COMPARATIVE TECHNICAL EFFICIENCIES OF STATE AND PRIVATELY OWNED SUGAR PLANTS IN TURKEY

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I. Introduction

In recent years, market economy and privatization have taken a broad place in economics and politics. That the market combined with private ownership would create more efficient results in any case than their alternatives (planned economy and state ownership) has been the major argument of the zealous defenders of market.

Pro-privatization views echoed in Turkey as well. State enterprises, once seen as driving force of the industrialization, were criticized for their inefficient operation, and burden on the government budget. Turkish government launched a broad privatization program in 1980s. The program aimed to privatize many public firms producing essential goods and services

Theoretical perspectives on privatization are based on shortcomings of public firms in efficiency.[1] It is claimed that unlike private firms, which aim solely for efficient operation, public firms (PFs) have multiple targets like regional development, providing low-priced inputs for private companies, etc. Even if the efficient operation is aimed, they have two main drawbacks to do so. First, ownership of PFs are held by the whole citizenry of a country without their will, and the returns and costs of the ownership are too small and are not easy to observe. Hence, there is too little incentive for owners to monitor PFs' performance and to set incentive mechanisms to achieve a better performance. Accordingly, there is too much room for agency costs (Alchian and Demsetz (1972); Jensen and Meckling (1976)). Second, PFs usually have monopolistic or oligopolistic position in product market. Therefore, they are deprived of the driving force of competition.

It is obvious that the knowledge of how inefficient the PFs that government wish to privatize are and whether privatized firms become more efficient are essential for a privatization program. This is because the case for privatization rests primarily on the argument that private firms operate more efficiently. Numerous studies on the performance of public and private firms in many countries show varied results (see for instance, Davies (1971), Pescatrice and Trapani (1980), Bruggink, (1982), Picot and Kaulman (1989), and Vickers and Yorrow (1989)). However, there have not been many studies investigating the inefficiencies of public as well as private firms in Turkey. Among the limited number of studies, Cakmak and Zaim (1991) examined the relative technical efficiency differences among private, public, and mixed cement firms in Turkey and found no significant technical efficiency differences among them. Krueger

[1] For a detailed discussion of the following arguments see Vickers and Yarrow (1989).

and Tuncer (1982) estimated measures of productivity for the state and privately owned industrial firms and obtained similar results. However, Ozkan-Gunay (1997) estimated technical efficiency of Turkish banks with different ownership structures and found private banks more efficient than state owned banks.

In this study, we examine the Turkish sugar industry. Traditionally, sugar was seen as a strategic product and its production and distribution were controlled by the government through state owned sugar plants. With the market liberalization of the 1980s, however, sugar plants were included in the privatization program just like many other PFs. Starting in early the 1990s, three sugar plants were privatized.

This study examines the Turkish Sugar Industry with the following objectives: (1) to estimate the average technical inefficiency level of sugar industry as well as technical inefficiencies of individual sugar plants, and (2) to determine relative technical inefficiencies of sugar plants which have different ownership structures and incentive mechanisms to find out whether privatization promoted technical efficiency. For this purpose, we use the stochastic production frontier approach commonly used in inefficiency studies. The results provide empirical evidences and insights for privatization debate and sugar market in Turkey.

The paper is divided into five sections. In the section II, we review sugar plants and sugar market in Turkey. The econometric methodology is discussed in the section III. The section IV presents the empirical results. Finally, the section V concludes the paper.

II. Turkish Sugar Industry: Production, Market, and Ownership

The first two sugar plants in Turkey were established in 1920s by private entrepreneurs. In the extraordinary conditions of the 1929 Economic Crisis, these plants were bought by the state. Two other plants were built by the state in 1933 and 1934. Ownership rights and management of all these plants were later transferred to Turkish Sugar Plants Ltd. (Turkseker), a government owned company, established in 1935. The company was also authorized to build and manage new plants. Sugar shortcomings after the World War II triggered a new wave of state investments and thirteen new plants (Adapazari, Amasya, Konya, Kutahya, Burdur, Susurluk, Kayseri, Erzincan, Erzurum, Elazig, Malatya, Ankara, and Kastamonu) had been established between 1951 and 1964. The minority shares of five of these new plants (Adapazari, Amasya, Kayseri, Kutahya, and Konya) were transferred to the Sugar Beet Producers' Cooperatives (SPC), in exchange for government debts to SPC. A new status was **also** given to these plants under the name of 'affiliated' firms. Between 1977 and 1998 twelve other plants (Afyon, Mus, Ilgin, Bor, Agri, Elbistan, Ercis, Eregli, Carsamba, Corum, Kars, and Yozgat) were established, again, by the state. In the beginning of the 1990s majority shares of Konya, Kayseri, and Amasya plants were transferred to SPC. In 1998, there were twenty-nine plants and three others were still under construction. Twenty-three of them were completely owned by the state and the ownership was shared with SPC in Amasya, Kayseri, Konya, Adapazari, and Kutahya plants. The shares of SPC in these plants were 85, 90, 76, 49.55, and 44 percents, respectively. The rest of the shares were still held by the state.

The management of the state owned and 'affiliated' plants were held by Turkseker, which owns the majority of the shares. But, managers of 'affiliated' plants were earning more, and were more autonomous than their counterparts in public. There is also a representative of SPC in the Board of Directors of 'affiliated' plants. In the Konya, Kayseri, and Amasya plants the management is held by Pankobirlik, a supreme organization of SPC.

As mentioned above all of the sugar plants established after 1933 were built by the state. No doubt, meeting the rising sugar demand was the primary goal of the state in building these plants. However, other factors, like regional development, impeding immigration to the big cities in the west, and political clientalism, played a crucial role especially in the phase of choosing the location of the plants, and many economic factors were ignored.[2]

After 1980, in accordance with global trends, liberal economic thought gained power in Turkey and economic aspects of sugar plants came to the fore as in other state owned companies. Privatization was an important tool of these liberal policies. The then ruling party, ANAP, was committed to privatization and economic liberalization. But it was difficult to sell state owned factories that were endemically suffering from huge losses. In order to clear PFs' balance sheets, the government took various steps to reduce costs and increase profits at PFs. Accordingly, the government submitted a declaration[3] containing cost reducing provisions to sugar plants owned by the state before privatization. In this regard, service stations in the plants were closed down, the number of permanent and temporary workers tapered. As a result of these measures, Amasya and Kayseri plants which had had great losses and were sold to SPC's afterwards, managed to make profit. The Konya plant, which was also privatized later on, even tripled its profit.[4]

In theory, sugar beet producers are the new owners of the Konya, Amasya, and Kayseri plants via their cooperatives. But, in practice, producers do not assume that role due to several organizational features of cooperatives in Turkey. First, from the beginning, governments have had a strong influence on the cooperatives, because of the inadequacies of farmers about the technological developments and organization and management of cooperatives, and the agricultural subsidy policy is conducted by the cooperatives. Until recent years even the managers of the cooperatives were appointed by the government. Second, the cooperatives have a hierarchical-bureaucratic structure that does not easily facilitate members' participation. This is a result of the strong state influence and control on cooperative structures.[5] Since cooperative members did not endure the cost of the returns they obtained through their cooperatives, and they could not change anything with active participation, they alienated from the management of their cooperatives. Thus, in the case of privatized sugar plants in Turkey, the farmers, as owners, have never benefited from the returns of the sugar plants.[6] But, at the same time, they enjoyed state subsidies in the from of financial and technical aid.

[2] For instance, the distances between Yozgat (finished), Aksaray, Sivas, and Kirsehir plants, which are currently under construction, are 100-200 km and their capacities are 3000 ton/day except Aksaray (6000 ton/day). The cost of building a 3000 ton/day plant is 10 trillion TL while a 6000 ton/day one is about 13 trillion TL. It is obvious that building one or two plants with higher capacities in that region rather than four small scaled ones would be more economic. Further details can be found in ITO (1997).

[3] For the content of the declaration see. 'Iscinin emegiyle oynamayin', Seker-Is Dergisi, Agustos (1991), No. 50, p.22.

[4] See Pankobirlik Statistical Yearbook (1994).

[5] At a conference on agricultural cooperatives in Turkey it is mentioned that even though the cooperatives were established in order to protect and improve producers ('farmers') interests, government intervention on the cooperatives turned the farmers (cooperative members) into passive actors and tapered their entrepreneurial skills. For a summary of the conference see Restructuring Agricultural Sale Cooperatives and Unions (1995).

[6] For instance, they never received dividends from the plants, although the plants are at profit for years after the privatization.

Sugar beet and sugar market is another important issue in this study. All the sugar plants in Turkey make contracts with sugar beet producers every year before planting season, to guarantee certain amount of product. Subsidized fertilizer, seeds, free financial and technical aid are also provided by the plants. The government declares a minimum price for a certain qualities of sugar beet. The SPC owned plants adjust their prices to the minimum price declared by the government.

As an essential foodstuff, sugar is an important product from many aspects. Authority of price determination was given to government by the Sugar Law enacted in 1956. Even though it was abolished in 1992, the government still continues to intervene to the determination of sugar price. The SPC-owned plants are not obliged to obey this price control, but the price they paid have never fallen under the price paid by the state owned sugar plants, implying a tacit collusion. The Sugar Law also tied export and import of sugar to the permission of governments. Even in the case of export, which rarely occurs, high custom taxes on sugar, aiming to equal the prices of imported and domestic sugar, hinder foreign competition in the sugar market. Restrictions on new plant building imposed by the Sugar Law are another barrier against the competitive threat of potential domestic entrants.

In sum, sugar plants have several characteristics from the point of the pro-privatization arguments. First, there are two kinds of ownership structure with three different incentive schemes. Some of the sugar plants in Turkey are owned by the state and the others are owned privately. In the twenty-six plants in which the majority shares are owned by the state, managers are appointed by Turkseker. Compensation and authority of these appointed managers are determined and limited by the law. But managers of 'affiliated' plants earn more and are more autonomous than their counterparts in other state owned plants. Compensation and authority of privately owned plants are determined regarding to market rules and practices by the owner, the SPC. Second, the ownership structure of a privately owned plant intimidates the shareholder participation in management. High ranked managers of Pankobirlik seem more active in management than the real owners (farmers). Third, prior to 1980, social factors were as important as economic factors in the state's involvement in sugar production. But in recent decades, at least in the case of sugar plants, social aspects of sugar production are no longer important. The governments are determined to reduce costs in order to sell the plants easily as part of privatization program. Fourth, in addition to restrictions brought by the Sugar Law, new entrant, the SPC, preferred to cooperate rather than compete with the state owned plants. So, privatization did not stimulate competition in the sugar market. This complicated structure of sugar industry in Turkey makes the investigation interesting from the efficiency standpoint.

III. Methodology and Econometric Model

In order to analyze the relative technical inefficiencies between the private and public sugar plants and obtain a firm specific inefficiency measure, we use the stochastic production frontier approach. The stochastic frontier model is widely applied in inefficiency studies. There are two methods available for inefficiency comparisons: (1) productivity indicators and (2) production and cost frontiers. The productivity indicators are simple input-output relations such as labor/output and capital/output ratios. Although the productivity indicators are easy to compare they are incomplete. The frontiers approach recognizes the much more complex nature of interactions between inputs and output. The cost frontiers specify the costs as a function of the level of output and the input prices. The production frontiers reveal technical relations between output and inputs of firms and are preferred when cost data is not available.

There are two methods commonly used in the literature for estimating frontiers: (1) non-parametric mathematical programming methods such as Data Enveloping Analysis[7] and (2) econometric methods. Further, econometric methods can be classified as (1) those that assume all deviations from the frontier are due to inefficiencies and (2) those that allow some variation around the frontier due to factors which cannot be controlled by the firm. In the first method, a deterministic frontier and in the second a stochastic frontier is prescribed. Econometric methods allow flexible functional forms for the frontier and impose some restrictions on the statistical properties of inefficiency terms. Mathematical programming methods require weaker assumptions and impose only piecewise linearity and convexity. Mathematical programming methods have two major shortcomings. First, measurement errors may have a significant effect on the positioning and shape of the estimated frontier. Second, hypothesis about the production parameters cannot be tested using the standard statistical theory. The debate about whether the mathematical programming or econometric methods are appropriate to use or not continues. The stochastic frontier model is the most commonly used model in efficiency studies.[8]

The stochastic frontier production model employed in this study was independently put forward by Aigner, Lovell, and Schmidt (1977) and Meeusen and van den Broeck (1977). The original specification of Aigner et al (1977) can be expressed as follows:

(1) $$Y_i = f(X_i; b)\exp(e_i), \qquad i = 1,2,\mathbf{K},N$$

where Y_i is the production of the ith firm;

X_i is a $k\times1$ vector of (transformations of the) input quantities of the ith firm;

b is a vector of unknown parameters; and

e_i is a composite error term which will be defined below.

In this specification, $f(\cdot)$ is the maximum possible output ith firm can obtain by using the inputs X_i efficiently. In the estimation stage, a suitable functional form, such as the Cobb-Douglas or translog, should be specified.

The composite error term e_i is assumed to have two additive components, one to account for random effects and another to account for technical inefficiency, that is $e_i = v_i - u_i$. Here, u_i is the firm-specific technical inefficiency term which is assumed to be a non-negative random variable. Assume v_i=0 initially. If the firm is efficient and uses the best technology available, then u_i for the ith firm takes a value of zero, and the firm obtains the maximum output possible. This firm can be labeled as 'efficient'. If not, u_i takes a positive value and firm obtains an output below the maximum output possible. Then, we can label such a firm as 'inefficient'. In reality, the positive values of u_i will vary among firms depending on their level of technical efficiency. The firms with larger values of u_i are less efficient than the firms with smaller values of u_i. Therefore, u_i is a random variable truncated at zero from below. The original specification by Aigner et.

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[7] See Seiford and Thrall (1990) and Seiford (1996) for a comprehensive review.

[8] Comprehensive reviews of this literature can be found in studies, such as Forsund, Lovell, and Schmidt (1980), Schmidt (1986), Bauer (1990), and Greene (1993).

al. (1977) assumed an independently and identically distributed half-normal with mean zero and unknown variance s_u^2, $iid\ |N(0, s_u^2)|$, distribution for u_i. This original specification is extended by making more general distributional assumptions, such as the truncated normal, exponential, and two-parameter gamma distribution. The most common form of the distribution used for u_i, and the one that will be used in this study, is half-normal. This distribution imposes the restriction that the majority of firms are almost quasi efficient. However, there is no theoretical reason impeding that inefficiency be distributed symmetrically as we assumed for v_i below.

The term v_i in the composite error term e_i is the non-systematic random error component, which is assumed to capture the effects of measurement errors and other factors that are not under the control of the firm. Therefore, the observed output Y_i is bounded above by the stochastic quantity $f(X_i;b)\exp(v_i)$. The value of v_i is unrestricted. We assume that v_i is an independently and identically distributed normal random variable with mean zero and unknown variance s_v^2, that is $v_i \sim N(0, s_v^2)$. Further, it is assumed that u_i and v_i are independent.

In addition to assumptions concerning v_i and u_i, one needs to specify a functional form for $f(X_i;b)$ in order to obtain an estimable model. We specify a translog stochastic frontier production function for the Turkish sugar industry. The output of a plant, which is sugar, is assumed to be the function of three major inputs: sugar beet, which is the main input for sugar production, labor, and coal, which is used for energy generation during the production process. Then, the estimable form of the translog stochastic production frontier model can be expressed as follows:

$$(2)\ \ln(Y_i) = b_0 + \sum_{j=1}^{4} b_j \ln(X_{ji}) + \sum_{j \le}^{4} \sum_{k=1}^{4} g_{jk} \ln(X_{ji}) \ln(X_{ki}) + v_i - u_i, \qquad i = 1,2,\ldots,N$$

where ln denotes the natural logarithm, subscript i denotes the ith firm;

Y_i represents the amount of sugar produced by ith firm;

X_{1i} is the total amount of sugar beet used in producing Y_i;

X_{2i} represents the total amount of labor, measured by working hours, used in producing Y_i;

X_{3i} represents the total amount of coal used in producing Y_i; and

X_{4i} represents the total amount of current capital

The three inputs, sugar beet, labor, and coal account for about 90% of the total cost of sugar. The data about publicly owned sugar plants is obtained from the annual reports of Turkseker and the data for cooperatively-owned sugar plants is obtained directly from the accounting departments of the respective sugar plants. We used total plant capacity as a proxy for capital since the value of capital in monetary terms for individual plants were not available in annual reports and too costly to obtain.[9] The data are for the year 1998, and the values of sugar beet and coal are in tons per year, and of labor is in hours per year.

[9] Although not very common, plant capacity is utilized as a measure of capital. See Forsund (1993) for details.

The parameters of (2) can be estimated by the maximum likelihood method given the distributional assumptions about the error terms. Given the distributional assumptions made about u_i and v_i, their density functions can be written as follows:

(3) $f_u(u_i) = \left(p s_u^2/2\right)^{-1/2} \exp\left(-\frac{1}{2}\frac{u_i^2}{s_u^2}\right)$ and $f_v(v_i) = \left(2p s_v^2\right)^{-1/2} \exp\left(-\frac{1}{2}\frac{v_i^2}{s_v^2}\right)$

respectively. Using the joint density function of the random variables u_i and v_i we can derive the density function of $e_i = v_i - u_i$ by the convolution formula. This allows us to express the density of ln (Y_i) as follows:

(4)
$$f_y\left(\ln(Y_i)\right) = \left(\pi(\sigma_u^2 + \sigma_v^2)/2\right)^{-1/2} \times \exp\left(-\frac{1}{2}\frac{\left(\ln(Y_i) - \ln(f(X_i;b))\right)^2}{s_u^2 + s_v^2}\right)\left(1 - \Phi\left(\frac{s_u}{s_v}\frac{\left(\ln(Y_i) - \ln(f(X_i;b))\right)}{\sqrt{s_u^2 + s_v^2}}\right)\right)$$

where $\Phi(\cdot)$ is the standard normal distribution function and $\ln\left(f(X_i;b)\right)$ is given by $\ln\left(f(X_i;b)\right) = b_0 + \sum_{j=1}^{4} b_j \ln(X_{ji}) + \sum_{j\leq}^{4}\sum_{k=1}^{4} g_{jk} \ln(X_{ji})\ln(X_{ki})$

Thus the log likelihood function of ln(Y_i) can be expressed as follows:

(5) $\ln L(q; X_i) = \frac{N}{2}\ln\left(\frac{2}{p}\right) - Ns - \frac{1}{2s^2}\sum_{i=1}^{N} e_i^2 + \sum_{i=1}^{N}\ln\left(1 - \Phi\left(\frac{le_i}{s}\right)\right)$ where $s^2 = s_u^2 + s_v^2$ and $l = s_u/s_v$. The log likelihood function in (5) is maximized with respect to the parameters $q = (b', g', s^2, l)'$, where $b = (b_j)'$, j = 0,1,...,4, and $g = (g_{li})'$, l,i=1,...,4, $l \leq i$.

Our primary interest is to estimate the average technical inefficiency levels as well as technical efficiency levels specific to each sugar plant. Thus, we need to estimate the firm-specific technical inefficiency levels u_i for each observation. The average technical inefficiency estimate can be obtained from the firm specific technical efficiency estimates. Jondrow, Lovell, Materov, and Schmidt (1982) showed that measurement of u_i for i=1,2,...,N can be derived from the conditional distribution of u_i given e_i. They provide an explicit expression for the conditional mean of u_i given e_i when u_i is half-normal *iid* and e_i is a normal *iid* random variable. This expression is given by:

(6) $$E\left(u_i | e_i\right) = \frac{ls}{1 + l^2}\left(\frac{f(\cdot)}{1 - \Phi(\cdot)} - \frac{e_i}{s}\sqrt{\frac{w}{1 - w}}\right)$$

where $w = s_u^2/s^2$ and $f(\cdot)$ is the standard normal density function. $f(\cdot)$ and $\Phi(\cdot)$ are both evaluated at

$$\left(\frac{e_i}{s}\sqrt{\frac{w}{1 - w}}\right)$$

IV. Empirical Results

The above method was applied to the data on 29 sugar plants. The stochastic frontier model is estimated by the maximum likelihood method using the log likelihood function in (5). The maximum likelihood estimates are obtained by maximizing the log likelihood using the Berndt-Hall-Hall-Hausman method.[10] The maximum likelihood estimates along with the OLS estimates are given in Table 1.

The estimate of mean technical inefficiency is 0.10, which implies that the production, on average, is 10 percent below the frontier. Thus, this result points out a substantial technical inefficiency. Therefore, a considerable amount of production is forgone due to technical inefficiency. The estimate of l, which is the ratio of the standard error of u_i to the standard error of v_i is 0.92. This implies that technical inefficiency is as much important as the other factors as a source of variation about the frontier. Therefore, the terms u_i and v_i as a source of the deviation of output from the maximal output are equally important.

[10] All computations are performed in RATS. See Doan (1996).

Table 1: Maximum Likelihood and Ordinary Least Squares Estimates of the Parameters

	MLE Estimates		OLS Estimates	
Parameter	Estimate	Standard Error	Estimate	Standard Error
b_0	-0.034	1.021	-22.473	22.915
b_1	0.252	0.787	21.508	7.733
b_2	0.538	0.927	12.604	4.646
b_3	0.224	0.503	0.602	3.178
b_4	0.129	0.890	12.030	5.124
g_{11}	0.430	0.095	0.512	0.179
g_{22}	-0.689	0.213	-0.991	0.440
g_{33}	0.932	0.077	0.907	0.252
g_{44}	0.017	0.376	-0.066	0.542
g_{12}	1.031	0.168	1.312	0.472
g_{13}	-3.658	0.235	-3.892	0.960
g_{14}	0.096	0.398	-0.204	0.596
g_{23}	1.543	0.167	1.665	0.521
g_{24}	-0.884	0.436	-0.509	0.565
g_{34}	1.641	0.111	1.757	0.617
$\ln L$	42.024		37.782	
σ^2	0.011	l	0.923	
s_u^2	0.011	$E(u)$	0.104	

Table 2: Estimates of Technical Inefficiency for Individual Sugar Plants

Sugar Plant	Inefficiency Estimate
Kastamonu	0.030
Ağrı	0.035
Alpullu	0.037
Ilgın	0.042
Erzurum	0.054
Susurluk	0.056
Afyon	0.059
Çorum	0.063
Kütahya*	0.064
Kars	0.068
Uşak	0.068
Turhal	0.069
Elazığ	0.072
Konya**	0.072
Çarşamba	0.080
Burdur	0.092
Eskişehir	0.093
Erciş	0.103
Bor	0.107
Elbistan	0.109
Muş	0.112
Ankara	0.122
Kayseri**	0.122
Malatya	0.123
Amasya**	0.164
Adapazarı*	0.178
Erzincan	0.194
Yozgat	0.295
Ereğli	0.330

* Affiliated plants.
** Privately owned sugar plants.

We can compute the estimates of inefficiency for each sugar plant using the equation in (6). These estimates are given in Table 2. The individual sugar plant technical inefficiency estimates show a high variation. The technical inefficiency estimates vary from 0.33 to 0.03. The mean technical inefficiency level for the public sugar plants is 0.11 while the mean technical inefficiency level for the privately owned sugar plants is 0.07. The average level of technical inefficiency for 'affiliated' firms is also 0.07. Although these means differ slightly, it does not imply a significant difference between public and privately owned sugar plants in terms of their technical inefficiency. Further, twelve other state owned sugar plants are found more efficient than the most efficient privately owned, Konya, plant. Moreover, twenty-one state-owned sugar plants are above the least efficient privately owned plant(Amasya) in ranking.

V. Concluding Remarks

As a conclusion, no significant difference, in efficiency manner, is found between public and privately owned (owned by cooperatives) sugar plants. This conclusion could be interpreted in two different ways: Public firms operate as efficiently as others do and/or privately owned sugar plants are working inefficiently.

Determination of governments to reduce costs and measures taken in this respect supports the first hypothesis. Managers of PFs usually face two types of conflicting goals; those imposed by the politicians and those required by economic efficiency. Often, these conflicting goals create a highly uncertain decision environment for the managers. When the politicians begin to see PF's as an economic unit that work under market conditions rather than an apparatus of their policies, the uncertainty of efficiency targets for PFs' managers disappears.

The first hypothesis also questions the views that see pecuniary incentives essential. No efficiency differences found between state owned, 'affiliated', and privately owned sugar plants which have different compensation schemes. As mentioned by Barkema (1995), non-pecuniary returns (approval of others, sense of confidence, etc.) are more important than pecuniary incentives. These arguments may be valid for the managers of sugar palnts as well. The managers of sugar plants are members of social notables especially in small provinces. The status their position provided may be as important as their remuneration. Thus, their position and business success is highly associated with their local prestige.

The second hypothesis is consistent with the views correlating inefficiency with weak ownership links. As mentioned above, the organizational structure of the cooperative does not stimulate their members to monitor and evaluate the operation and the performance of the plants. Therefore, privately owned sugar plants are always open to mismanagement and managerial fraud. The failure of other efforts of this kind, like the companies established by Turkish immigrant workers in Europe in 1970s or the cooperatives to build housing for low income families,[11] also support the claim about cooperative ownership.

As mentioned above, privatization made no contribution to competition, which is another determinant of efficiency, in sugar beet and sugar markets. The effect of incompetitiveness could not be estimated, but high level of average inefficiency in privately owned sugar plants may also be attributed to the lack of competition in the sugar market.

[11] These efforts also suffered from mismanagement and managerial fraud.

Our results have three major implications from the privatization (ownership) perspective. First, efficient operation is equally possible in state owned firms if the state-owned plants are seen as economic units by politicians and cost saving measures are pursued. Second, without the provision of ownership rights to farmers, the expectations of privatization in terms of increased efficiency can not be met in the plants owned by the SPC. Within the framework of privatization, to sell the other plants to companies where the sense of private property is stronger might be a better solution. Third, in a non-competitive environment, privatization, solely, does not improve the efficiency.

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