

Trade exposure and technical efficiency in the Turkish rubber industry: A preliminary report

Ömer Gökçekuş*

School of Business, North Carolina Central University, Durham, NC 27707 USA

Abstract

When a country's foreign trade regime becomes more open, a domestic firm faces more competition and starts to operate more efficiently in order to reduce its production cost. This proposition is examined in this paper by using plant level data and a simple econometric model. It is shown that technical efficiency levels improved significantly when Turkey's foreign trade regime shifted from a restrictive one to a more liberalized one: In the Turkish rubber industry which is examined here, the technical efficiency level increased by 15.6 %. It is also shown that plant-specific factors have an effect on technical efficiency levels.

1. Introduction

The argument that a more liberal trade regime has positive effects on the performance and competitiveness of an economy is one of the oldest ideas in economic theory, dating back to Adam Smith. In addition to static gains from allocative efficiency, it is often argued that the gains of a more liberal trade regime come from price efficiency and productive efficiency.¹

* The author is thankful to Patrick Conway, Marjorie McElroy and an anonymous referee for their helpful comments. My special thanks go to Haluk Kasnakoglu for his help in getting the data set. The usual disclaimer applies.

¹ According to international trade theory there are a number of channels through which a more liberal trade regime affects performance and competitiveness of an economy. For a

Yet, despite theoretical explanations in favor of a liberal trade regime, there are doubts in many circles about liberalization. These doubts are not groundless: First of all, the number of studies conducted on this matter can be counted on the fingers of one hand. Moreover, these studies have a common but a major flaw: Although the arguments about trade regime and productivity gains are based on how the most disaggregated production unit, the plant, would react to changes in the trade regime, most of the empirical studies in the early 1980s were conducted at the macro level. Indeed, the few studies conducted at a disaggregated level could not go beyond a 2-digit ISIC (International Standard Industrial Code) disaggregation level (e.g., Krueger and Tuncer, 1982; Nishimizu and Robinson, 1982).

Compounding the problem for scholars in the 1980s was the lack of a precedent of a developing country moving toward trade liberalization. Among developing countries in the previous decades, there was typically a consensus on import substitution with high levels of tariff and non-tariff barriers. In the 1980s, however, a number of countries have taken significant steps to liberalize their trade regimes.² This decisive shift in trade policies provided an impetus for economists to conduct empirical studies. For this reason, there are now a number of studies coming from the World Bank research project "The Effects of Trade Regimes on Industrial Competition and Efficiency": For example, Tybout *et al.* (1990) investigate the effects of trade reforms on scale efficiency and technical efficiency in Chile; Roberts and Tybout (1991) study size rationalization and trade exposure in Chile and Colombia; and Levinsohn (1991) analyzes the changes in price-cost markups in Turkish industries following trade liberalization. None of these studies, however, addresses the effects of Turkish trade liberalization on technical efficiency.

The main purpose of this paper is to provide new insights into the Turkish trade liberalization experience of the 1980s. In order to conduct this study at the most disaggregated level, the technical efficiency level is quantified for each plant in a 4-digit (ISIC) industry, namely, Turkish rubber industry (ISIC 3559). To do so, a model is derived from production theory. Then, plant level technical efficiency levels are examined to determine if they vary under different trade regimes. The data set is derived from the Annual Manufacturing Surveys of Turkey. An advantage of having this data set is that it includes very detailed plant specific characteristics. Consequently, this

detailed review, see Havrylyshyn (1990).

Rodrik (1992) provides a detailed explanation of trade policy reforms in developing countries.

paper also provides new insights into plant-specific characteristics and their effects on the technical efficiency level.

The paper is divided into six sections. The next section (Section 2) gives a brief review of the channels through which trade liberalization effects technical efficiency levels. Section 3 describes the econometric models utilized in the estimation of technical efficiency and in the explanation of the technical efficiency differences within the sector. Section 4 provides background information on Turkish trade reforms in the 1980s. It gives detailed information on the 4-digit rubber industry. It also shows how the plant level data from the rubber industry is edited. Section 5 includes estimation results and their evaluations. Finally, Section 6 provides some concluding remarks.

2. Theoretical background

International trade theory provides an explanation for how a more liberal trade regime affects the technical efficiency level. According to this theory, there are three main channels. First, in order to compete against the international producers in domestic and foreign markets, domestic firms must adopt a newer and more efficient technology or use the same technology with less waste and less X-inefficiency to reduce the cost whenever possible. This is the so-called induced challenge-response mechanism (Nishimizu and Robinson, 1982: 5).

Second, in the case of developing countries, imports of intermediate and capital goods may not be substitutable with domestically produced ones: the imported inputs may embody differentiated intermediates that are not available in the local economy. The increased availability of such imports leads to a greater number of insights that local researchers gain from inspecting and using these goods, and this increase in knowledge leads to greater technical efficiency.

Third, not only the increase in the volume of imports but also the increase in the volume of exports augment international technical knowledge spillovers. This may happen through the suggestions of the foreign purchasers to improve the manufacturing process, by, for example, the recommendation that new intermediate inputs be used. Therefore, the extent of the spillovers between any two countries increases with the volume of their bilateral trade (Grossman and Helpman, 1991: 167).

3. The econometric model

The production function with technical inefficiency can be written as

$$y_i = f(x_i) \exp(r_i) \exp(v_i) \quad (1)$$

where y_i is output, x_i is a vector of inputs, $f(\cdot)$ is the production technology, r_i is the error term which is composed of technical inefficiency r_i , and statistical noise v_i , $r_i = \delta_i + v_i$ and the subscript $i=1, \dots, n$ denotes plants. By definition, the error component r_i is non-positive. More specifically, in our analysis we model a production process with labor (L), capital (K) and materials (M) as inputs, and a Cobb-Douglas production technology as

$$y_i = AK^\alpha L^\beta M^\gamma e^{r_i} \quad (T)$$

Technical efficiency as an economic performance measure can be defined as the ratio of actual output level to maximum potential output level obtainable from a given input (Lovell, 1993: 4). The degree of technical efficiency of a producer is given by the ratio of observed to maximum feasible output, and maximum feasible output is given by the stochastic production function. Accordingly, then the technical efficiency measure can be written as

$$TE_i = \frac{y_i}{f(x_i) \exp(v_i)} = \exp(r_i) \quad (2)$$

It is assumed that the objective of a plant is to maximize profit. Furthermore, in the present study, inputs are treated as exogenous. One can justify this assumption in terms of a two-stage decision process where an input choice decision is made prior to an output decision. In such a case, maximizing profit with given exogenous input and output prices is equivalent to maximizing output. Production function is consistent with the profit maximization hypothesis.

In order to simplify the estimation procedure, it is assumed that $v_i = 0$: The problem is simplified to estimate the parameters of a deterministic production frontier with no noise. In the estimation, the corrected ordinary least squares (COLS) strategy has been selected (Lovell, 1993: 21). This is a two-step procedure. In the first step, the technology parameters have been estimated by ordinary least squares (OLS). In the second step, the downward bias in the estimated OLS intercept has been corrected by shifting up until all corrected residuals are non-positive and at least one is zero. This is necessary to make certain that all r_i 's are greater than or equal to zero. Corrected residuals are then used in equation (2) to calculate technical efficiency.

Having calculated the technical efficiency for the years 1980 and 1985, we can compare technical efficiency before and after trade liberalization.

Then, in order to calculate the effects of the other plant-specific factors, in addition to the trade regime, the following equation will be used:

$$TE_i = \beta_0 + \beta_1 \text{TRADE}_i + \beta_2 \text{MANAG}_i + \beta_3 \text{SKILL}_i + \beta_4 \text{SHARE}_i + \beta_5 \text{SPILL}_i + u_i \quad (4)$$

where

TRADE = 1 if year : 1985 and 0 otherwise;

MANAG = 1 if production workers/total labor force > .70 and 0 otherwise;

SKILL = 1 if engineers and technical personnel/production workers > .20 and 0 otherwise;

SHARE = 1 if sales/total sales > .10 and 0 otherwise;

SPILL = 1 if aggregate output in the same province/total output > .30 and 0 otherwise.

The first dummy variable, TRADE, has been used to indicate the different trade regimes. The following dummies are used to explain the plant-specific-characteristics. MANAG has been included based on the following rationale: To adjust to the changes in the environment, the company needs to evaluate them and come up with a viable new course of action. A good management and administration can do a better job. Here it is assumed that good management and administration are directly related to the ratio of its workers in the total labor force. SKILL is the proxy to differentiate skilled and unskilled labor. It is the ratio of technical production workers (i.e., engineers and technicians) in the total production workers. SHARE reveals the information about the size of the plant. SPILL can be seen as a proxy to the spillover effects from the neighboring plants.

4. Turkish trade liberalization in the 1980s and data

Responding to the adverse economic circumstances during the second half of the 1970s, the Turkish government introduced to parliament a radical economic reform package in January 1980. Yet, this package could not be implemented because of a political *impasse* in the parliament. The political turmoil did not calm down until after the bloodless *coup d'etat* of September, 1980. Yet, the economic team that prepared the January proposal stayed in charge of the Turkish economy during the military regime and was able to implement their economic reform package.³ In 1983, the head of the

There are a number of sources on the Turkish economic developments in the 1970s and the 1980s. A very detailed account of the Turkish economy, with a particular emphasis on international trade issues can be found in Krueger (1974), Baysan and Blitzer (1991), and

economic team, Mr. Turgut Ozal founded the Motherland Party and was voted in as prime minister in the first democratic parliamentary election after the *coup*. The civilian government then moved forward and launched a second economic reform package. Together, the two trade reforms liberalized the foreign trade regime by eliminating trade restrictions such as the quota system and reducing tariffs; and at the same time, they gave incentives to exporters. As a result, the prohibitive quota system was eliminated, and the overall impact of import duties and quantitative restrictions (as percentage of c.i.f. price) declined by about 45 % from its level of 129 % in 1980 to 68 % in 1985. The ratio of the effective exchange rate for imports to exports (a proxy for the bias towards producing import substitutes instead of exportables) declined from 1.95 in 1980 to 1.33 in 1985. Both imports and exports responded to these changes, and industrial imports and exports increased by 470 % and 54 %, respectively.

For this study, the rubber industry is selected because of the drastic cuts in protection levels and the resulting dramatic changes in export, import and production levels in this sector. The rubber industry was a typical import substitution industry: In 1980, the share of exports and imports together in domestic production was only 6.5 %, and the rate of protection was 129%. In 1985, after the attempts to liberalize trade, the share of trade in domestic production became 38.4 % and the total protection rate became 60 % (Krueger and Aktan, 1992). Thus, based on these indicators we can assume that the potential channels (i.e., channels we briefly explained in Section 2) through which technical efficiency could be improved were existing for the Turkish rubber industry. 1980 and 1985 are chosen as the benchmark years in this study due to the restriction on the availability of the data.⁴

Since the technical efficiency measure is based on the information from the residuals of the regression results, the measure will be very sensitive to any errors made in compiling the raw data: To exclude the observations with measurement errors is an extremely important issue. Therefore, we should be very careful in deciding upon an editing rule. The editing rule which was developed and used by Caves *et al* (1992) in their study which covered several countries is adopted in this paper. Table 1 supplies the rules and the

Krueger and Aktan (1992). Krueger and Turan (1993) discuss the politics and economics of Turkish policy reforms in the 1980s.

The plant level data for the manufacturing sector is collected annually by the State Institute of Statistics of Turkey. The data covers all plants with ten or more employees for 1980 and twenty five and more for 1985. For detailed information on Annual Surveys of the Manufacturing Industry, the reader is referred to a recent issue of the Annual Manufacturing Industry Statistics of Turkey.

number of plants which are excluded at each step. Consequently, 92 plants out of 161 were left for 1980 and 53 out of 87 for 1985. Summary statistics are provided in Table 2.

5. Empirical results

The results from the estimation of the production function (1^f) are the following:

For 1980

$$\ln Y = 2.465 + 0.553 \ln K + 0.447 \ln L$$

(3.10) (13.82) (5.58)

$R^2 = 0.83$

For 1985

$$\ln Y = 0.875 + 0.629 \ln K + 0.379 \ln L$$

(0.80) (9.35) (3.07)

$R^2 = 0.82$

The numbers in parentheses are t-statistics, and R^2 represents the measure of the goodness-of-fit. All of the estimated slope coefficients are statistically significant at 0.01 level.

According to the procedure described in Section 2, the technical efficiency rates for each plant are calculated. The frequency distribution of the technical efficiency levels for 1980 and 1985 are presented in the following table.

In the preliminary estimations of the production function, I started with total sales as a measure of output and included energy and material as inputs in addition to capital and labor; the estimations by Ordinary Least Squares (OLS) method yield parameter estimates that were inconsistent with production theory. One possible reason for this inconsistency was a simultaneity bias: perhaps levels of gross output and material inputs are jointly determined by the producers within the one year period. Another possible explanation is the very close association between the use of materials and the levels of output. The OLS estimation of the equation $M = mY$ is $M = 0.62Y$ (with $R^2 = 0.99$), where M is material inputs and Y is output. Following Griliches and Ringstad (1971), in particular their Chapter 5 about the justification for using value added as a measure of output, I concluded that value added would be my best measure for output.

Value added is derived by subtracting the changes in inventories of semi-finished and finished products, the expenditures on raw materials, primary inputs, packaging and other variable inputs and electricity expenditures from the total sales. Capital includes items such as machinery and equipment, motor vehicle, building, improvement to land and other construction, office equipment and furniture. Labor is calculated as (average number of production workers) \times (number of working days in a year) \times (number of hours in each shift) \times (number of shifts in a day): the production workers include technical personnel, foremen, and the workers. Value added and capital are in 1980 prices and million TLs.

Table 1
The Editing Rule and Number of Observations Excluded

NO	Editing Rule*	EXCLUDED	
		1980	1985
1	$K = 0$ **	44	14
2	$LH = 0$ **	2	0
3	$VA < 0$	4	14
4	$LH > \text{AVG}(LH) + 4.5 * \text{STD}(LH)$	1	3
5	$\text{WAGE} > \text{AVG}(\text{WAGE}) + 4.5 * \text{STD}(\text{WAGE})$	7	1
6	$VA/LH > \text{AVG}(VA/LH) + 4.5 * \text{STD}(VA/LH)$	1	2
7	$N < 10$	6	0
8	$Y/LH > \text{AVG}(Y/LH) + 4.5 * \text{STD}(Y/LH)$	2	4
9	$K/LH > \text{AVG}(K/LH) + 4.5 * \text{STD}(K/LH)$	2	0
	TOTAL	69	34

For the details of the editing criteria, see Caves *et al.* (1992). Abbreviations: K: total capital stock; LH: total labor hours; VA: value added; WAGE: wage rate per labor hour; N: number of workers; Y: output; AVG: average; and STD: standard deviation (For details on the variables, see Footnote 5 and Table 2).

"These observations refer to either incorrect or missing data.

Table 2
Summary Statistics of the Data Set

Variables*	output*	capital	material	labor-hour	MANAG	SHARE	SPILL	SKILL
Year: 1980								
Mean	38,766	17,964	25,347	60,700	0.11	0.01	0.36	0.04
Minimum	2,855	406	475	10,000	0	0.00	0	0
Maximum	447,932	232,777	299,267	306,176	0.60	0.13	0.66	0.79
Std. Dev.	56,856	30,343	39,591	57,576	0.15	0.02	0.31	0.13
Year: 1985								
Mean**	121,928	81,427	70,768	137,493	0.15	0.02	0.26	0.08
Minimum	13,915	1,428	4,241	31,360	0	0.00	0	0
Maximum	782,987	619,892	488,810	564,000	0.75	0.14	0.57	0.65
Std. Dev.	176,623	124,248	106,469	122,030	0.14	.03	0.23	0.15

The variables are in terms of 1980 prices and million Turkish Lira. For details, see Footnote 5. Definitions of the dummy variables MANAG, SHARE, SPILL and SKILL are given in the text.

** All the statistics are unweighted: i.e., mean is the unweighted arithmetic mean.

Source: Data tapes from State Institute of Statistics, Turkey.

It can be seen from Table 3 that there is a big variation in the frequency distribution and the average of technical efficiency in the rubber industry both within 1980 and from 1980 to 1985.⁶ In 1980 there was a large efficiency dispersion within the rubber industry. In 1985, however, the technical efficiency dispersion among the plants narrowed down dramatically. In other words, the difference in efficiency levels between the best and the least performing plants got smaller in 1985. These findings, particularly the big variation in the first period, provide empirical evidence to support the proposition that "... there were very weak incentives for engineering or economic efficiency in private or public sector... High cost and low-cost firms coexisted in many industries with very weak market pressures for expansion of the latter and contraction of the former..." (Krueger, 1993: 15). There is also evidence of an improvement in the technical efficiency of the plants over time: (1) the average technical efficiency was 15.6 % higher in 1985 than it was in 1980; (2) the lower limit of the measure also significantly increased; (3) the mode range is below 70 % in 1980 and 80-85 % in 1985.

However, it is possible that plant characteristics that show differences from the 1980 sample to the 1985 sample might have an undismissible effect on the technical efficiency levels. In 1985, there were 36 plants which were also active in 1980. Yet, at the end of the editing process summarized in Table 1, only 15 of them are included in the data set which is used in the calculations. Since it is not possible to control the plant specific characteristics for a big group of plants, despite the statistically significant change in the technical efficiency level, it might not be convincing to state that the improvement from 1980 to 1985 is only a result of the change in the trade regime. Thus, it is desirable to determine if other plant-specific characteristics have an effect on efficiency levels. In other words, the optimal solution requires the quantification of the effects of these characteristics together with the trade regime variable. This can be done by using the single linear regression equation explained in the model section. The estimation results arc as follows:

$$TE = 0.761 + .091 TRADE - .058MANAG - .011SKILL + .094SHARE + .016SPILL$$

(3.75)	(6.11)	(3.38)	(0.59)	(2.05)	(1.17)
					R ² =0.39

(The numbers in parentheses arc t-statistics).

Arithmetic mean is used here, since the main concern is to calculate the mean technical efficiency over all observations in the sample.

Table 3
Frequency Distribution of Technical Efficiency

Technical Efficiency (%)	1980		1985	
	Total	Frequency	Total	Frequency
95-100	2	2.18	5	9.43
90-95	0	0.00	7	13.21
85-90	4	4.34	4	7.55
80-85	7	7.60	20	37.74
75-80	18	19.57	12	22.64
70-75	23	25.00	4	7.55
below 70	38	41.30	1	1.89
Total	92	100.00	53	100.00
average:*	72.30		83.60	
(std. dev.)	(7.90)		(7.80)	

Average is calculated as simple arithmetic mean.

Source: Author's own calculations.

This estimation result also supports the previous finding that the trade regime has a significant effect on the efficiency level: The coefficient of the trade regime dummy is positive and it is statistically significant.

The coefficients of the other plant level characteristics also provide interesting insights. The negative coefficient of MANAG tells us that technical efficiency decreases with an increase in the ratio of production workers in the total labor force. In other words, an increase in the managerial and administrative workers' share in the total labor force affects technical efficiency positively. The share of skilled labor in the total production force has a negative effect on the technical efficiency level: Although this finding is against common wisdom, it is not statistically significant. The relative size of a plant also has a positive effect on technical efficiency. The plants which have at least 10 % of the total sales have a 9% higher technical efficiency rate than other plants with the same characteristics but a smaller size. As the theory predicts, a plant which is located next to other plants performs better than one which is located away from an industrial area.

6. Conclusions

This study empirically unveils the relationship between a trade regime and technical efficiency. It also sheds light on the importance of plant-specific characteristics and their effects on the performance of the plants.

More specifically, this study shows that the decisions at the production side of the economy are sensitive to changes in the trade regime -a dimension of the environment within which decisions are made. Particularly, the Turkish rubber industry provides evidence that under a more open trade regime technical efficiency levels are higher than those under a less open trade regime: (1) the average technical efficiency was 15.6 % higher in 1985 than it was in 1980; (2) the lower limit of the technical efficiency for the industry jumped up; and (3) the mode range was below 70 % in 1980 and 80-85 % in 1985.

Technical efficiency is explained not only by the current trade regime but also by plant characteristics. Specifically, this study shows that in addition to an open trade regime, the following factors all effect technical efficiency rates: (1) the share of managerial and administrative workers in the total labor force, (2) the proximity to other plants, and (3) plant size.

It might be interesting to calculate the technical efficiency levels based on panel data because such a data set is a remedy for a number of econometric problems caused by not being able to distinguish the time and firm-specific effects (Kumbhakar, 1993). To make the same kind of calculations for different industries might also be a fruitful exercise in terms of providing some kind of guideline for the policy makers who make the decision about industrial incentives, protection and general industrial policies in the developing countries. In addition, it will be possible to compare the industrial efficiencies in developed and developing countries.

References

- BAYSAN, T. and BLITZER, C. (1991), "Turkey", in M. Papageorgiou and A.M.Choksi (eds.), *Liberalizing Foreign Trade, Vol 6*, Oxford: Basil Blackwell.
- CAVES, R.E. and ASSOCIATES, (1992), *Industrial Efficiency in Six Nations*, Cambridge, MA: MIT Press.
- GRILICHES, Z. and RINC.STAD, V. (1971), *Economies of Scale and the Form of Production Function*, Amsterdam: North Holland.
- GROSSMAN, G.M. and HELPMAN, E. (1991), *Innovation and Growth in the Global Economy*, Cambridge, MA: MIT Press.
- HAVRYLYSHYN, O. (1990), "Trade Policy and Productivity Gains in Developing Countries: A Survey of Literature", *The World Bank Research Observer*, 5, 1-24.
- KRUEGER, A. O. (1974), *Foreign Trade Regimes and Economic Development: Turkey*, New York: Columbia University Press.
- (1993), *Political Economy of Policy Reform in Developing Countries*, Cambridge, MA: MIT Press.
- KRUEGER, A.O. and AKTAN, O. (1992), *Swimming Against the Tide: Trade and Economic Policy in Turkey in the 1980s*, San Francisco, CA: International Center for Economic Growth Publications.
- KRUEGER, A.O. and TUNCER, B. (1982), "Growth of Factor Productivity in Turkish Manufacturing Industries", *Journal of Development Economics*, 11, 307-25.
- KRUEGER, A.O. and TURAN, I. (1993), "The Politics and Economics of Turkish Policy Reforms in the 1980s", in R. H. Bates and A. O. Krueger (eds.), *Political and Economic Interactions in Economic Policy Reform: Evidence from Eight Countries*, Oxford: Basil Blackwell.
- KUMBHAKAR, S.C. (1991), "Estimation of Technical Efficiency in Panel Data Models with Firm-and Time-Specific Effects", *Economic Letters*, 36, 43-8.
- LEVINSOHN, J. (1991), "Testing the Imports-as-Market-Discipline Hypothesis", NBER Working Paper, No 3657.
- LOVELL, C.A.K. (1993), "Production Frontiers and Production Efficiency", in H.O. Fried, C.A.K. Lovell and S.S. Schmidt (eds.), *The Measurement of Productive Efficiency*, Oxford: Oxford University Press.
- NISHIMIZU, M. and ROBINSON, S. (1982), "Sectoral Productivity Growth in Semi-Industrialized Countries: A Comparative Analysis", World Bank Development Research Department, WP No. 82-6.
- RODRIK, D. (1992), "The Limits of Trade Policy Reform in Developing Countries", *Journal of Economic Perspectives*, 6, 87-105.
- ROBERTS, M. and TYBOUT, J. (1991), "Size Rationalization and Trade Exposure in

Developing Countries", The World Bank Policy, Research and External Affairs, Trade Policy Working Papers, WPS 594.

S I A T I · INSTITUTE OF STATISTICS (1989), *Annual Manufacturing Industry Statistics*, Ankara, Turkey: State Institute of Statistics.

TYBOUT, J., DE MELO, J. and CORBO, V. (1990), "The Effects of Trade Reforms on Scale and Technical Efficiency", The World Bank Policy, Research and External Affairs, Trade Policy Working Papers, WPS 481.

Özet

Dış ticaret rejimi ve Türk lastik sanayiindeki teknik etkinlik: Bir ön rapor

Bu çalışmada, uluslararası dış ticaret teorisinin, "dış ticaret rejimindeki serbestleşme yerel üreticileri daha fazla rekabetle karşı karşıya bırakır ve onları üretim maliyetlerini düşürmek için daha etkin bir şekilde çalışmaya zorlar" öngörüsü ampirik olarak test edilmiştir. Bunu yapmakta ekonometrik bir model ve Türk Lastik Sanayinden (ISIC 3559) fabrika bazındaki veriler kullanılmış ve her fabrikaya ait 'teknik etkinlik' düzeyi hesaplanmıştır. Türkiye dış ticaret rejiminin serbestleşmesi ile teknik etkinlik düzeylerinin arttığı saptanmıştır. Türk Lastik sanayiindeki fabrikaların ortalama teknik etkinlik düzeyi % 15.6 artarak %72.3'den %83.6'ya çıkmıştır. Fabrikalar arasındaki teknik etkinlik farklılıklarını açıklamada, dış ticaret rejimindeki değişikliğe ek olarak, fabrikalara özgü faktörlerin de -örneğin, fabrikanın büyüklüğü ve coğrafi konumu- etkili oldukları gösterilmiştir.