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**Turkish Trade Policy and the Efficiency of  
Turkish Cotton Markets**

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## **Turkish Trade Policy and the Efficiency of Turkish Cotton Markets** **Troy G. Schmitz, 2000**

Turkey is one of the major cotton producers in the world. From 1987/88 through 1997/98, Turkey produced an average of 656,000 metric tonnes (MT) of cotton lint per year. It also exports a significant quantity of cotton lint and imports a significant quantity as well. For example, Turkish processors purchased an average of 766,000 MT of cotton lint per year from 1990/91 through 1996/97. Over that same period, Turkey imported an average of 133,000 MT per year, but also exported 70,000 MT per year. Turkish cotton markets can be divided into two distinct markets; the Aegean market and the non-Aegean market. Aegean cotton is typically considered to be one of the highest quality products in the world. As such, there is a demand for Aegean cotton in the rest of the world. Non-Aegean cotton is of lower quality, and because Turkish production is lower than its processing capacity, Turkey imports non-Aegean cotton from the rest of the world. Aegean and non-Aegean cotton are not considered substitutes by Turkish processors because Aegean cotton is roller-ginned while most non-Aegean cotton is saw-ginned.

Turkish cotton trade policy is characterized by a combination of export taxes and import duties. In addition, TARIS, ANTBIRLIK, and CUKOBIRLIK are three agricultural cooperatives that handle approximately 20% of all cotton marketed in Turkey. Prior to 1995, the government established domestic price support programs for cotton through these cooperatives. As of August, 1998, the Turkish government still subsidizes its cotton producers in the form of water subsidies, fertilizer subsidies, and credit subsidies. In essence, the combination of import duties, export taxes, and domestic subsidies result in trade distortions that directly affect international cotton markets.

In this paper, the degree of economic efficiency associated with Turkish cotton markets is measured by constructing one partial equilibrium model for the Aegean market, and one for the non-Aegean market. Consumer, producer, and government welfare under the current policy regime is compared with free trade in each market. Government intervention in Turkish cotton markets results in a net income transfer from taxpayers to producers. Because this transfer is implemented through various international and domestic policies, a portion of the amount paid by taxpayers to support Turkish cotton producers is never realized by producers. Domestic cotton consumers (i.e. further processors) are also affected by these government policies. The resulting economic inefficiencies attributed to the above forms of government intervention are measured by aggregating the loss in economic efficiency from both the Aegean and non-Aegean cotton markets.

## ***II. Theoretical Model***

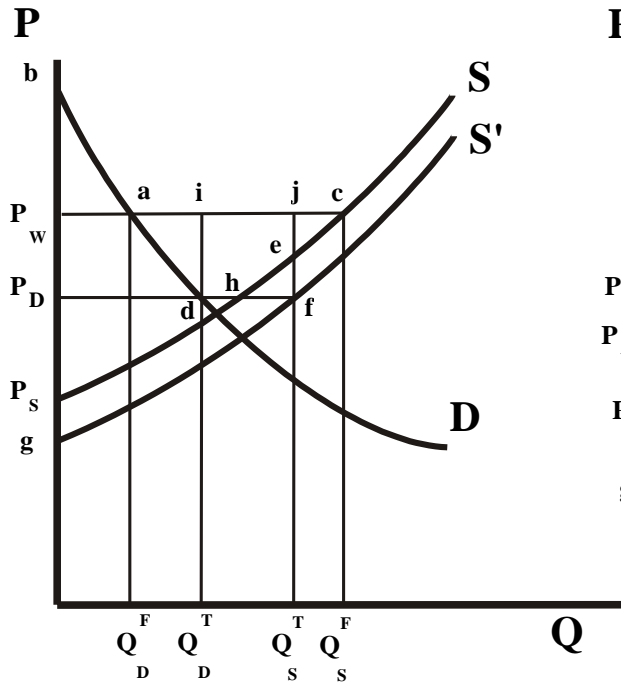
First, consider the Aegean market as illustrated in Figure 1. The Turkish domestic demand curve for Aegean cotton is given by  $D$  and the supply curve for Turkish Aegean cotton is given by  $S$ . The shut-down price (i.e., the price at which producers just cover average variable costs, and below which producers would switch to some other crop) is represented by  $P_S$ .  $P_W$  is the world price for Aegean cotton which, it is assumed, is not affected by the quantity exported by Turkey.<sup>1</sup>

The quantity of Aegean cotton demanded by Turkish consumers in free trade (assuming no trade barriers or input subsidies) would be  $Q_D^F$ . The quantity of Aegean cotton produced by Turkey under free trade would be  $Q_S^F$  and the quantity exported under free trade would be  $(Q_S^F -$

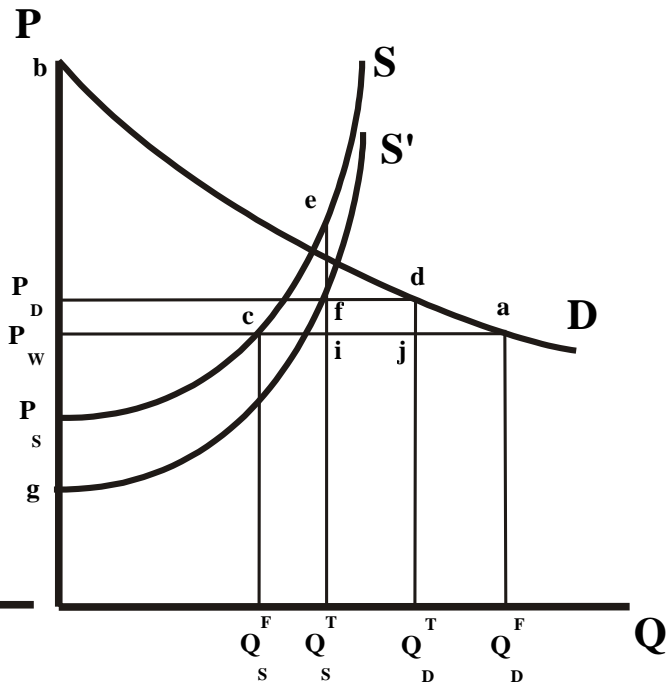
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<sup>1</sup> The limitations due to the "small country" assumption should be kept firmly in mind when analyzing the Aegean cotton market. Egyptian cotton is the only close substitute for Turkish Aegean cotton. This implies that Turkey may have a certain degree of monopoly power in the world market for Aegean cotton. However, from 1995 through 1997, the average volume of Aegean cotton exports from Turkey was only 40,000 metric tonnes. This is a very small portion of all world cotton exports. Data limitations and the inherent complexities involved with constructing an econometric model to determine the degree of market power exerted by Turkey in each Aegean cotton import market, preclude the incorporation of market power into the current analysis.

## AEGEAN MARKET



## NON-AEGEAN MARKET



Figures 1 and 2. Aegean and non-Aegean Cotton Markets

$Q_D^F$ ). In free trade, consumer surplus would equal area  $P_wab$  and producer surplus would equal area  $P_wcP_s$ . Total economic welfare under free trade, which is derived by adding consumer and producer surplus together in Figure 1, is the benchmark of economic efficiency by which any other market structure can be measured.

To illustrate the efficiency of the Aegean cotton market, consider  $S'$  and  $P_D$  in Figure 1.  $P_D$  is the actual domestic price of Aegean cotton in Turkey, which is determined by subtracting the export tax (imposed by the Turkish government in most years), from the world price ( $P_w$ ).  $S'$  is the subsidized supply curve, which represents the outward shift of the actual supply curve ( $S$ ) due to the water, fertilizer, and credit subsidies provided by the Turkish government to cotton producers in the Aegean region. At a price of  $P_D$ , Turkish consumption of Aegean cotton is  $Q_D^T$ , Turkish production of Aegean cotton is  $Q_S^T$ , and Turkey exports a quantity of  $(Q_S^T - Q_D^T)$ . Figure 1 is drawn so that the quantity supplied under the current marketing system is less than what

would be produced under free trade.<sup>2</sup> In this case, producer surplus equals area  $P_Dfg$ . Consumer surplus equals area  $P_Ddb$ . The Turkish government collects export tax revenue equal to area  $ijfd$ , but Turkish taxpayers must pay an amount equal to area  $P_Sefg$  to support Aegean cotton producers.

Comparing with free trade, consumers gain area  $P_{wad}P_D$  in consumer surplus under the current Aegean marketing system. Producers gain area  $P_Shfg$ , but lose area  $P_{wch}P_D$  in terms of producer surplus. The net change in producer surplus can be positive or negative. As the level of input subsidies gets smaller or the export tax gets larger, area  $P_{wch}P_D$  will eventually outweigh area  $P_Shfg$ , and producers will lose under the current Aegean marketing system. Adding export tax revenue, and subtracting input subsidies provided by the government, the net inefficiency of the Turkish Aegean cotton marketing system is equal to area  $(aid + jce)$ . Referring back to Figure 1, the magnitude of this inefficiency is small relative to total producer revenue.

Now consider the non-Aegean market illustrated in Figure 2. The Turkish domestic demand curve for non-Aegean cotton is given by  $D$  and the supply curve for Turkish non-Aegean cotton is given by  $S$ . The shut-down price is represented by  $P_S$ .  $P_W$  is the world price for non-Aegean cotton which is not affected by the quantity of non-Aegean cotton imported by Turkey.<sup>3</sup> Under free trade (with no input subsidies), the quantity demanded by Turkish consumers would be  $Q_D^F$ . The quantity of Aegean cotton produced by Turkey under free trade would be  $Q_S^F$  and the quantity imported under free trade would be  $(Q_D^F - Q_S^F)$ . In free trade, consumer surplus would

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<sup>2</sup> It is theoretically possible that the quantity produced under the current marketing system could actually be larger than the quantity that would be produced under free trade. This would occur if the combined level of input subsidies were much larger than the amount of the export tax. In this case, there would also be a source of inefficiency resulting from the input subsidies, although it would look different than in Figure 1.

<sup>3</sup> In non-Aegean markets, the "small country" assumption seems reasonable, given that from 1995 through 1997, Turkey imported an average of only 114,000 metric tonnes of cotton. This represents a very small portion of total non-Aegean cotton exports by the rest of the world.

equal area  $P_{wab}$  and producer surplus would equal area  $P_{wc}P_s$ . Total surplus under free trade in the non-Aegean market is equal to area  $(P_{wab} + P_{wc}P_s)$ .

To illustrate the efficiency of the non-Aegean cotton market, consider  $S'$  and  $P_D$  in Figure 2.  $P_D$  is the actual domestic price of non-Aegean cotton in Turkey, which is determined by adding the import duty (imposed by the Turkish government in most years), to the world price ( $P_w$ ).  $S'$  is the subsidized supply curve for non-Aegean cotton.<sup>4</sup> At a price of  $P_D$ , Turkish consumption of non-Aegean cotton is  $Q_D^T$ , Turkish production of non-Aegean cotton is  $Q_S^T$ , and Turkey imports a quantity of  $(Q_D^T - Q_S^T)$ . Consumer surplus equals area  $P_D b d$  and producer surplus equals area  $P_D f g$ . The Turkish government collects revenue from import duties equal to area  $f d j i$ , but Turkish taxpayers must pay an amount equal to area  $P_s e f g$  to support non-Aegean cotton producers.

Comparing with free trade, consumers lose area  $P_{wad}P_D$  in consumer surplus under the current non-Aegean marketing system. Producers gain area  $P_D f g P_{sc}P_w$ , which is always positive. Adding the revenue from the import duties, and subtracting the input subsidies provided by the government, the net inefficiency of the Turkish non-Aegean cotton marketing system is equal to area  $(c e i + j a d)$ .

To summarize, the inefficiency of the Turkish cotton marketing system can be divided into two parts; the inefficiency in the Aegean (export) market and the inefficiency in the non-Aegean (import) market. From figure 1, the inefficiency in the Aegean market equals area  $(a i d + c e j)$ . From figure 2, the inefficiency in the non-Aegean market equals area  $(c e i + j a d)$ . Hence, the inefficiency of the entire cotton marketing system in Turkey is equal to the values represented by the sum of these four areas.<sup>5</sup>

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<sup>4</sup> This curve is not the same as  $S'$  in Figure 1 because average variable costs, water costs, and fertilizer costs are different in the non-Aegean region, when compared to the Aegean region.

<sup>5</sup> It should be noted that import duties and/or export taxes have been in place only in certain years. In those years in which either of these policies did not exist, the level of inefficiency is smaller, but is still positive due to the input

### *III. Empirical Estimates of the Efficiency of Turkish Cotton Markets*

Empirical estimates of the efficiency of Turkish cotton markets are calculated using a procedure adapted from Schmitz, Schmitz, and Dumas (1997). Demand curves in each market are assumed to be of the form  $P(Q) = a_0Q^{a_1}$  and supply curves in each market are assumed to be of the form  $P(Q) = b_0 + b_1Q^{b_2}$ . These equations are fit through points  $(P_D, Q_D^T)$  and  $(P_S, Q_S^T)$  in Figure 1 and points  $(P_D, Q_D^T)$  and  $(P_S, Q_S^T)$  in Figure 2. The demand elasticity in both the Aegean and non-Aegean Turkish cotton markets is assumed to be -0.3. The supply elasticity in both markets is assumed to be 0.4.<sup>6</sup>

In order to take input subsidies into account, the average variable cost of producing cotton in a particular year is assumed to be 40 cents/kg in the Aegean region, and 39.2 cents/kg in the non-Aegean region as reported by the Ministry of Agriculture and Rural Affairs for 1998. These values include the unsubsidized cost of water, but include only that portion of fertilizer costs that producers actually paid. The unsubsidized cost of fertilizer equals 8.6 cents/kg in the Aegean region and 8.2 cents/kg in the non-Aegean region. However, producers in both regions receive an input subsidy equal to 50% of the fertilizer cost. Hence, for the purposes of this analysis, the unsubsidized average variable cost of producing cotton is assumed to be 44.3 cents/kg in the Aegean market and 43.3 cents/kg in the non-Aegean market. In addition, the unsubsidized average cost of water is assumed to be 2.6 cents/kg in the Aegean region and 5.2 cents/kg in the non-Aegean region and it is assumed that producers receive input subsidies equal to 50% of the cost of water in each market.<sup>7</sup>

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subsidies. The above analysis still applies in these cases because one can assume that the export tax and/or import duty simply approaches zero.

<sup>6</sup> The demand elasticities are taken directly from Kasnakoglu and Gurkan and are also the same as those used in Schmitz, Schmitz, and Dumas (1997) for U.S. cotton markets. The supply elasticity reported in Kasnakoglu and Gurkan is 0.38. This was rounded up to 0.4 for the purposes of this study.

<sup>7</sup> These estimates are based on cost estimates of the Ministry of Agriculture and Rural Affairs for 1998. In proportional and dollar terms, the level of water and fertilizer subsidies has not changed much over the last five years.

Due to data limitations, the exact amount of credit subsidies received by Turkish cotton producers is difficult to approximate. For the purposes of this analysis, it is assumed that farmers can borrow 10% of the variable cost of cotton production at a subsidized interest rate of 50% per year, whereas the commercial lending rate in Turkey is approximately 100% per year.

#### ***IV. Turkish Cotton Markets 1995/96***

In this section, empirical estimates are obtained for the inefficiency of Turkish cotton markets in 1995/96. All values are converted to U.S dollars using the exchange rate for 1995/96. The Turkish government imposed an export tax of 20 cents/kg on all exports of Aegean cotton and applied an ad-valorem import duty of one percent to the non-Aegean market in 1995/96.

Table 1 shows the empirical results relating to the efficiency of Turkish cotton markets in 1995/96. All empirical estimates have been converted from a raw seed basis, to cotton lint. The actual levels of different variables that existed in 1995/96 are provided in the second and fifth columns for the Aegean and non-Aegean markets, respectively. The simulation results for the levels that would have occurred under free trade in 1995/96 are provided in the third and sixth columns. The difference between the actual market and free trade are provided in columns 4 and 7. The aggregate results for both the Aegean and non-Aegean markets are provided in column 8.

First, consider the Aegean market (columns 2 through 4). In the Aegean region, water subsidies in 1995/96 were equal to \$3.69 million, fertilizer subsidies were equal to \$12.21 million, and credit subsidies amounted to \$6.29 million. In addition, the Turkish government extracted export tax revenue equal to \$11.60 million. Exports were 13,990 MT lower than they would have been under free trade due, in most part, to the 20 cents/kg export tax that existed



**Table 1: Efficiency of Turkish Cotton Markets in 1995/96**

	AEGEAN MARKET			NON-AEGEAN MARKET			TOTAL
	Actual	Free Trade	Change	Actual	Free Trade	Change	Change
World Price (C/KG)	207.00	207.00	0.00	155.45	155.45	0.00	
Domestic Price (C/KG)	187.00	207.00	-20.00	157.00	155.45	1.55	
Production (1000 MT)	284.00	291.21	-7.21	550.00	534.95	15.05	7.84
Consumption (1000 MT)	226.00	219.21	6.79	664.00	665.99	-1.99	4.80
Exports (1000 MT)	58.00	71.99	-13.99	0.00	0.00	0.00	-13.99
Imports (1000 MT)	0.00	0.00	0.00	114.00	131.03	-17.03	-17.03
Water Subsidies (mil \$)	3.69	0.00	3.69	14.30	0.00	14.30	17.99
Fertilizer Subsidies (mil \$)	12.21	0.00	12.21	22.55	0.00	22.55	34.76
Credit Subsidies (mil \$)	6.29	0.00	6.29	11.91	0.00	11.91	18.20
Export Tax Revenue (mil \$)	11.60	0.00	11.60	N/A	N/A	0.00	11.60
Import Tariff Revenue (mil \$)	N/A	N/A	0.00	1.77	0.00	1.77	1.77
Net Govt. Payments (mil \$)	10.59	0.00	10.59	46.99	0.00	46.99	57.58
Market Revenue (mil \$)	531.08	602.80	-71.72	863.50	831.56	31.94	-39.78
Producer Surplus (mil \$)	323.36	358.40	-35.05	513.70	457.17	56.53	21.48
Net Producer Welfare (mil \$)	334.96	358.40	-23.45	515.47	457.17	58.30	34.85
Consumer Surplus* (mil \$)			44.51			-10.34	34.17
Total Turkish Welfare* (mil \$)			-1.14			-0.79	-1.93

\*There is no closed form solution for consumer surplus. Hence, only changes in consumer surplus, and therefore changes in total welfare, can be calculated.

\*\*Actual 1995/96 data on supply and demand were obtained from "Cotton: Situation and Estimates" 1997/98 and 1998/99, AERI.

\*\*\*Actual yearly prices are simple averages of monthly prices.

during 1995/96. Producer surplus was \$35.05 million lower than it would have been under free trade in 1995/96. Even if the \$11.60 million tax revenue was distributed back to producers, net producer welfare was still \$23.45 million lower than it would have been under free trade.

However, consumers gained \$44.51 million in consumer surplus because the export tax reduced the price of domestic Aegean cotton compared to what it would have been under free trade. The inefficiency of the Aegean cotton market in 1995/96, which represents the difference in total welfare between the actual market structure and free trade, is estimated at \$1.14 million as shown in the last row of Table 1.

Now consider the non-Aegean market (columns 5 through 7). Net government payments (calculated as the sum of water subsidies, fertilizer subsidies, and credit subsidies minus import

tariff revenue), were equal to \$46.99 million. \$1.77 million was collected from import duties on 114,000 MT of imports. Imports of non-Aegean cotton were 17,030 MT lower than they would have been under free trade. Producer surplus was \$56.53 million higher than it would have been under free trade in 1995/96. If the \$1.77 million tariff revenue was distributed back to producers, net producer welfare was \$58.30 million higher than it would have been under free trade. However, consumers lost \$10.34 million in consumer surplus because the import duty inserted a wedge between the domestic price and the world price. The inefficiency of the non-Aegean cotton market, which represents the difference in total welfare between the actual market structure and free trade, is estimated at \$790,000 in 1995/96.

The last column in Table 1 shows the aggregate welfare effects from both the Aegean and non-Aegean Turkish cotton markets. In total, producers gained \$34.85 million in net producer welfare compared to free trade. Turkish consumers (i.e. cotton processors) gained \$34.17 million over free trade. However, the Turkish government spent \$17.99 million on water subsidies, \$34.76 million on fertilizer subsidies, and \$18.20 million on credit subsidies (for a total of \$70.95 million) in input subsidies to support cotton producers. Combining the producer, consumer, and government effects, the net inefficiency of Turkish cotton markets in 1995/96 was equal to \$1.93 million.

#### ***V. Turkish Cotton Markets with a Large Export Tax and Import Tariff***

This section is included in order to get an idea of the sensitivity of the net inefficiency that might arise from relatively higher export taxes and import tariff levels. For example, in 1998, the Turkish government imposed an ad-valorem import duty of 5.2 percent to the non-Aegean import market. They also announced (but then recanted) an export tax of 35 cents/kg that would have been applied on all Aegean cotton exports. Although the 35 cents/kg export tax has actually been withdrawn, it would have been of interest to obtain empirical estimates of the

inefficiencies that might have arisen in 1998/99 under such a support mechanism. To this end, supply and demand conditions for 1998/99 are projected as the three-year average of actual values from 1995/96-1997/98. The projected world price for 1998/99 is estimated as the three-year weighted average of actual world prices from 1995/96-1997/98. Water, fertilizer, and credit subsidy levels are assumed to remain at the levels used to obtain the estimates in Table 1.

Table 2 shows the empirical results related to the efficiency of Turkish cotton markets projected for 1998/99 under a 35 cents/kg export tax on Aegean cotton and a 5.2% ad-valorem import duty on non-Aegean cotton. In the Aegean market, export tax revenue is projected to be \$14.12 million with an additional \$3.08 million in water subsidies, \$10.19 million in fertilizer subsidies, and \$5.25 million in credit subsidies. Exports are projected to be 26,750 MT lower than they would be under free trade because of the 35 cents/kg export tax. Producer surplus is projected to be \$66.55 million lower than it would be under free trade in 1998/99. On the other hand, consumers are projected to gain \$66.73 million in consumer surplus because the export tax will reduce the price of domestic Aegean cotton compared to what it would be under free trade. The inefficiency of the Aegean cotton market, which represents the difference in total welfare between the actual market structure and free trade, is projected to be \$4.22 million dollars in 1998/99. This value is almost four times higher than the inefficiency that existed in 1995/96.

In the non-Aegean market, imports are projected to be 30,460 MT lower than they would have been under free trade because of the 5.2% ad-valorem tariff. Net government payments are projected to be \$18 million higher than under free trade. \$21.95 million in import tariff revenue is projected when compared to free trade. Producer surplus is projected to be \$75.24 million higher than it would be under free trade in 1998/99. If the \$21.95 million tariff revenue is distributed back to producers, net producer welfare is projected to be \$97.19 higher than under free trade. However, consumers are projected to lose \$59.31 million in consumer surplus

because the import tariff will raise the price of domestic non-Aegean cotton compared to what it would be under free trade. The inefficiency of the non-Aegean cotton market, which represents the difference in total welfare between the actual market structure and free trade, is projected to be \$2.08 million. The degree of inefficiency projected for non-Aegean markets is almost three times higher than in 1995/96 (see table 1).

**Table 2: Efficiency of Turkish Cotton Markets Projected for 1998/99**

	AEGEAN MARKET			NON-AEGEAN MARKET			TOTAL
	Actual	Free Trade	Change	Actual	Free Trade	Change	Change
World Price (C/KG)	192.33	192.33	0.00	157.53	157.53	0.00	
Domestic Price (C/KG)	157.33	192.33	-35.00	165.72	157.53	8.19	
Production (1000 MT)	237.00	252.24	-15.24	450.67	431.22	19.44	4.20
Consumption (1000 MT)	196.67	185.17	11.50	718.67	729.68	-11.01	0.49
Exports (1000 MT)	40.33	67.08	-26.75	0.00	0.00	0.00	-26.75
Imports (1000 MT)	0.00	0.00	0.00	268.00	298.46	-30.46	-30.46
Water Subsidies (mil \$)	3.08	0.00	3.08	11.72	0.00	11.72	14.80
Fertilizer Subsidies (mil \$)	10.19	0.00	10.19	18.48	0.00	18.48	28.67
Credit Subsidies (mil \$)	5.25	0.00	5.25	9.76	0.00	9.76	15.01
Export Tax Revenue (mil \$)	14.12	0.00	14.12	N/A	N/A	0.00	14.12
Import Tariff Revenue (mil \$)	N/A	N/A	0.00	21.95	0.00	21.95	21.95
Net Govt. Payments (mil \$)	4.40	0.00	4.40	18.00	0.00	18.00	22.40
Market Revenue (mil \$)	372.88	485.15	-112.27	746.83	679.29	67.54	-44.73
Producer Surplus (mil \$)	219.10	285.65	-66.55	449.28	374.04	75.24	8.69
Net Producer Welfare (mil \$)	233.21	285.65	-52.43	471.23	374.04	97.19	44.76
Consumer Surplus* (mil \$)			66.73			-59.31	7.42
Total Turkish Welfare* (mil \$)			-4.22			-2.08	-6.30

\*There is no closed form solution for consumer surplus. Hence, only changes in consumer surplus, and therefore changes in total welfare, can be calculated.

\*\*1998/99 projections were based on supply and demand data for 1995/96-1997/98 obtained from "Cotton: Situation and Estimates" 1997/98 and 1998/99, AERI.

\*\*\*World prices are calculated as the three-year weighted average of world prices for 1995/96-1997/98.

The last column in Table 2 shows the aggregate welfare effects projected for both the Aegean and non-Aegean Turkish cotton markets under an export tax of 35 cents/kg and an ad-valorem import tariff of 5.2%. In aggregate, producers are projected to gain \$44.76 million in net producer welfare compared to free trade. Turkish consumers (i.e. cotton processors) are projected to gain \$7.42 million over free trade. However, it is projected that the Turkish government will spend \$14.80 million on water subsidies, \$28.67 million on fertilizer subsidies,

and \$15.01 million on credit subsidies (for a total of \$58.48 million) in input subsidies to support cotton producers. Combining the producer, consumer, and government effects, the projected net inefficiency of Turkish cotton markets under an export tax of 35 cents/kg and an import duty of 5.2% is equal to \$6.30 million. This is more than three times larger than the net inefficiency attributed to aggregate government support of Turkish cotton producers in 1995/96.

## ***VI. Conclusions***

In 1995/96, the government of Turkey imposed an export tax of 20 cents/kg on Aegean cotton and an ad-valorem import duty of one percent on non-aegean cotton. The simulation results for the Aegean market indicate that consumers gained \$44.5 million in consumer surplus because the export tax reduced the purchase price of Aegean cotton. The Turkish government extracted export tax revenue equal to \$11.6 million, but provided water, fertilizer, and credit subsidies equal to \$22.2 million. Producers lost \$35 million in producer surplus due to the lower domestic price caused by the export tax. However, while these numbers represent large transfers from producers to consumers, the net inefficiency due to government distortions amount to only \$1.14 million in the Aegean market. Adding this number to the dead-weight loss of only \$790,000 obtained from the non-Aegean market simulation, the net inefficiency caused by government intervention in Turkish raw cotton markets was only \$1.93 million in 1995/96. If one considers that cotton producers in Turkey realized gross revenue of over \$1.4 billion across all markets in 1995/96, the results of the analysis seems to indicate that the income transfer associated with Turkish government programs is not very inefficient.

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