Turk J Agric For
28 (2004) 125-130

An Analysis of the Impacts of Production Quotas and URA Provisions on Turkey's Sugar Sector

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Received: 03.03.2003

Abstract: Sugar beet is an important crop in terms of production value and represents 2.5% of the total value of crop production. Its production has been regulated and supported by the government. To adapt Turkey's sugar policies for potential admission to the EU, a sugar production quota policy was implemented in 1999 in addition to existing policies, mainly including price support and input subsidies. At the same time, the tariff imposed on imported sugar was reduced by 10% in order to comply with Uruguay Round Agreement (URA) provisions. The objective here is to analyze the impacts of these policy changes on Turkey's sugar sector using classic welfare analysis with the supply and demand parameters estimated in this study. The implementation of the production quota policy reduced domestic production by 107,000 tons but did not change domestic consumption. Thus, government spending and the producer surplus declined by 95 million and 9 million U.S. dollars, respectively, while the consumer surplus remained the same. A 10% decrease in tariffs because of URA provisions had no impact on the sugar sector since the border price, including the tariff, is still above the domestic price. To carry out this transition easily, Turkey must lower its production costs by structural enhancement in the sector.

Key Words: Turkey's sugar sector, quota, URA provisions

Üretim Kotası ve URA Koşullarının Türkiye Şeker Sektörü Üzerine Etkilerinin Analizi

Özet: Şeker pancarı, toplam bitkisel üretim değerinin % 2.5'i ile Türkiye tarımında önemli bir yere sahiptir. Şeker pancarı üretimi, hükümetler tarafından sürekli olarak desteklenmiş ve düzenlenmiştir. Türkiye şeker politikalarının Avrupa Birliği politikalarına uyumunun sağlanması amacıyla, mevcut olan destekleme fiyatı ve girdi sübvansiyonu politikalarına ilave olarak 1999 yılında üretim kotası uygulamasına başlanılmıştır. Aynı zamanda, URA çerçevesinde, şeker ithalatına uygulanan tarifede % 10 indirim yapılmıştır. Bu çalışmanın amacı, şeker sektörü arz ve talep denklemlerini tahmin ederek bu iki politika değişikliğinin etkilerini klasik refah analizi ile belirlemektir. Tahmin edilen denklemler, ekonomik teori, istatistiksel ölçüler ve daha önceki çalışmalarda tahmin edilen parametreler açısından değerlendirildiğinde, şeker sektörünü iyi temsil ettiği anlaşılmaktadır. Mevcut politikalar altında, kilogram şeker piyasa fiyatı 0.44 ABD doları olarak belirlenirken, üretilen ve talep edilen şeker miktarı ise sırasıyla 1923 ve 1812 bin ton olmuştur. Destekleme politikasının sonucu olarak, 142 milyon ABD doları hükümet harcaması yapıldığı saptanmıştır. Üretim kotası politikasıyla, şeker üretimi 107 bin ton azalmış, fakat şeker tüketimi değişmemiştir. Bunun sonucu olarak hükümet harcamaları ve üretici artığı sırasıyla 95 ve 9 milyon ABD doları azalmıştır. Ticaret politikalarında mihenk taşı olan serbest ticaret senaryosu, yurtiçi üretimi % 12.5 azaltırken, yurtiçi tüketimi sadece % 1.5 oranında artırmıştır. Yurtiçi fiyatında önemli bir düşüşe neden olan serbest ticaret ile, üretici artığındaki düşme tüketici rantındaki artışla karşılanırken, 142 milyon ABD doları olan hükümet harcamaları tamamen ortadan kalkmaktadır. Uruguay Round Anlaşmaları nedeniyle ithalat tarifinde yapılan % 10'luk indirimin Türkiye şeker sektörüne herhangi bir etkisi olmamıştır. Çünkü, ithalat tarifini de içine alan sınır fiyatı hala yurtiçi fiyatının üzerinde kalmıştır. Bu politika değişikliklerine geçişi kolaylaştırmak için Türkiye'nin sektörde yapısal iyileştirmeler yaparak üretim maliyetlerini düşürmesi gerekmektedir.

Anahtar Sözcükler: Türkiye şeker sektörü, kota, URA koşulları

Introduction

Sugar is one of the most important commercial products in terms of added value in Turkey's economy. The value of sugar beet production represents 2.5% of the total value of total crop production (Yavuz, 1998). Turkey started sugar production in 1926 and became self sufficient in 1934. Sugar production became a monopoly under the control of the government after enacting the Sugar Monopoly Act in 1929 (Kıymaz, 2001). The Sugar Factories Corporation of Turkey was established in 1935

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to unify sugar factories and to balance sugar production and consumption. The Sugar Act (no. 6747) was enacted in 1956 and all laws related to the sugar sector were unified under one law that applied until 2001 when a new Sugar Act was passed.

Turkey's sugar beet production increased steadily until the 1950s when there was a jump in sugar beet planted areas because of a rapid increase in the number of sugar factories (TŞFAŞ, 2002). There was a slow decreasing trend in the 1960s and a rapid increasing trend in the 1970s, while sugar beet planted areas started decreasing slowly in 1980 until 2001. Trends of planted sugar beet have been mainly affected by government policies towards the sugar beet sector because sugar beet cropping had been regulated by the government. The production fluctuations led to sugar exports in some years and imports in others because sugar consumption increased more steadily compared to the sugar production fluctuations. Turkey used to import sugar before 1941 but started exporting it in most years after the 1960s. In general, sugar beet production does not fluctuate in the EU as much as it does in Turkey. Sugar beet consumption in the EU has not changed much since 1979, while production has fluctuated slightly above consumption (Bullock and Nitsi, 2001). This may be due to the quota in the EU that constrains sugar beet production according to domestic consumption.

The sugar support price has been determined at the level of 10% above production cost for sugar beet that contains 16% sugar with additional sugar content and an early harvest premium having been further paid. Sugar beet farmers have received early payments of up to 40% before the harvest (Özçelik and Fidan, 2002). Some of these payments are spent on inputs such as fertilizer and seed at half price. Maintenance of machines and equipment used in planting and harvesting has been provided by the Sugar Corporation which has also exported some sugar at world prices when sugar stocks are high and has given certain corporations the authority to export. Sugar production is protected from low world prices using a high level of tariff. This tariff was declared as 150% above the world price and was reduced by 10% until 2004 because of URA provisions (Yücel and Ünal, 2002). The sugar quota was first applied in 1999 and the law related to sugar quotas was passed in 2001. Quotas A, B and C were determined under this law to comply with sugar production for domestic consumption and export to adapt policies in the sugar sector to the policies in the EU. Quota A is the amount of sugar that is produced and marketed according to domestic demand in the same marketing year. Quota B is the amount produced to meet a certain ratio of quota A for safety. Quota C is the amount of raw and white sugar that is produced in addition to quotas A and B and provided for processing and export with the sugar that was not able to be marketed domestically (Başbakanlık, 2001).

The impacts of URA provisions and the adaptation of Turkey's sugar sector policies to EU policies have been extensively discussed recently. Some researchers have exaggeratedly stated that such pressures from abroad would lower the sugar beet production level and income of sugar beet producers, because Turkey would become a market for world sugar producers (Konyalı and Gaytancıoğlu, 2002; Tortopoğlu, 2002). On the other hand, others have said that these policies would bring about structural improvement in the sugar sector to allow it to integrate into the world sugar market, and would also reduce government expenditure (Özçelik and Fidan, 2002; Yücel and Ünal, 2002).

The objective of this study is to determine the impacts of the sugar quota policy enacted recently and of the URA provisions imposed on sugar tariffs. In order to determine these impacts, demand and supply models were estimated, the equilibrium price and quantity of the sugar beet sector for 2000 was determined, classic welfare analysis of the policies was performed and finally conclusions were drawn from the results.

Materials and Methods

Data used in this study were mainly drawn from the web page of the Sugar Company of Turkey (TŞFAŞ, 2002). These data are time series and represent 21 years, from 1980 to 2000. The other data and the parameters for comparison were drawn from previous studies (Bullock and Nitsi, 2001; Koç et al., 2001; Tarakçıoğlu, 2001). All prices and incomes were indexed to 1987 prices and converted to the U.S. dollar using the exchange rate (855.69) of the same year. The quantity of sugar beet was converted to its sugar equivalent (7.91), which was calculated using current data.

Demand and supply equations were estimated for the sugar sector in order to conduct classic welfare analysis measuring the impacts of URA provisions and sugar

production quota policy. These supply and demand models were formed as the following equations:

$$s = f(f, y, p_{sb(t-1)}, p_{w(t-1)}, p_m, p_f) \quad (1)$$

$$d = f(n, p_ş, i) \quad (2)$$

s: sugar equivalent of sugar beet production (thousand metric tons)

f: number of farmers producing sugar beet (thousand)

y: sugar beet yield (kg ha^{-1})

$p_{sb(t-1)}$: sugar equivalent of 1 year lagged sugar beet price (U.S. dollars kg^{-1})

$p_{w(t-1)}$: one year lagged wheat price (U.S. dollars kg^{-1})

p_m: price of diesel fuel (U.S. dollars $liter^{-1}$)

p_f: price of fertilizer (U.S. Dollars kg^{-1})

d: domestic sugar consumption (thousand metric tons)

n: population (thousand)

$p_ş$: sugar price (U.S. dollars kg^{-1})

i: income (thousand U.S. dollars)

Double logarithmic demand and supply models of sugar sector were estimated using ordinary least squares method in the Shazam econometric computer program (Shazam, 1997). Estimated models were tested for autocorrelation, heteroskedasticity and stability using Durbin-Watson, BPG and Chow tests, respectively.

The impact of policy changes was analyzed using classic welfare analysis that employs the demand and supply models estimated in this study. The impacts of policy changes on producers, consumers and tax payers were calculated and net social benefit was thus determined. The prices and quantities for 2000 were used in these analyses.

Results and Discussion

Supply and demand models were estimated with 0.969 R^2 and 0.739 R^2, respectively (Tables 1 and 2). The signs of the parameters are in agreement with economic theory. Among the parameters, the number of farmers, sugar beet yield and price of sugar beet were significant. The Durbin-Watson and BPG tests showed that the models did not have autocorrelation and heteroskedasticity problems respectively. The Chow test indicated that sugar production and consumption structure did not change during the period 1980-2000, thus the model could be estimated using whole data to

Table 1. Estimated parameters of supply model of the sugar sector.

	R^2 = 0.969			
Variables	Coefficient	Standard Error	P-Value	Elasticity
Number of farmers	0.976	0.117	0.000	0.976
Sugar beet yield	1.122	0.129	0.000	1.122
Sugar beet price (t-1)	0.322	0.110	0.011	0.322
Wheat price (t-1)	-0.043	0.098	0.665	-0.043
Diesel Fuel Price	-0.122	0.116	0.312	-0.122
Fertilizer price	-0.015	0.027	0.592	-0.015
Constant	-10.152	1.14	0.000	

Table 2. Estimated parameters of demand model of the sugar sector.

	R^2 = 0.740			
Variables	Coefficient	Standard Error	P-Value	Elasticity
Population	0.375	1.392	0.791	0.375
Sugar market price	-0.040	0.180	0.828	-0.040
Income	0.329	0.429	0.454	0.329
Constant	-2.833	7.735	0.719	

estimate the parameters. The P values of the Durbin-Watson, BPG and Chow tests were 0.04, 0.82 and 0.34 for the supply model and 0.53, 0.28 and 0.87 for the demand model, respectively. In other words, the tests were not significant at the 1% significance level. All of these estimation results show that the models can be used to represent the sugar sector. Estimated supply and demand models and calculated equilibrium conditions are shown below.

Supply model (figures in parentheses are t values)

$$s = \underset{(-6.290)}{-10.152} + \underset{(8.360)}{0.976}\, f + \underset{(8.702)}{1.122}\, y + \underset{(2.914)}{0.322}\, p_{sb(t-1)} - \underset{(-0.442)}{0.043}\, p_{w(t-1)} - \underset{(-1.049)}{0.122}\, p_m - \underset{(-0.548)}{0.015}\, p_f \qquad R^2 = 0.969$$

Demand model (figures in parentheses are t values)

$$d = \underset{(-0.366)}{-2.833} + \underset{(0.269)}{0.375}\, n - \underset{(-0.221)}{0.0398}\, p_s + \underset{(0.767)}{0.329}\, i \qquad R^2 = 0.739$$

Supply model with price as only endogenous variable

$\xi = 0.322 \rightarrow \xi = \beta * p/q \rightarrow \beta = 1335.6$

$\alpha = q - \beta * p \rightarrow \alpha = 1335.7$

$s = 1335.7 + 1335.6 * p$

Demand model with price as only endogenous variable

$\xi = -0.0398 \rightarrow \xi = \beta * p/q \rightarrow \beta = 163.9$

$\alpha = q - \beta * p \rightarrow \alpha = 1883.8$

$d = 1883.8 - 163.9 * p$

Market equilibrium price and quantity

$s = d$

$1335.7 + 1335.6 * p = 1883.8 - 163.9 * p$

$1499.5 * p = 548.1$

$p^* = 0.366$

$q^* = 1825$

Current policies

The current position of the sugar sector is presented in Figure 1. Under existing policies, the market price of sugar is $0.44 per kg and the quantities supplied and demanded are 1.923 and 1.812 million tons, respectively. As a result of support policy compared to market equilibrium, government spending was 142 million U.S. dollars. Since the gains of sugar producers exceed the losses of sugar consumers by only 4 million U.S. dollars, social benefit was reduced by 138 million U.S. dollars because of the support policies. These figures are relatively close to the figures in the recent literature (Akbay, 2002). The impacts of existing policy are as follows:

Government spending:	142 million U.S. dollars
Surplus gained by producers:	139 million U.S. dollars
Surplus lost by consumers:	135 million U.S. dollars
Decrease in net social benefit:	138 million U.S. dollars

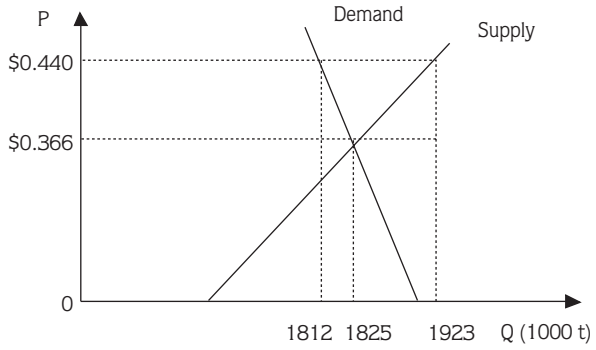

Figure 1. Turkey's sugar market under existing policies.

Production quota

In the framework of adopting Turkey's policies to the EU, where sugar production quotas, designated as A, B and C, are allocated to each member state, this scenario is implemented (Bullock and Nitsi, 2001). Since the production quota policy was only recently implemented, the impact of this policy has not yet been completely understood. In order to analyze the impact of the quota policy, information in the literature was used. In the last 3 years (1999-2001), production quotas reduced the sugar beet planted area by 5.54% based on 1980-1982

average planted areas (Özçelik and Fidan, 2002). The production quota policy reduced domestic production by 107,000 tons but did not change domestic consumption (Figure 2). Compared to the current situation, this policy caused government spending and the producer surplus to decline by 95 million and 9 million dollars, respectively, while the consumer surplus remained the same. The sum of all these caused net social benefit to increase by 86 million dollars. The implications of the production quota are as follows:

Decline in government spending: 95 million U.S. dollars
Surplus lost by producer surplus: 9 million U.S. dollars
Change in consumer surplus: 0 million U.S. dollar

Increase in net social benefit: 86 million U.S. dollars

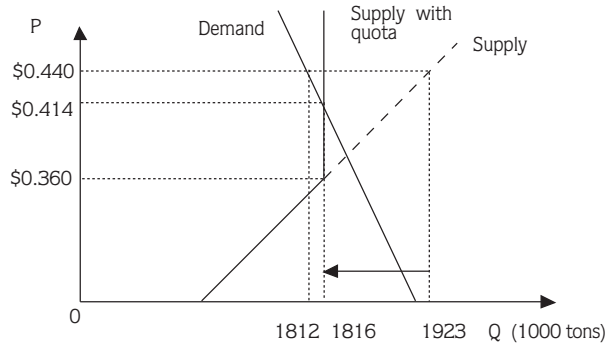

Figure 2. Turkey's sugar market under production quota.

Free trade using 2000 world prices

The free trade scenario is usually a benchmark in studies that analyze policy impacts (Tweeten, 1992). Therefore, the case of completely free sugar trade at the 2000 world price level ($0.28) was first analyzed (FAO, 2002). Compared to the case under existing policies, free trade at 2000 world prices reduces domestic production by 11.1% (213,000 tons) and increases domestic consumption by only 1.5% (26,000 tons).

All government spending on support policies disappeared because of this policy, while the decline in the producer surplus was almost offset by an increase in the consumer surplus (Figure 3). Thus, the 142 million U.S. dollar decline in government spending and the 1 million U.S. dollar difference between the increase in the consumer surplus and the decline in the producer surplus was reflected by an increase of 143 million dollars in net social benefit. Brief results of the free trade scenario are as follows:

Decline in government spending: 142 million U.S. dollars
Surplus lost by producer: 291 million U.S. dollars
Surplus gained by consumer: 292 million U.S. dollars

Increase in net social benefit: 143 million U.S. dollars

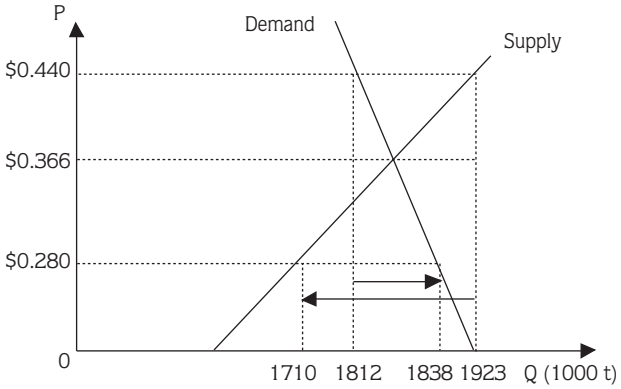

Figure 3. Turkey's sugar market under free trade scenario.

URA provisions

The URA first addressed trade barriers by converting market distortions to tariff equivalents and reductions in these tariffs among provisions for agriculture including market access, domestic support and export competition (FAO, 2002). In this scenario, tariffs on sugar imports were reduced by 10% from 150% to 135% which was accommodated by Turkey under the URA provisions (Figure 4). Given the lowest sugar price of $0.2028 from Brazil in the world sugar market, the price including the 135% tariff at the border would be $0.477 ($0.2028 * (1 + 1.35)). Since the domestic price in 2002 was $0.44, the 135% tariff protects domestic production. In other

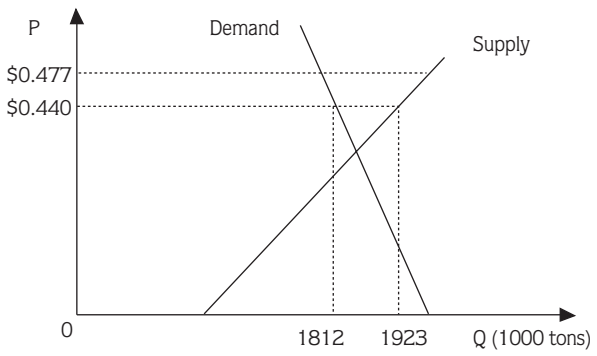

Figure 4. Turkey's sugar market under URA provisions.

words, a 10% decrease in tariffs has no impact on Turkey's sugar sector. This result is in line with the conclusion of Devadoss and Kroph (1996) that indicates that the impact of the URA provisions on sugar production is rather small in those countries which accommodated the policy reforms required through policy changes.

Conclusions

Compared to the current situation, the production quota scenario reduced domestic production but did not change domestic consumption. This policy also reduces the support policy burden on the government. The free trade scenario increases net social benefit by eliminating the support burden on the government. The reduction of 10% in tariffs for imported sugar under the URA provisions did not affect the domestic market because the world price plus tariff was still above the domestic price.

Turkey's efforts to become a member of the EU may succeed with the adaptation of agricultural policies in Turkey to those of the EU. Thus, policies such as sugar production quotas will inevitably be implemented in Turkey by adapting them at a minimum cost or probably with a gain, which is the result of this study.

The URA provisions do not affect Turkey's sugar sector in the short term. However, taking into consideration the declines in tariffs around the world because of the URA provisions, Turkey should reduce costs by structural enhancement in the sugar sector as well as in other sectors to compete with the world market in the long term.

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