The Turkish Sugar Industry in the Aftermath of EU Sugar Reform

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In this paper we analyze the potential impact of the EU sugar reform on the Turkish sugar industry. Turkey's candidacy to the EU and its strong economic links to the region imply that EU sugar policy will likely to be binding for Turkey as well in which case this will lead to a decrease in prices of Turkish sugar by no less than 55%. Turkish sugar industry will be seriously affected by the reduction in beet and sugar prices which will not be offset by possible increases in world sugar prices. Growers on contract will decline substantially. Since the reduction in growers contracted is more extensive than declines in sales, we can predict that the sugar industry will be transformed as a result of the synchronization with EU policies. In the aftermath of this transformation, we expect to see larger and more efficient plants prevail with increased capacities and work with fewer growers with large acreages.

Introduction

The EU-25 Commission submitted a proposal to drastically reform sugar in June 2005 following a World Trade Organization (WTO) Panel ruling that found the EU sugar regime in violation of WTO export commitments and the "Everything But Arms" (EBA) agreement in which the EU agreed to phase out tariffs by 2009 on imported raw sugar from 48 of the least developed countries. The proposed reforms include reducing sugar prices by 36 percent from €631.9 to €404.4 per metric ton over a 4-year phase-in period beginning in 2006/07, reducing minimum sugar beet price by 39.5 percent to €26.3/mt over the phase-in period as well as compensating farmers for the price cut.

Turkey is in the midst of accession talks with the EU and is expected to become a full member in 2015 and will be subject to all EU practices as such. Turkish sugar prices are expected to decrease by 55 % from current levels as result of the EU sugar reform as Turkish sugar industry is heavily subsidized and protected from cheaper imports. In this paper, we analyze the effect of the changes in the EU sugar policy on the Turkish sugar industry. . In the next section, sugar production in the EU is presented and compared with Turkey. In the third section the price elasticity of supply is analyzed based on plant level data

Literature on Sugar Industry

Sugar is produced from sugar cane and sugar beet. Sugar cane is a perennial crop grown in tropical areas and sugar beet is an annual crop found in temperate climates. Sugar cane is converted into raw sugar in mills and requires further refining whereas sugar beet can be directly processed into refined sugar. Both raw sugar and refined sugar are traded internationally, each representing 50 percent of total sugar exports.

Sugar consumption has been growing on a steady basis, approximately 2 percent per annum. In 2006, world sugar consumption amounted to 150 million tones up from 75 million tonnes in 1970. From 1970 to 2001, world sugar production averaged 101.2 million tonnes annually. The EC, Brazil and India are the largest producers and the EC and India are also large consumers. The EU is a major exporter as well as importer. The EC Sugar Protocol is therefore an important factor in world sugar trade. Frandsen et al. (2001) based on scenario analysis of EU sugar policy have concluded that EU sugar policy is distortionary to world sugar trade and depresses sugar production in developing countries for which sugar production is an important source of income. Brazil is the dominant player in world sugar trade: it is the largest exporter and among the top five consumers. A number of studies (Schmitz et al. (2005), Frandsen et al. (2001)) have shown that under complete global trade liberalization in the sugar market, the gains would be large, especially in many of the Latin American and Caribbean countries, Brazil in particular, where production and export would increase as a result of higher world prices.

The Turkish sugar industry is heavily subsidized. Almost all sugar production is from sugar beets and for domestic consumption. The government sets minimum prices for sugar beets and this has resulted in prices that are 3 times higher than world prices or more.

In this paper we analyze the consequences for Turkish sugar industry of harmonization with EU sugar policy reform. The effect of EU policies on the Turkish economy have been investigated mainly in the context of the Customs Union. (Harrison (1997), Togan (1997), Mercenier and Yeldan (1997)). Agricultural products were not part of the Customs Union and hence have not been investigated in the EU context to the same extent. A notable exception is Grethe's (2003) partial equilibrium analysis of the effects of including agricultural products in the Customs Union. His analysis finds that domestic sugar prices will decline by 32 percent if the Customs Union was extended to include agricultural products.

Data

In this section, factors that affect sugar production will be investigated. In order to be able to study the dynamics that have been influential in the sector in the past few years, panel data analysis will be utilized. The focus of analysis is the recent past. Data on sugar plants have been utilized. Plant production, employment and sales data have been extracted from the Turkish sugar plants A.S. (TSFAS) World sugar prices are taken form the US Agriculture Ministry and Turkish sugar prices have been compiled from various sources in Turkey. Export and imports of sugar related goods is taken from the Turkish Foreign Trade Ministry. The sugar beet planting fields in Turkey, the employment that is created as a result, sugar production and sugar sales are analyzed for the 1997-2005 period. Data on 27 plants have been used. The total production of these plants constitute 83% of Turkish sugar production in this period. This study focuses on the sectors price elasticity of supply as the EU Common Agricultural Policy is expected to push sugar prices down in Turkey by 35%.

In Table 1, the variables that are used in the analysis are listed with brief descriptions and sources. Table 2 presents descriptive statistics on these variables. The total sales in Turkey in this period are 1.23 million tons per year with a standard deviation of 33950 tons. Minimum sales in the period was 1.19 million tons and maximum sales was 1.29 tons. Apart from structural breaks in the mid 1970s and early 1980s, world sugar prices have been relatively constant. From 1997 to 2005, nominal prices averaged US$241 per ton. World sugar prices reached 14-year lows in February 2000. Since then, large stocks and greater than expected harvests have damped any significant rally in the market. The volatility in sugar prices, particularly in recent years, is also due to the short-term rigidity of the supply response to price changes. In this period, average sugar prices in Turkey have been three times higher than the world average.

Average annual sales per plant is 48,127 tons with a standard deviation of 38,576. Average plant capacity is 3,673 tons per day. The smallest plant has a capacity to process 1200 tons pre day compared to the largest at 7000 tons per day. Average campaign period is 104 days. Average area planted per plant per year is 11,594 hectares. Number of growers on contract per plant per year is 13,807 people.

Methodology

Plants vary substantially by size and this suggests that the appropriate estimation technique is the least-squares dummy-variable approach also known as the covariance or the fixed-effects model. This model is usually denoted as

$$Y_{it} = \sum_j \beta_j X_{it,j} + \sum_n \gamma_j D_{it,n} + \varepsilon_{it} \qquad (1)$$

where Xs are the explanatory variables and Ds are the dummies for each plant.

It is common practice, when dealing with pooled cross-section and time-series data, to also estimate what is known as the error component or random-effects model and compare the relative efficiency of the two models.

The reasoning behind the random-effects model is that, since the error term is generally considered to represent the effect of omitted variables, and some of the omitted variables could represent factors peculiar to individuals or time periods or both, the error term should be treated as consisting of three components. The model then can be represented as

$$Y_{it} = \mu + \sum_j \beta_j X_{it,j} + v_{it} \qquad (2)$$

where $v_{it} = \alpha_i + \lambda_t + v_{it}$.

The advantage of using an error component model is that we save a number of degrees of freedom, since we do not need to estimate individual-specific intercepts, and thus obtain more efficient estimates of the regression parameters. The disadvantage is that if the cross-sectional characteristic were also captured by the explanatory variables in the regression, the estimates would have become biased and inconsistent.

Results

In Table 3, we present fixed-effects regression results on sales, growers contracted and employment. The fixed-effects model was compared to the random-effects model via the Hausman test which revealed that the random-effects model did not provide an improvement over the fixed-effects model, therefore only the fixed-effects estimates are presented in Table 3.

Due to severe multicollinearity between domestic beet price and sugar price, we include three sets of results for each variable. The first set of results includes all three price variables and these results are used for scenario analysis. The other two sets, include beet price and domestic sugar price separately. We use contemporaneous prices rather than lagged prices. Beet prices are determined by the government, which in turn determine domestic sugar prices. Sugar plants contract farmers at the beginning of the season and the price that is determined is a function of the lobbying power of the growers and supply. In this type of an environment, the effect of price changes on growers contracted or employment are not straightforward. With this caveat in mind, we nevertheless investigate the effect on prices on plant sales, employment and growers contracted.

The dependent variable is sales rather than production because increases in sugar production due to higher prices require significant long-term capital investment. When prices fall, production continues at full capacity in order to spread the fixed costs, hence sugar supply tends to be inelastic with respect to price in the short-term.

World and domestic sugar prices are significant determinants of sales. Total sales measures market size and is a significant determinant of plant sales.

We also analyze the number of growers contracted as a function of prices. The number of growers on contract increase with increases in world prices.

Our perverse results on employment are due to the employment structure in the sector. These plants started out as state owned enterprises and employment in the sector was used as political favors. In the privatization stage, employment declined and hence we cannot get meaningful results on the effect on employment on expected price declines.

Scenario analysis of the effect of EU sugar reform on Turkish sugar industry

In this section we analyze the effect of EU sugar reforms on the Turkish industry. The base case scenario assumes beet price falls by 59 percent and sugar price falls by 55 %. Since current prices in Turkey are higher than in the EU, these are the corresponding expected changes in prices relative to current level after the EU sugar reform has been completed. EU sugar reform is likely to have an effect on world prices as well however for the base case scenario we assume world prices remain unchanged. Changes in total sales, employment and growers are computed by inflating predicted per plant changes in the variables by thirty since this is the size of the industry by 2003/2004 season levels.

In the scenario 2 and 3 we calculate the effect of changes in world prices after Turkish sugar prices are synchronized with EU prices and the EU sugar reform is completed. We provide figures for changes in the rate of 10 percent in both directions. Trade liberalization is expected to lead to increases in world prices; however, magnitudes of expected changes vary substantially.

We then open the sugar market to competition from cane sugar. Cane sugar is not a substitute for sugar in final consumption, however, raw sugar is a substitute for refined sugar in production. In scenarios 4 and 5 we assume the xxxx industries that use sugar as an input will be taken over by cane sugar by 50 and 100 % respectively.

For the 5 scenarios discussed above, we present 95 % confidence intervals for sales, employment and farmers on contract.

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At the base case, 95 percent confidence interval for expected plant sales are in Turkey is -12 % ± 33 %. The interval is wide reflecting the range of effects on plants of different sizes. Decreases in sugar prices will have a positive effect on demand which would work in favor of the more efficient plants. These plants will not be affected to the same degree by declining sugar prices

since they will be able to reap the benefits from reduced costs due to lower beet prices. However, smaller and less efficient plants will realize substantial annual losses in sales and will not be able to survive the vastly changes economic environment.

Although the massive reduction in sugar prices is somewhat offset by equally massive reductions in beet prices for part of the industry, the effect of lower beet prices will have devastating effects on farm employment.. The 95 percent confidence interval for expected plant sales are in Turkey is -31 % ± 26 %. The interval is wide yet negative everywhere indicating the sure decline in the number of growers on contract. A reduction in beet prices of this magnitude will reduce growers on contract in two ways. Firstly, lower beet prices will make other crops relatively more attractive so farmers will choose not to plant beet. In addition, lower sugar prices combined with lower beet prices will lead to loss of less efficient plants in the industry and result in fewer farmers being contracted.

In scenarios 2 and 3 we calculate the effect of changes in world prices after Turkish sugar prices are synchronized with EU prices and the EU sugar reform is completed. We provide estimates for changes in the rate of 10 percent in both directions. Trade liberalization is expected to lead to increases in world prices, however, magnitudes of expected changes vary substantially so we opt to provide sensitivities to a basic 10 % change in world prices. We acknowledge, however, that the EU after reform prices are quite a bit higher than current world prices which would put upward pressure on world prices. In Scenario 2, world prices decline by 10 %. This is not a likely scenario since world prices today are lower what should prevail under free trade. However, this scenario is useful to gauge the sensitivity to price changes of Turkish sugar production.

A 10 percent decline in world prices, will reduce sales of average plant sales by 14 % and decrease the number of growers on contract by 47 %. Decline in world prices leads to further declines in growers on contract. Average plant sales is not affected too much by a decline in world prices of this magnitude. We conclude that efficient plants in the Turkish sugar industry will be able to withstand a 10 percent decline in world prices. Scenario 3 assumes world prices increase by 10 %. Trade liberalization in world sugar markets is expected to lead to increased prices form current levels. An increase of this rate translates into a decrease in sales of 11 %. Growers on contract still declines substantially by 20 percent.

The analysis of the above scenarios indicate that the Turkish sugar industry will be seriously affected by the reduction in beet and sugar prices which will not be offset by possible increases in world sugar prices. Growers on contract will be substantially reduced. Since the reduction in growers contracted is more extensive than declines in sales, we can predict that the sugar industry will be transformed as a result of the synchronization with EU policies. We expect to see larger and more efficient plants prevail with increased capacities and work with growers with large acreages.

We then open the sugar market to competition from cane sugar. Cane sugar is not a substitute for sugar in final consumption, however, raw sugar is a substitute for refined sugar in production. Based on the 1996 input-output tables the 16.6 percent of the output of the sugar industry is used in manufacturing. In scenarios 4 and 5 we assume that sugar produced from beet in Turkey will lose market share to cane sugar by 50 and 100 % respectively. These scenarios highlight the

devastating effects of competition from cane sugar. A loss of 50 % of the market to cane sugar is expected to lead to a 23 percent decline in Turkish sugar sales. The loss of 100 % of the market will lead to a reduction 33 percent.

The scenarios above indicate that the greatest threat to Turkish sugar industry is not the reduced prices per se but the competition from cane sugar. The scenarios we have analyzed are based on price levels in sync with EU sugar policy reform. However, at these prices Turkish and EU sugar prices are still substantially higher than world prices. Therefore, it is likely that Turkish sugar prices will fall even more and world prices will increase. With liberalization of world sugar markets, cane sugar will become a serious threat. The degree of competition from cane sugar with free trade should be investigated in detail.

Turkish sugar prices will fall due to EU sugar reform and are likely to fall even further. At such low prices, part of the Turkish sugar industry will not be able to survive. The smaller and less efficient plants will need to close unless through investment in new technology and improvements in management gains in efficiency can be realized. The most important effect though is on the growers of sugar beet. Currently around 400 thousand farmers grow sugar beet. This number will be reduced substantially. Most of these farmers will be forced to plant other crops possibly reducing prices in other agricultural products. All this is bound to result in a large decline in farm incomes. Measures to combat this major transformation in agriculture are necessary.

Conclusions

If the EU sugar policy is adopted in Turkey, there will be major welfare gains and losses. In particular, consumers will gain while growers and workers will lose. The massive reduction in sugar prices will be somewhat offset by equally massive reductions in beet prices for part of the industry, but the effect of lower beet prices will have devastating effects on farm employment in sugar. A reduction in beet prices of this magnitude will reduce growers on contract in two ways. Firstly, lower beet prices will make other crops relatively more attractive so farmers will choose not to plant beet. In addition, lower sugar prices combined with lower beet prices will lead to loss of less efficient plants in the industry and result in fewer farmers being contracted. Currently around 400 thousand farmers grow sugar beet. This number will be reduced substantially. Most of these farmers will be forced to plant other crops possibly reducing prices in other agricultural products. All this is bound to result in a large decline in farm incomes. Measures to combat this major transformation in agriculture are necessary.

The less efficient plants will need to close unless through investment in new technology and improvements in management gains in efficiency can be realized. The implications for the Turkish government and the Turkseker are huge. Turkseker is privatizing the most efficient plants but will be left with inefficient plants that cannot be shut-down due to associated social costs. The inefficient plants are located in less developed regions and shutting them down will be politically and socially too costly. On the other hand, these plants will prove to be very costly in a more liberalized market. As a solution, Turkseker is working on a new privatization model where an efficient plant will be bundled with less efficient plants and privatized as a group. The trade union projects that the Turkseker plants will not be able to compete in the domestic market even today with the loss of efficient plants and annual excess stocks will amount to 1 million ton.

On the other hand, the transformation in the Turkish sugar industry will result in contributing private and privatized plants that are larger, more efficient and working with fewer growers with larger acreages.

There will also be long-term impacts of restructuring reform. If the sugar industry can be transformed with success, a potential for exports could be created. Turkey is a large consumer and currently self-sufficient. New investments in the sugar industry are being made. The EU market is expected to become a net importer of sugar with imports exceeding 3 million tons[1] and Turkey can have an export potential in this market as well as the Middle East, providing its sugar production is cost efficient internationally.

An important topic of concern is diversification and competition within the sugar industry itself. Starch-sugar is rapidly gaining ground relative to beet sugar. Starch-sugar is not a substitute for sugar in final consumption; however, it is a substitute for beet sugar in food manufacturing. Based on the 1996 input-output tables the 16.6 percent of the output of the sugar industry is used in manufacturing. A fight over quotas is ongoing for this market between producers of sugar beet and starch. This, however, is a topic outside the framework of this paper.

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[1] Projections of the FAPRI model at Iowa State University (http://www.fapri.iastate.edu).

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Table 1: Sources and Definitions of Variables

Variable	Definition	Unit	Source
TOTSALES	Total sugar sales in Turkey	Tons	
BEETPR	Average price for beet	TL/Kg	TŞFAŞ
WORLDPR	World price of sugar	Tons/$	
PRICE	Domestic price of sugar	Tons/$	
IMPORT	Imports of foods containing sugar	$	DTM
EXPORT	Exports of foods containing sugar	$	DTM
CAMPAIGN	Length of campaign	Days	TŞFAŞ
CAPACITY	Capacity	Tons/Day	TŞFAŞ
AREA	Beet planting area	Hectares	TŞFAŞ
GROWERS	Number of growers contracted	Person	TŞFAŞ
PROD	Total sugar production	Tons	TŞFAŞ
SALES	Sugar sales of plant	Tons	TŞFAŞ
EMP	Total employment	Person	TŞFAŞ

Table 2. Descriptive Statistics

	Obs.	Average	Std. Dev.	Minimum	Maximum
TOTSALES	162	1233277	33950	1190098	1285717
BEETPR	216	52963	34120	12128	108383
WORLDPR	216	241	33	201	316
PRICE	216	720	203	473	1091
IMPORT	216	129183783	63126462	78036675	237345152
EXPORT	216	341823780	65656505	253774742	449329909
CAMPAIGN	215	104	39	0	188
CAPACITY	215	3673	1844	1200	7000
AREA	215	11594	6831	0	37271
GROWERS	215	13807	7520	0	39832
PROD	215	61198	44757	0	201805
SALES	215	48127	38576	0	192691
EMP	215	673	223	156	1272

Table 3: Regression Results (Fixed-Effects)

Independent Variables	Dependent Variable								
	TOTSALES	TOTSALES	TOTSALES	GROWERS	GROWERS	GROWERS	EMP	EMP	EMP
TOTSALES							-0.00007 (0.0005)	-0.00026 (0.00055)	-0.0001 (0.0005)
BEETPR	-0.049 (0.149)	0.09** (0.04)		0.196 *** (0.0313)	-0.0042 (0.0068)		0.0012 (0.0008)	-0.0015 *** (0.00017)	
WORLDPR	477.35*** (164.53)	339*** (85)	432.736 *** (93.620)	-116.321 *** (34.775)	74.986*** (21.395)	64.476*** (22.052)	-2.938*** (0.977)	-0.268 (0.553)	-1.799 *** (0.571)
PRICE	18.487 (18.808)		12.477 *** (4.743)	-25.519*** (3.918)		-1.433 * (0.844)	-0.348 *** (0.107)		-0.198*** (0.021)
IMPORT									
EXPORT	-0.000068*** (0.00002)	-0,000056*** (1,66E-05)	-0.0000642*** 0.0000172	-0.0000033 (0.0000044)	-0.000019 *** (00000419)	-0.00001705 (0.00000428)	0.000000289 ** 0.000000124	0.000000067 (0.000000107)	0.0000002 * (0.000000108)
COMPAIGN	655.408 *** (46.973)	676*** (42)	661.863 *** (42.565)	3.276 (9.491)	-21.945** (9.960)	-24.264 (9.574)	1.270 *** (0.4332)	1.056 * (0.444)	1.127*** (0.423)
AREA	0.407 (0.496)	0,498 (0,487)	0.454 (0.474)						
SALES	0.121 *** (0.033)	0,106*** (0,029)	0.117 *** 0.0295627	-0.0186** (0.007)	0.0022 (0.0073)	0.00084 (0.0073)	-0.0004 ** (0.0002)	-0.00012 (0.00019)	-0.00029 (0.00018)
EMP	-4.211 (15.086)	-8,726 (14,367)	-5.057 (14.815)						
F-stat	97.2678	100.2127	100.9199	81.3528	62.5322	63.8203	84.8800	81.0927	86.7517
# obs	161	161	161	161	161	161	161	161	161

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Table 4: Scenarios
(95 % Confidence Intervals for Average Plant)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Beet Price	-59%	-59%	-59%	-59%	-59%
Sugar Price	-55%	-55%	-55%	-55%	-55%
World Sugar Price	0	-10%	+10%	0	0
Loss of market share to cane sugar				50%	100%
Sales (±33 %)	-12 %	-14%	-11 %	-23 %	-33 %
Growers (±26 %)	-31 %	-47 %	-7 %		

The changes in price are relative to 2004/2005 season averages. Beet price for the 2004/2005 season is 120000 TL, domestic and world sugar prices $890are $240 respectively. The standard error of estimate for sales is 8139 and for growers 1838. Average plant sales is 48,127 tons/year and growers contracted on average per plant is 13,807.