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Measuring Inefficiency in the Presence of an Export Tax, an Import Tariff, and a State Trading Enterprise

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ABSTRACT

Agricultural sales cooperative unions (ASCUs) in Turkey are heavily influenced by both domestic and international government policies. Both export taxes and import tariffs are used as policy tools to regulate cotton markets. Domestic price support programs, water subsidies, fertilizer subsidies, and credit subsidies have also been used as domestic policy tools. These types of subsidies are not uncommon among developing countries. This paper provides empirical estimates of the degree of economic inefficiency associated with government intervention in Turkish cotton markets. A two-region partial equilibrium model of cotton exports and imports is developed under the "small country assumption" to obtain empirical estimates of the deadweight welfare loss associated with these government subsidies. Although government intervention results in significant income distribution among the various cotton sectors within Turkey, the overall economic inefficiency of the redistribution is very low.

Key Words: *export tax, tariff, agricultural policy, Turkey, cotton, agricultural cooperatives, welfare, state trading enterprises.*

State Trading Enterprises (STEs) are prevalent in many parts of the world (Ackerman and Dixit, 1999; Schmitz, Furtan, and Baylis, 1999). They are under close scrutiny by the WTO, and many questions surround their activities. For example, what practices fall within the legal definition of state trading and STEs? Does the WTO allow trade-distorting activities that cause world prices and quantities to differ from those present in a perfectly competitive market? Does the WTO define its criteria governing STEs clearly? Does the WTO differentiate between STE trade distortions caused by hard-price discrimination (charging different buyers different prices without using government subsidies) versus those caused by soft price discrimination (using direct government subsidies)? And finally, do STE activities significantly distort trade?

Turkey is a country where STEs are widespread, and export taxes and subsidies are used extensively. Also, it has been alleged that rent-seeking activities, through STEs, contribute to significant inefficiencies in resource allocation (Krueger, 1974). In Turkey, border measures for cotton, such as export taxes and import tariffs, are announced by government decree each year. Support (floor) prices have also been traditionally announced by decree, but rarely at the same time as corresponding border measures. Agricultural Sales Cooperatives Unions (ASCUs), which are STEs, act as agencies for the procurement and sale of cotton. Government intervention in Turkish ag-

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riculture is also present in that government provides additional subsidies for the commodities handled by the ASCUs. Subsidies are applied to water, fertilizer, and credit. Agricultural cooperatives that administer these types of subsidies, as well as government policies that combine export taxes, import tariffs and price supports, are not uncommon among other developing countries.

ASCUs are commissioned to buy commodities at the determined price supports and to implement most other domestic subsidy programs. The ASCUs are then reimbursed by the Treasury for any loss related to the difference between the support price and the sales price. The implications of agricultural price intervention and possible agricultural trade policy reform in Turkey have been discussed by Olgun (1989), Harrison, Rutherford, and Tarr (1993); and Gurkan and Kasnakoglu (1991).

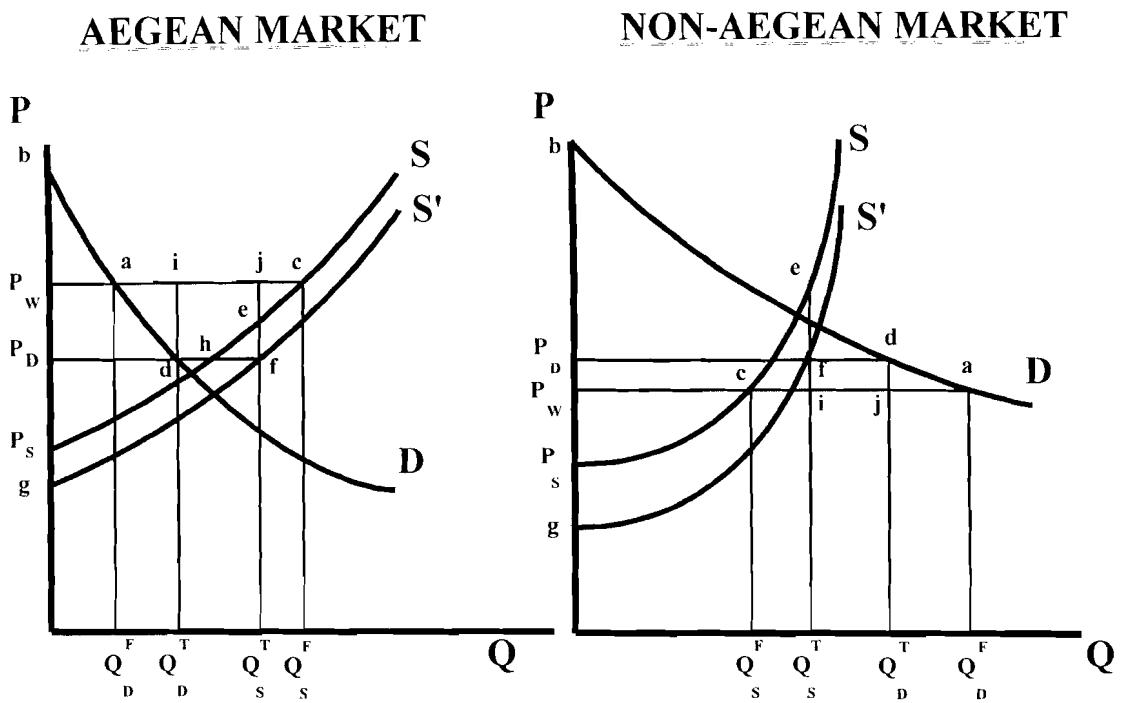
Subsidies on water, fertilizer, and credit, in combination with export taxes, import tariffs, and domestic price supports, result in market distortions that directly affect the magnitude and distribution of welfare among producers, consumers, and taxpayers in the Turkish cotton sector. The potential gains that can be realized from the liberalization of both domestic and international farm policies are well known (Schmitz, Sigurdson, and Doering, 1986; and Schmitz, Schmitz and Dumas, 1997). However, these papers do not consider the case of a market affected by both export taxes and import tariffs.

Hudson and Etheridge (2000) measure the income distributional impacts of trade policies in the case of cotton production and processing in Pakistan. Their analysis contains a multi-market equilibrium model that includes behavioral relationships for producers and processors of cotton. They find that income is transferred from cotton producers to yarn spinners and taxpayers as a direct result of export taxes imposed by the government. They also discuss the common practice among developing countries of "controlling the price of a raw material as a means of conferring a competitive advantage on their domestic industries" (Hudson and Etheridge, 2000, p.1). However, cotton markets in Turkey should be treated differently than cotton markets in Pakistan. While the approach taken by Hudson and Etheridge (2000) is quite appropriate for Pakistan, it cannot be applied to Turkey. The multi-market equilibrium model developed by Hudson and Etheridge (2000) contains export taxes and price supports for producers and downstream processors in Pakistan, treating raw cotton as a homogeneous commodity. However, in the case of Turkey, cotton should be treated as a non-homogenous commodity because cotton produced on the Aegean coast is very different from non-Aegean cotton (Schmitz, Cakmak, Schmitz, and Gray, 1999). While export taxes are placed on Aegean cotton exported by Turkey (as is the case with Pakistan), import tariffs are also placed on non-Aegean cotton imported by Turkey. Hence, the multi-market model presented herein is horizontal, while Hudson and Etheridge (2000) employ a vertical analysis.

The major objective of this paper is to measure the degree of economic inefficiency associated with government intervention in cotton markets in Turkey. A two-region, partial equilibrium model of cotton exports and imports is developed to obtain empirical estimates of the deadweight welfare loss associated with the combination of domestic price support programs, import duties, export taxes, water subsidies, fertilizer subsidies, and credit subsidies provided by the Turkish government. Descriptions of the Turkish cotton industry and the implications of TARIS (the largest ASCU involved in cotton) are provided in Appendices I and II in order to motivate the analysis and to justify the separation of Turkish cotton markets into distinct export and import markets.

Measuring the Efficiency of Turkish Cotton Markets

The degree of economic inefficiency associated with government cotton policy in Turkey 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 are compared with free



Figures 1 and 2. Aegean and non-Aegean cotton markets

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 following the generally accepted principles of welfare analysis taken from Just, Hueth, and Schmitz (1982).

Theoretical Model of Turkish Cotton Markets

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. For purposes of this analysis we employ the "small country" assumption; that is, the world price for cotton is not affected by the quantity exported by Turkey. Egyptian cotton is the only close substitute for Turkish Aegean cotton. Hence, it is possible that Turkey may have a certain degree of monopoly power in the world market for Aegean cotton. However, testing for market power is beyond the scope of this analysis. From 1995 through 1997, the average volume of Aegean cotton exports from Turkey was only 40,000 metric tonnes, which is a small portion of total world cotton exports.

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 $(Q_S^F - Q_D^F)$. In free trade, consumer surplus would equal area $P_W ab$ and producer surplus would equal area $P_W cP_S$. Total economic wel-

fare under free trade, which is derived by adding consumer and producer surplus together, is the benchmark of economic efficiency by which any other market structure can be measured (Figure 1).

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 such that the quantity supplied under the current marketing system is less than what would be produced under free trade.[1] In this case, producer surplus equals area $P_D$fg. Consumer surplus equals area $P_D$db. The Turkish government collects export tax revenue equal to area ijfd, but Turkish taxpayers must pay an amount equal to area $P_S$efg to support Aegean cotton producers.

Compared with free trade, consumers gain area $P_W$adP_D in consumer surplus under the current Aegean marketing system. Producers gain area $P_S$hfg, but lose area $P_W$chP_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 $P_W$chP_D will eventually outweigh area $P_S$hfg, 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). The magnitude of this inefficiency is small relative to total producer revenue (Figure 1).

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. We make the "small country" assertion for non-Aegean cotton as well. This 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 relative to the rest of the world.

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 equal area $P_W$ab and producer surplus would equal area P_WcP_S. Total surplus under free trade in the non-Aegean market is equal to area ($P_W$ab + P_WcP_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 tariff (imposed by the Turkish government in most years) to the world price (P_W). S′ is the subsidized supply curve for non-Aegean cotton.[2] 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 $P_D$db and producer surplus equals area $P_D$fg. The Turkish government collects revenue from import duties equal to area fdji, but Turkish

[1] 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 was 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.

[2] 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 than in the Aegean region.

taxpayers must pay an amount equal to area $P_S efg$ to support non-Aegean cotton producers.

Compared with free trade, consumers lose area $P_W adP_D$ in consumer surplus under the current non-Aegean marketing system. Producers gain area $P_D fgP_S cP_W$, 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 (cei + jad).

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. The inefficiency in the Aegean market equals area (aid + cej) (Figure 1). The inefficiency in the non-Aegean market equals area (cei + jad) (Figure 2). Hence, the inefficiency of the entire cotton marketing system in Turkey is equal to the values represented by the sum of these four areas.[3]

Functional Forms for Demand and Supply

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 of the form

$$(1) \quad P(Q) = a_0 Q^{a1}$$

Supply curves in each market take the form:

$$(2) \quad P(Q) = b_0 + b_1 Q^{b2}$$

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. Demand parameters are recovered by specifying a demand elasticity (ϵ_D) and using the fact that

$$(3) \quad \epsilon_D = \frac{\partial \ln Q}{\partial \ln P} = \frac{1}{a_1}$$

Hence, the demand parameter (a_1) is found through the relationship

$$(4) \quad a_1 = \frac{1}{\epsilon_D}$$

Once a_1 is determined, the second demand parameter (a_0) can be recovered using

$$(5) \quad a_0 = P_D Q^{D\ a1}$$

Recovery of supply parameters can be accomplished by specifying a supply elasticity (ϵ_S) and shutdown price (b_0) and rewriting (2) as

$$(6) \quad Q^{b2} = \frac{P - b_0}{b_1}$$

Taking the natural logarithm of both sides and solving for lnQ yields

$$(7) \quad \ln Q = b_2^{-1} \ln\left(\frac{P - b_0}{b_1}\right)$$

Making use of equation (7), the supply elasticity becomes

$$(8) \quad \epsilon_S = \frac{\partial \ln Q}{\partial \ln P} = b_2^{-1} P (P - b_0)^{-1}$$

Solving for the supply parameter b_2:

$$(9) \quad b_2 = \epsilon_S^{-1} P (P - b_0)^{-1}$$

The final parameter can be recovered using (2) and (9):

$$(10) \quad b_1 = (P - b_0) Q^{-b2}$$

Welfare measures can be derived using the following procedure. By definition, consumer surplus represents the area below the demand curve and bounded by the price line. Mathematically this is written:

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

$$(11) \quad CS = \int_{\theta}^{Q_D} (P(Q)\, dQ) - TR$$

where TR is total revenue, Q_D is the quantity demanded, and θ is a number close to zero.[4]

Solving and rearranging (11) yields

$$(12) \quad CS = \frac{a_0}{a_1 + 1}[Q_D^{(a_1+1)} - \theta^{(a_1+1)}] - P_D Q_D$$

where P_D and Q_D are the price and quantity consumed, respectively.

By definition, producer surplus represents the area below the price line and bounded by the supply curve. Mathematically, this is written as

$$(13) \quad PS = TR - \int_{0}^{Q_S} (b_0 + b_1 Q^{b_2})\, dQ$$

where Q_S is the quantity supplied. Solving (13) and rearranging yields

$$(14) \quad PS = (P_S - b_0)Q_S - b_1(b_2 + 1)^{-1}Q_S^{b_2+1}$$

Model Parameterization

The demand elasticity used for both the Aegean and non-Aegean Turkish cotton markets is −0.3. This is taken directly from Gurkan and Kasnakoglu (1991) and is also consistent with demand elasticities estimated by Duffy and Wohlgenant (1991) and used in Schmitz, Schmitz, and Dumas (1997) for the United States. The supply elasticity is 0.4, which is rounded from Gurkan and Kasnakoglu's (1991) estimate of 0.38.

In order to take input subsidies into account, the average variable cost of producing cotton in a particular year is 40 cents/kg in the Aegean region, and 39.2 cents/kg in the non-Aegean region (Ministry of Agriculture and Rural Affairs, 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 (Ministry of Agriculture and Rural Affairs, 1998). However, producers in both regions receive an input subsidy equal to 50 percent of the fertilizer cost. Hence, for the purposes of this analysis, the unsubsidized average variable cost of producing cotton is 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 2.6 cents/kg in the Aegean region and 5.2 cents/kg in the non-Aegean region, where producers receive input subsidies equal to 50 percent of the cost of water in each market.[5]

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 percent of the variable cost of cotton production at a subsidized interest rate of 50 percent per year, whereas the commercial lending rate in Turkey is approximately 100 percent per year (Schmitz, Cakmak, Schmitz, and Gray, 1999).

Efficiency of Turkish Cotton Markets in 1995/96

For 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 tariff of 1 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

[4] It is not possible to directly calculate consumer surplus under specification (1) because it involves dividing by zero. However, it is possible to compute changes in consumer surplus as long as θ is the same in both calculations.

[5] 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 did not change much over the five-year period from 1994 through 1998.

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.

Notes: 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.

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 (Table 1).

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 large part to the 20 cents/kg export tax that existed 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 would have still been $23.45 million lower than 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 tariff 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 for 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.

Efficiency of Turkish Cotton Markets Under a Large Export Tax and Import Tariff

In 1998, the Turkish government imposed an ad-valorem import tariff of 5.2 percent in 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 percent ad-valorem import tariff 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 percent 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

Table 2. Efficiency of Turkish Cotton Markets under a Large Export Tax and Import Tariff

	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.

Notes: 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.

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 (Table 1).

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 percent. 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 tariff of 5.2 percent is equal to $6.3 million. This is more than three times larger than the net inefficiency attributed to aggregate government support of Turkish cotton producers in 1995/96. However, considering that the total revenue received by producers of Turkish cotton in the Aegean and non-Aegean markets combined is in excess of one billion dollars, the $6.3 million in inefficiency due to Turkish cotton policy, even under a large export tax and import tariff, is still less than 1 percent of total revenue.

Conclusions and Other Considerations

Cotton producers in Turkey receive support from the government through the ASCUs in the form of water, fertilizer, and credit subsidies. In addition, export taxes in the Aegean market cause significant transfers from producers to taxpayers and consumers. On the other hand, import tariffs in the non-Aegean

market cause significant transfers from both domestic and foreign consumers to producers.

Results indicate that in 1995/96, under a 20 cents/kg export tax and an import tariff of 1 percent, consumers in the Aegean market gained $44.5 million, taxpayers lost $10.6 million, and producers lost $35.1 million. On the other hand, consumers in the non-Aegean market lost $10.3 million, taxpayers lost $47 million, and producers gained $56.5 million. While these numbers provide evidence of significant income redistribution among the various sectors of the Turkish economy, the net inefficiency due to government distortions in 1995/96 was estimated at only $1.14 million in the Aegean market and $790,000 in the non-Aegean market. This amounts to an aggregate inefficiency of only $1.9 million caused by government intervention in Turkish cotton markets. Compared to the almost $1.4 billion in market revenue, this deadweight loss amounts to only 0.14 percent of total revenue.

The inefficiency of Turkish cotton markets was found to be small, even under a relatively large export tax of 35 cents/kg and an import tariff of 5.2 percent. Under these conditions, consumers in the Aegean market gain $66.7 million, taxpayers lose $4.4 million, and producers lose $52.4 million. Consumers in the non-Aegean market lose $59.3, taxpayers lose $18 million, and producers gain $75.2 million. The net inefficiency due to government intervention under these conditions would be $6.3 million. While this is more than three times larger than the net inefficiency in 1995/96, it is still only 0.56 percent of total revenue.

These deadweight loss calculations are essentially Harberger effects and do not include inefficiencies due to transaction costs associated with policy implementation. In terms of measuring the efficiency of the Turkish cotton sector, there are additional considerations that are not accounted for in the empirical analysis. The implications of high inflation rates and exchange rate fluctuations are not integrated into the analysis. In addition, the scope of the analysis is limited to the raw cotton sector, and any potential market power is not explored. Further research could extend the analysis of cotton market efficiency presented here to include the implications of export taxes and import duties for both the production and processing sectors in Turkey. Elements of the Hudson and Etheridge (2000) approach could be combined with the current analysis to accomplish this goal.

Discussions on privatization in Turkey and other developing countries abound. Cotton is one commodity for which privatization has occurred rapidly. Employment in TARIS has dropped sharply, and elements of a U.S. type of cooperative are emerging. Many of the ASCUs are too small to be efficient and many will likely be merged in the future. TARIS also owns and operates a large yarn processing facility, located in Izmir, which has been in operation since 1980. It is one of the largest yarn processing facilities in the Middle East. TARIS processes approximately 20 percent of its production into yarn and sells the remaining 80 percent on the Izmir cotton exchange. The government is considering splitting the procurement and processing activities of the ASCUs and privatizing the processing plants. Privatization would obviously affect market inefficiency. If one focuses on the level of employment involved with ASCUs such as TARIS, findings will most likely indicate that such ASCUs are technically inefficient, largely because of over-employment and low levels of technical and marketing skills. Future research is needed to determine whether or not there are major differences between the technical and economic efficiency of private firms in Turkey and their competitors. In addition, the inefficiencies generated through STEs from rent-seeking behaviour need to be explored.

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Appendix I: Turkish Cotton Industry

Cotton is produced in four main regions in Turkey. Data on regional cotton production in Turkey from 1987/88 through 1997/98 are provided in Appendix Table 1. In general, the highest quality cotton is grown in the Aegean region. TARIS operates mainly in this region, which is the largest cotton-producing region in Turkey. From 1987/88 through 1997/98, Turkey produced an average of 656,000 tonnes of lint, with the Aegean region averaging 275,000 tonnes. Turkish cotton production increased significantly in 1995/96 and has remained at a higher level than before 1995/96.

Cotton produced in the Aegean region of Turkey is roller-ginned as opposed to saw-ginned. For this reason, nearly all cotton processing facilities in the Aegean region can use only roller-ginned cotton in their production process. Hence, there are not many substitutes for cotton inputs on the Aegean coast. Egypt is the only country that produces a close substitute for Turkish Aegean cotton. However, Turkey has more processing capacity than domestic production can supply. These two facts contribute to Turkey's position as both an importer and exporter of cotton.

With the rapid expansion of the textile and clothing industry, Turkey has become a net im-

Table A1. Cotton Lint Production in Turkey by Region in 1000 Metric Tonnes (1987/88 through 1997/98)

	Region				
Year	Cukurova	Aegean	Antalya	SE Anatolia	Total
1987/88	185	224	36	92	537
1988/89	196	305	42	107	650
1989/90	197	254	46	113	617
1990/91	190	285	38	142	655
1991/92	161	263	22	115	559
1992/93	194	260	26	95	575
1993/94	152	272	25	153	602
1994/95	178	265	20	164	627
1995/96	284	308	34	208	834
1996/97	225	278	32	226	761
1997/98	166	308	19	302	795
Average	193	275	31	156	656

Source: Turkish Cotton Advisory Board (Correspondence with Tulay Yildirim, Director of the Agricultural Economics Research Institute, Ankara, Turkey).

Table A2. Turkish Cotton Consumption, Imports, and Exports in 1000 Metric Tonnes (1990/91 through 1996/97)

Year	Consumption	Imports	Exports
1990/91	557	48	164
1991/92	646	95	56
1992/93	676	236	58
1993/94	700	121	109
1994/95	850	239	2
1995/96	944	114	58
1996/97	991	77	45
Average	766	133	70

Source: Imports and Exports compiled from Correspondence with Tulay Yildirim. Consumption data are from the USDA PS&D Electronic Database.

Table A3. Purchases and Gross Receipts of Cotton by TARIS (1992/93 through 1997/98)

Year	Purchases (Metric Tonnes)	Gross Receipts (Billions of Turkish Lira)	Gross Receipts (Millions of U.S. Dollars)
1993/94	251,238	1,818	89
1994/95	91,487	2,394	61
1995/96	159,383	7,067	112
1996/97	178,000	13,136	113
1997/98	170,137	24,905	
Average	170,049	9,864	

Source: Personal interviews conducted with TARIS officials. Gross Receipts in U.S. Dollars are calculated using the August–July average of monthly exchange rates in the International Financial Statistics, IMF.

porter of cotton during the last decade. Most of the imported cotton is comprised of low-quality cotton lint imported from the Central and Eastern Asian countries. Data on Turkish cotton consumption, imports, and exports from 1990/91 through 1996/97 are provided in Appendix Table 2. Cotton consumption in Turkey has increased rapidly in the last few years. This may be attributed to the rapid increase in processing capacity within Turkey. Turkey consumed an average of 766,000 tonnes per year of cotton from 1990/91 through 1996/97. The volume of Turkish cotton imports has typically exceeded the volume of Turkish cotton exports over the last several years. On average, Turkey has imported 133,000 tonnes per year while exporting only 70,000 tonnes per year. Hence, the volume of Turkish imports is approximately twice as large as the volume of Turkish cotton exports in a typical year.

Export taxes on cotton produced in the Aegean region of Turkey serve to reduce the internal price of raw Aegean cotton so that domestic processors can purchase the raw product at a lower price. They also serve to increase government revenue. These elements are consistent with what Hudson and Etheridge (2000) found in Pakistan. On the other hand, import tariffs on non-Aegean cotton serve to increase the price of non-Aegean cotton imports while simultaneously allowing non-Aegean producers to receive a higher price. Import tariffs on non-Aegean cotton also serve to increase government revenue even further. While these two policies seem inconsistent with each other, it may be the case that the import tariff is used to support farmers in the more rural and poorer non-Aegean areas of the country, while the export tax is used to support processors (the majority of whom are located in the Aegean region).

Appendix II: The TARIS Cooperative

TARIS, ANTBIRLIK, and CUKOBIRLIK are the three ASCUs that are involved in cotton. These ASCUs are comprised of over 110 local cooperatives which have a combined membership of over 140,000 producers. TARIS, ANTBIRLIK, and CUKOBRILIK control over 20 percent of all cotton marketed in Turkey. TARIS, established in the 1950s, is a conglomerate of four unions of agricultural cooperative societies. These unions specialize in marketing cotton, olive oil, sultana raisins, and figs. TARIS also markets several by-products and derivatives of these four basic commodities including cotton yarn, gray knitted fabric, fig paste, vinegar, margarine, soap, and detergents. Membership in TARIS is comprised of 125 cooperatives in 67 locations serving 120,000 member growers. TARIS is also involved in extension activities, quality control, and product development efforts.

The TARIS cotton union (TARIS PAMUK) is the largest in size when compared to the other three unions that comprise TARIS. The purchases and gross receipts of cotton by TARIS are shown in Appendix Table 3. TARIS purchased an average of 170,049 tonnes of cotton per year from 1993/94 through 1997/98. In a typical year, TARIS controls in the neighborhood of 10 percent of all Turkish cotton production. The other cooperatives have a total of 5 percent to 7 percent of the cotton market.

As a result, all of the cooperatives combined have roughly a 20 percent market share. While this market share seems relatively low, TARIS controls a much larger share of the total amount of high quality Aegean cotton sold domestically and for export.

TARIS has a single agent who sells cotton on the Izmir cotton exchange on behalf of its members. The Izmir cotton exchange is comprised of buyers and sellers from domestic and international markets. On June 22, 1998, the price of STD-1 SIRA cotton was 530,000 Turkish lira per kilogram. This compares to a New York July futures price of 435,490 Turkish lira per kilogram. The price difference, according to the commodity exchange, can be attributed to a quality premium paid for Aegean cotton and an additional premium paid for cotton sold by TARIS. The quality premiums for Aegean cotton in general can be substantial and vary considerably. For example, the price correlation between EGE STD-1 Izmir cotton and Memphis cotton for the August to July 1995/1996 crop year, as calculated in Izmir Ticaret Borsasi (1997), was only 0.31.

Until the 1960s, TARIS operated without direct financial support from the government. Each union offered its members an initial payment, sold the product, and returned any final payment to its members on an annual basis. Sales were on a voluntary pooling basis. In the 1960s, the cooperatives experienced financial difficulties and turned to the government for financial support. At that point the government became involved in price-setting activities and in the directorship of TARIS. In order to address the pooling problem, cooperative members became legally obligated to sell their product to TARIS, and TARIS became legally obligated to buy all of the product offered for sale by its members. Not long after the government became involved, the setting of the initial price became both an income support mechanism for the government and a political policy tool. A support price for the current year's crop was established by a committee comprised of government and TARIS officials. During this period the government retained any surpluses in the pool account, but also picked up any losses. At this point TARIS was no longer financially accountable to its members.

Even though the government relinquished direct control over setting initial prices in 1994, it did retain indirect influence over cotton markets. First, the general director of TARIS is still appointed by the government, and he or she has veto power over all decisions made within TARIS. Second, the unions still receive credit from the government in the form of low-interest loans. Given the large subsidy involved in these loans, the government can indirectly influence prices. In addition, water and fertilizer subsidies provided by the government are administered through the ASCUs.