) Domestic demand:	$Q_d = f(P_d\text{-}S)$
(2a) Export demand:	$Q_x = g(P_w\text{-}S)$
(3) Inventory demand:	$Q_i = h(P_d)$
(4) Domestic supply:	$Q_s = j(P_f)$
(5) Market-clearing identity:	$Q = Q_s = Q_d + Q_x + Q_i$

where:

Q_d = domestic mill use;

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Q_x = quantity exported;
Q_i = ending inventory;
Q_s = domestic supply;
Q = equilibrium quantity;
P_d = domestic market price;
P_w = U.S. cotton price in Northern Europe;
P_f = supply-inducing price to which U.S. farmers respond;
S = subsidy rate under Step 2.

The U.S. price in Northern Europe P_w, can be thought of as the sum of the domestic price, transportation, and other costs T, incurred by moving cotton from the U.S. border to Northern Europe. In other words, the export demand equation can be re-specified as:

(2b) $Q_x = g(P_d+T-S)$.

Total differentiation of (1) through (5), where $Q_x = g(P_d+T-S)$, yields the following behavioral model:

(6) $dlnQ_d = \eta_{dd}dlnP_d-\eta_{ds}dlnS$
(7) $dlnQ_x = \eta_{xd}dlnP_d+\eta_{x\tau}dlnT-\eta_{xs}dlnS$
(8) $dlnQ_i = \eta_{id}dlnP_d$
(9) $dlnQ_s = \epsilon dlnP_d$
and
(10) $dlnQ = dlnQ_s = k_d dlnQ_d+k_x dlnQ_x+k_i dlnQ_i$

where:

$dlnQ_d$ = percentage change in domestic mill use;
$dlnQ_x$ = percentage change in quantity exported;
$dlnQ_i$ = percentage change in ending inventory;
$dlnQ_s$ = percentage change in domestic supply;
$dlnP_d$ = percentage change in domestic market price;
$dlnP_w$ = percentage change in U.S. price in Northern Europe;
$dlnT$ = percentage change in per-pound transportation and other costs;
$dlnS$ = percentage change in subsidy;
η_{dd} = elasticity of domestic mill use with respect to domestic price;
η_{ds} = elasticity of domestic mill use with respect to subsidy;
η_{xd} = elasticity of export demand with respect to domestic price;
η_{xt} = elasticity of export demand with respect to transportation and other costs;
η_{xs} = elasticity of export demand with respect to subsidy;
η_{id} = elasticity of inventory demand with respect to domestic price;
ϵ = elasticity of domestic supply with respect to domestic price;
k_d = domestic mill use share of the domestic supply (Q_d/Q_s);
k_x = export demand share of the domestic supply (Q_x/Q_s).
k_i = ending inventory share of the domestic supply (Q_i/Q_s);

Equations (6) and (7) implicitly include, through S, the world price (P_i). The payment rate under Step 2, S, represents the wedge between U.S. price in Northern Europe and world price ($S= P_w-P_i-1.25$).

To solve the model, we assume that the U.S. is a price-taker on the international market, and that U.S. exporters do not have full control over transportation and other costs, such as insurance. In other words, $dlnT$ and $dlnS$ are assumed to be determined outside the U.S. cotton market system. Thus, endogenous variables in the model are: $dlnQ_d$, $dlnQ_x$, $dlnQ_s$, $dlnQ_i$, and $dlnP_d$.

Solving the system of equations for dlnPd, we get:

$$\text{(11.a)}\quad dlnP_d = \frac{k_x\eta_{x\tau}dlnT - (k_d\eta_{ds}+k_x\eta_{xs})dlnS}{\epsilon - k_d\eta_{dd} - k_x\eta_{xd} - k_i\eta_{id}}$$

The domestic mill use share of the domestic cotton supply (k_d) was obtained by averaging annual domestic mill use shares over the 1990-97 period. The initial export demand share (k_x) was obtained in a similar manner, by averaging annual export demand shares from 1990 to 1997. Over these years, $k_d = 0.50$ and $k_x = 0.34$. The inventory demand share (k_i) was obtained by the identity: $k_d+k_x+k_i = 1$ ($k_i = 0.16$).

The short-run own-price supply elasticities (ϵ) of 0.404, under non-restrictive government cotton policy such as those now prevailing, was obtained from Hishamunda (1999). It is in line with previous supply elasticities (Duffy, Richardson, and Wohlgenant, 1987). The value of own-price domestic demand elasticity (η_{dd}), -0.3, was obtained from Coleman (1991). In absolute terms, this estimate is lower than that reported by Gardiner et al. (1989) and higher than that reported by Sullivan et al. (1989), but close to that estimated by Mues and Simmons (1988) and in line with that reported by Lowenstein (1952).

The elasticity of domestic demand with respect to subsidy η_{ds}, the domestic price elasticity of inventory holding η_{id}, and elasticities of export demand with respect to domestic price η_{xd}, subsidy η_{xs}, and per-pound transportation and other costs $\eta_{x\tau}$, were obtained from Hishamunda. His subsidy elasticity of mill use (domestic demand) was 0.096 and his price elasticity of inventory holding was -2.36. His estimates of export elasticity with respect to transportation and other costs and export elasticity with respect to subsidy were -1.233 and 0.189, respectively. There are no previously estimated elasticities of mill use with respect to subsidy, price elasticity of inventory holding, and export demand elasticities with respect to transportation and other costs, and to subsidy for comparison with these findings. Elasticity of export demand with respect to domestic price (η_{xd} =-1.447) falls within the range of estimates available in the literature (Sirhan and Johnson, 1971; Johnson, 1977; Gardiner and Dixit, 1986; Duffy, Richardson, and Wohlgenant, 1990.; Zhang, 1991).

With termination of Step 2 payments, the subsidy drops from its previous value to zero, which is equivalent to a negative-100% change in payment rate. Assuming no change in transportation costs, dlnT becomes zero. Thus, the change in domestic price caused by elimination of Step 2 payments would be:

$$\text{(11.b)}\quad dlnP_d = \frac{(k_d\eta_{ds}+k_x\eta_{xs})dlnS}{\epsilon - k_d\eta_{dd} - k_x\eta_{xd} - k_i\eta_{id}}$$

Using the elasticity and share values mentioned above, we find that eliminating the Step 2 subsidy, with other things equal, would result in a fall in producer cotton prices of 7.8%.

Effects of FAIR

Again using a partial equilibrium framework, we can denote the percentage change in cotton lint supply caused by an acreage change resulting from planting-liberalization policies under FAIR by δ_a. The domestic supply response equation thus becomes:

$$(9.b)\ dlnQ_s = \epsilon dlnP_d + \delta_a$$

Where δ_a is the percentage change in supply due to a change in acreage during non-restrictive policy regimes, and all other variables are defined as previously. The system of equations is again solved for the percentage change in domestic price, $dlnP_d$, letting all other exogenous shifters, including dlnS this time, equal zero:

$$(11.c)\ dlnP_d = \frac{-\delta_a}{\epsilon - k_d\eta_{dd} - k_x\eta_{xd} - k_i\eta_{id}}$$

The parameter δ_a, which represents percentage change in domestic production caused by non-restrictive policy regimes, is the only unknown in the right hand side of (11.b); others were discussed previously. A two-step procedure was used to estimate this parameter. In the first step, the impact of non-restrictive programs on acreage was obtained by regressing acreage on dummy variable *Regime* and time. The dummy variable *Regime* was assigned the value "1" for the relatively non-restrictive years (1960-65, 1971-81, and 1995-97) and "0" otherwise. Regression results are presented in Hishamunda (1999). The impact of non-restrictive policy regimes on acreage was converted into cotton lint supply equivalents.

According to Hishamunda's regression results, non-restrictive programs, such as the current farm bill, would be expected to cause domestic production to increase by about 8.4%. This increase in production would cause the domestic price to fall by 5.9%.

Conclusions

Two recent changes in cotton policy, temporary elimination of the Step 2 subsidies and the change toward a less restrictive farm policy, both have been shown to exert downward pressure on the domestic price of U.S. cotton. Without Step 2 payments, demand for U.S. cotton fiber falls, leading to lower prices. Without policy provisions designed to reduce acreage, cotton production has increased, also leading to lower prices. Other factors, coinciding with these policy changes, have also affected the cotton market. The expansion of the Boll Weevil Eradication program and the use of Bt cotton have affected cotton supply. Low prices for alternative crops, such as soybeans and corn, have also impacted the cotton market, putting more downward pressure on cotton price.

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