Economic Liberalization, Markups, and Total Factor Productivity Growth In Turkey's Manufacturing Industries

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ABSTRACT

This paper tests whether economic liberalization in the 1980s increased total factor productivity in Turkey's manufacturing industries. The total factor productivity(TFP) measure here is the Solow residual. As is known, standard Solow residual assumes perfect competition and constant returns to scale. If the real industries under investigation show imperfect competition and non-constant returns to scale, then standard measure gives us biased estimates of the total factor productivity. Therefore, this paper modifies to include the effects of imperfect competition and non-constant returns to scale. After modifying the TFP growth, I test whether economic liberalization affects the TFP growth. Economic liberalization is captured by either an explicit measure of liberalization like the measures of trade liberalization such as reduced protection rates or by a dummy variable capturing a change in the economic policies. In this paper, industry specific total protection rates, total subsidy rates, and import penetration rates are used as explicit measures of economic liberalization. Our analysis is including both public and private sectors. For both sectors , I calculate, along the process of the effects of trade liberalization, sector specific markups. Markups that this paper comes up with are in general smaller than those of the US manufacturing industries. This point is interesting since one expects markups in the USA to be smaller than those in Turkey since the USA is more competitive. And this is, to my knowledge, the first time markups are estimated for the Turkish manufacturing sectors by this methodology.

When the whole period (1980-1984;1985-1991) is divided into two sub periods, (the important year is chosen to be 1984 since the import regime was changed in that year) one of which has more open-trade policies along with other complementary liberalizing policies such as political and financial liberalization, changes in the pricing policies, etc., the results show that the more open period shows a higher total factor productivity growth.

Key Words : Trade liberalization, productivity growth, Turkey, panel estimation.

1.1. Introduction

This paper concerns the possible effects of liberalization on productivity growth. Liberalization implies an increased role for market forces in the economy
The temporal domain of the study is between 1980 and 1991, and the spatial domain is Turkey's 26 different manufacturing industries. Turkey liberalized its foreign trade regime in the 1980s, and introduced other liberalizing policies. It was portrayed as a success story of liberalization in terms of its increased exports as compared to the years before 1980. In terms of productivity growth, however, there is no comprehensive study to test whether liberalization was a success or not. I opted for this sample since it is interesting to see whether liberalization increased productivity growth. The time domain of the study solely depends on the years of liberalization and the availability of the data. I used manufacturing industries since they provided a better data set compared to service and agricultural industries. The data will be discussed in the section 3 in detail, and briefly below. In order to investigate the possible effects of liberalization on productivity growth, I need to have measures for both liberalization and productivity growth.

Productivity growth will be discussed in terms of the Solow residual in section 3. In terms of measures of liberalization, I either use a dummy variable, measuring a discrete change in economic policies, or some explicit measures for trade liberalization such as reduced total protection rates, the ratio of the value of imports to total value of domestic production, or total subsidy rates to different industries. The three explicit measures of openness used will be explained in the section 3. In short, my "conceptual measure" of trade liberalization will be captured, in one of the models, by three "operational measures", mentioned above, which capture different aspects of liberalization. For example, total protection rates show how industries are protected via tariffs and other taxes and duties, whereas the import ratio to the total value of domestic production measures the degree of competition and how it is affected when more imports result from trade liberalization. While total protection rates are the measures of liberalization, or of its absence, the import ratio is the result of trade liberalization. Therefore, the purpose of using three different measures of openness is to check empirically the robustness of the theoretical analysis with different measures. Other measures of trade openness were used in empirical studies, depending on whether the study is a cross country or cross-industry/firm and the particular country, since some countries have more data than some other countries. In my case here, in terms of explicit openness measures, I am limited by the data set. In terms of the relevance of my study to other samples, as long as there is a relevant data set, the methodology that I employ here is applicable to other countries' liberalization experience.

Several studies have examined the effects of trade liberalization on total factor productivity growth for different countries such as Krishna and Mitra (1999) for India and Kim (2000) for Korea. I will extend their analysis of trade liberalization to encompass liberalization in general and compare my results with those estimated for other countries. Previous findings for the contribution of total factor productivity growth to total output growth have yielded contradictory results. Many developing countries grew via "factor accumulation", instead of improved technological change via total factor productivity growth. I plan to look at how much total factor productivity growth contributed to the total output growth in Turkey and how total factor productivity in manufacturing has been affected by liberalization.

Levinsohn (1993) used plant level data in the greater Istanbul area from 1983 to 1986 to see whether firms in the manufacturing sector were getting more competitive or not. He defined "more competitive" by the concept of price-marginal cost mark-up. If price /marginal cost is getting close to 1, then the firms (and industry) are getting more competitive. If all the firms in a particular industry are getting more competitive, then industry is getting more productive. This is surely a hypothesis, not a statement of fact. In this paper, I explicitly investigate the effects of trade liberalization on productivity growth, using the 3 -digit manufacturing sector level data and incorporate the impact of liberalization on competition. Ignoring this impact leads to biased estimates of the relationship between trade liberalization and productivity growth.

After the pioneering work of Hall (1988, 1990), there were many case studies, investigating the empirical relationship among trade liberalization, market discipline, and productivity growth, such as Tybout et. al. (1991), Levinsohn (1993), Harrison (1994), Krishna and Mitra (1998), and Kim (2000). They were only investigating the effects of trade liberalization, not necessarily "liberalization in general" as mentioned before. Also, they examined the only private sector firms' productivity growth, paying no attention to public sector firms. Some countries, such as India, Turkey, and Egypt, however, have had, until recently, before privatization, a huge public sector. Therefore, this paper differs from the articles cited above by paying attention to public sector as well as private sector firms. Since the incentives used to encourage private sector development were different from the measures taken to get public sector to enter new product lines and expand production, I plan to keep them separate.

1.2. Liberalization in Turkey

This section presents a brief history of trade liberalization, and related policy changes, in Turkey. There are many studies about protectionism and trade liberalization in Turkey such as Krueger and Aktan (1992), Togan and Balasubramanyam(1996), and Togan (1994). There are also early studies about total factor productivity growth in the manufacturing sectors (Kruger and Tuncer, 1980), (Yagci, 1984). These studies, however, do not combine the effects of liberalization with total factor productivity growth.

Beginning in 1980, Turkey started liberalizing its foreign trade along with other policies. These other liberalizing policies were taking place especially in the second half of the decade. From 1980 to 1983, liberalization measures were mainly directed at encouraging exports since, at the end of the 1970s, the lack of foreign exchange in the economy presented grave difficulties. During this first phase of liberalization, measures took the form of real devaluation of about 30 %, increased tax rebates to exporters, credit subsidies to exporters, and foreign exchange currency allocation that allowed the importation of raw material and intermediate goods for exporters. These policies gave some fruits by 1983; merchandise exports almost doubled. How these policies affected the productivity remains uncertain. This first phase of reforms is not really considered as the liberalization that I am interested in since all the emphasis was given to increased exports, which does not necessarily capture trade or other economic liberalization. In the trade literature, there is an established understanding that trade liberalization is more about the elimination of barriers to imports and opening the domestic market to foreign goods and services. In terms of imports, in December 1983, new import liberalization measures were announced and then implemented in Turkey. After the announcement of the new program, the authorities intended to provide incentives via exchange rate regulations rather than specific export promoting incentives and policies. In addition to this, the 1984 Import Program drastically reduced both tariff and non-tariff barriers. Before 1984, imports were regulated with several lists and lists were positive lists. During the 1960s and 1970s, all imports into Turkey were regulated by annual import programmes that were published in the official gazette at the end of the year. Those programmes outlined the import regime for the coming year. The import programme itemized commodities under three lists, one of which was further divided into two lists. Those three lists were the liberalization list, the quota list, and a list enumerating commodities to be imported under the bilateral trade agreements. Lists were positive lists, such that the importation of goods not enumerated in any of the lists was prohibited. The liberalization list was further divided into two lists, liberalization list I (free import list) and liberalization list II (restricted list). Commodities on the free import list consisted mainly of raw materials and spare parts, while commodities on the restricted list consisted of raw material and processed and semi-processed goods. The liberalization list (list I and list II) and quota list were of major importance since they were part of an inward looking development strategy plan, which was divided into annual programmes. The quota list covered commodities that were not important for the development plan, such as consumer goods or were produced domestically. As soon as home production of a commodity began, that commodity was transferred from the liberalized list to the quota list. When a sufficient amount of a commodity was produced domestically, that commodity was removed from the quota list as well. Complete production/protection was then granted to local producers. Importers who were wanting to import any commodity on the liberalized lists I and II during the 1960s and 1970s had to go through a complicated procedure[1].

In the case of imports of commodities on the quota list, the procedure was much more complex than either of the liberalization lists. In that process, many government offices such as the State Planning Organization, the Central Bank, the Ministry of Commerce, the Ministry of Finance and Union of Chambers of Commerce and Industry took part. The import regime explained above remained in power until the beginning of the 1980s.

In 1981, a large list of commodities were transferred from the liberalization list II to the liberalization list I. A major trade reform was introduced in January 1984. All imports were classified into three lists: the prohibited list, the imports subject to permission list, and the liberalized list. Goods that could not be imported in any circumstances, such as guns and ammunition, were covered in the prohibited list, which originally contained about 500 commodities. That number was decreased in the following years. The imports subject to the permission list specified the items that could be imported with prior official permission, and the liberalized list enumerated commodities that could be freely imported. The January 1984 program, as far as can be understood from the explanations, was a negative list. That is, all items not specifically mentioned were eligible for importation. In itself, the shift from a positive list to a negative list was a liberalizing act. For this reason, in this study, 1984 was a watershed year for the second model I estimate, as will be explained in the second section. I consider two periods, 1980-1984 and 1985-1991,where the first period is considered to be less open.

This division of the time span under study is important since the first period is more related to export-increasing trade policies, whereas the second period is related to fewer restrictions on imports and more liberal economic policies overall, which were not only explicitly trade-liberalizing in nature, but included political, financial, and other forms of economic liberalization. For example, in the second half of the eighties, as a consequences of a series of reform towards financial liberalization, the domestic financial market gained more depth and flexibility (Taskin and Yeldan , 1996). In terms of financial liberalization, capital account is liberalized, which caused a massive inflow of short-term capital into the domestic economy. In the credit market, the Central Bank eased the controls over the commercial banks. An interbank money market is established in 1986. Also Capital Market Board is established , and it initiated the reopening of the Istanbul Stock Exchange in 1986. These measures in terms of financial liberalization had impacts on the economy and all financial indicators showed high degree of financial deepening (Yeldan, 1997).

During this second half of the decade, the inflation rate increased and the exchange rate began to appreciate in real terms. The price reform lost its momentum in this period:

[1] Togan (1996) explains the complicated process of importing goods from the quota lists.

until 1985, the price indexes for the public and private manufacturing sector moved together. However, from 1986 onward the spread between the two widened in favour of the private sector. This suggests that pricing policy in the public sector from 1986 failed to exploit the market signals, while the private sector responded more flexibly (Taskin and Yeldan, 1996) .

Morrissey (1996) analyzes the other liberalizing policies in the 1980s and especially in the second half of the decade. For example, the reforms of state economic enterprises(SEE) were related to public investment. In this period, public investment in SEEs was reduced in scale and public investment redirected toward infrastructure. This act can be seen as liberalizing since investing in infrastructure is less price distortionary than SEEs producing private goods with regulated prices. Also privatization was implemented in many cases. Infrastructure was an appropriate area for public investment in terms of productivity growth as investigated by Aschauer (1989).

In terms of political liberalization, Turkey had the first election in 1983, following the military intervention in 1980. This election and its aftermath tried to establish the political stability and political will to implement the economic reforms. In the empirical literature, many articles for example (Barro, 1998) have investigated the links between growth, political freedom and stability. Since the election in 1987 was the first election with no military influence, we can safely assume that after the 1987 election the degree of political freedom and political liberalization was higher, which may have affected growth and productivity. Political stability in terms of the political will to implement reforms might have a positive effect on foreign aid and foreign direct investment, and this in turn can affect productivity growth since foreign direct investment can bring a newer technology.

Another major change in economic policy related to the tax system in the middle of the 1980s. Lee (1996) investigated the possible effects of the tax system on productivity growth. Turkey adopted the value added tax and changed the structure of the tax system in 1984, and in the second half of the decade arranged for tax rebates and incentives to exports. In this regard, the anti-export bias was reduced repeatedly in the second half of the decade. Turkey adopted the value added tax because it wanted to simplify the bureaucracy and be a part of European integration, since EU countries have a value added tax. These policy changes are also considered to be liberalizing.

In short, in the 1980s, especially in the second half of the decade, Turkey adopted many liberalizing policies. That is why the second model, to be explained in the second section, is crucial to understand the possible effects of liberalization which goes beyond trade liberalization. The explicit measures of trade liberalization captured in the first model (as again will be explained in detail in the second section) might not have had significant effects on productivity growth. It will be shown, however, that liberalization, including economic and financial policies, and the political regime, along with trade liberalization, have had a significant and positive effect on productivity growth.

The rest of the paper is organized as follows. In section 2, Econometric modeling is given. Section 3 gives the data and preliminary estimates of productivity. Estimation of the models and interpretation of them is given in section 4. Section 5 concludes the paper.

2. Econometric Modeling of Liberalization

I plan to estimate two different models embodying imperfect competition and non-constant returns to scale. The first model uses an explicit measure for the trade policy variable like protection rates or import shares over the years, while the second model uses a dummy variable which takes the value of 0 before liberalization and the value of 1 after it. Most previous studies use only one of these two models. It would be interesting to see whether the results are sensitive to the econometric specification. When I have an explicit measure for trade policy like protection rates over the years, I make an assumption of a continuous process of liberalization. When I have dummy variables, I make an assumption of once and for all liberalization. Both approaches will be discussed in the estimation section.

2.1. Model 1

In this first model, I have three different measures of trade liberalization, total protection rates, import shares, and subsidy rates. All these three measures will be discussed in detail in the estimation section. In the regressions these measures will be included as one of the independent variables.

2.1.1. CRS and perfect competition

This section examines the methodological framework, which is used with few differences by Kim (2000), Harrison (1994), and Krishna and Mitra (1998) , to estimate the relationship between trade policy and total factor productivity growth.

As a benchmark case, I start out with the standard growth accounting assumption of constant returns and perfect competition. First, I estimate the sectoral rates of TFP growth by using the standard production function:

$$Y_{it} = A_{it} F(L_{it}, K_{it}) \tag{1}$$

Output, which is value added here, Y_{it}, is produced by industry i with inputs labor, L_{it}, and capital, K_{it}. A_{it} is an industry specific index of Hicks-neutral technical progress. Now, totally differentiating (1), and dividing through by Y, and after some manipulation, I get:

$$\begin{aligned} dY/Y_{it} &= (\partial Y/\partial L)(L/Y)(dL/L)_{it} \\ &+ (\partial Y/\partial K)(K/Y)(dK/K)_{it} + dA/A_{it} \end{aligned} \tag{2}$$

Now in a competitive economy, $\alpha_L = (\partial Y/\partial L)(L/Y)$ is the labor share in the value of output. Analogously, $\alpha_K = (\partial Y/\partial K)(K/Y)$ is the capital share in the value of output. Of course, if the production function has constant returns to scale, $\alpha_K + \alpha_L = 1$. Therefore, I have

$$\left(dY/Y\right)_{it} = \alpha_L\left(dL/L\right)_{it} + (1-\alpha_L)\left(dK/K\right)_{it} + \left(dA/A\right)_{it} \tag{3}$$

The change in output is equal to the sum of changes in inputs and change in productivity with inputs weighted by their respective shares in the output. Now , again assuming both perfect competition and constant returns to scale, I can calculate the index of the total factor productivity growth, $\left(dA/A\right)_{it}$ from eq.(3) above since everything in eq.(3), is observable. Given this index, the following equation tests the hypothesis that the dynamic benefit of trade policy(openness) derives from its impact on productivity.

$$(dA/A)_{it} = \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it} \qquad (4)$$

where $\left(dA/A\right)_{it}$ is the total factor productivity (TFP) growth, and TP_{it} stands for trade policy. The trade policy variable is related to openness to trade, where traded goods are aggregated according to three-digit industries. So trade policy variable is related to industry i since I am looking at the industry specific effects of trade policy or trade liberalization. f_i is industry specific fixed effect, in effect a dummy variable, capturing factors peculiar to industries , but not explicitly included in the regression. ζ_i is the coefficient of industry specific fixed effects. ϕ_t is time specific fixed effect, which is capturing the factors that are affecting all industries in a given year. ξ_t is the coefficient of the time specific fixed effects. e_{it} is the error term.

Eq. (4) is one way of estimating the effects of trade liberalization on productivity growth. In this equation, as can be seen, I explicitly include in the regression the trade policy variable, which can be tariff rates, quotas, import penetration, etc. In eq.(4) , however, left hand side variable might be biased since I assumed constant returns to scale and perfect competition. Right hand side variables might have some measurement errors since it is not easy to find accurate measures of trade openness. One of the purposes of this paper is to compare and test whether manufacturing industries under consideration here show perfect competition and constant returns to scale.

In addition to trade policy variables, there might be other important determinants of TFP growth such as political stability, better institutions, democracy, etc. as suggested by many authors recently (Edwards, 1998). These variables are difficult to measure on an industry basis even though they can be captured in cross-country studies. Therefore, a dummy-variable approach is employed instead to capture them (Kim , 2000). In the above specification of the total factor productivity growth, an industry-specific component, f_i , captures the effects of all omitted factors like institutions, political variables, etc. that vary across-industries, but do not change over time. A time specific component, however, ϕ_t, reflects the productivity shocks specific to period in which they occur and common to all industries. ϕ_t is a dummy variable. So our estimation equation contains a trade policy variable, which will be captured by protection rates, and import shares of the industries under investigation, and dummy variables described above. It is known that one should use dummy variables sparingly since one can have a degrees of freedom problem. However, in our case, I will not have this problem because cross-section and time dimension of the study are wide enough. Eq.(4) is the starting equation. One of the main purposes of this paper is to see whether it is appropriate to use an equation like eq. (4) to understand the effects of trade liberalization. Eq.(4) is assuming constant returns to scale and perfect competition as mentioned above. Therefore, if the industries under consideration here don't have perfect competition and constant returns to scale, the dependent variable will be biased in eq.(4) and all the coefficient estimates will be biased. If this is the case, I can not rely on this regression to assess the effects of trade liberalization and eq.(4) should be changed to incorporate imperfect competition and non-constant returns to scale. In the next section , I talk about how that can be done theoretically.

2.1.2. Imperfect competition and non-constant returns to scale

If perfect competition and constant returns to scale assumptions are violated, total factor productivity growth estimation would yield a biased estimate of TFP growth. In particular, profit maximization by firms holding some market power would no longer imply that share of that input in total income (output) would be equal to elasticity of output with respect to that input. There will be some markup, μ_i, and this markup will be assumed to be the same all over the firms in the same industry in a given period (Levinsohn ,1993). In addition, if the constant returns to scale assumption is violated, factor shares of production factors do not exhaust the output, but their sum is equal to a scale parameter, φ divided by the markup parameter, μ_i. In the following section, I will show this explicitly.

<u>The share of inputs in the value of output</u>	<u>The elasticity of output</u>
for labor : $(wL/pY)=\alpha_L$	$(\partial Y/\partial L)(L/Y)=\varepsilon_L$
for capital : $(rK/pY)=\alpha_K$	$(\partial Y/\partial K)(K/Y)=\varepsilon_K$

When there is perfect competition, $\alpha_L=\varepsilon_L$ and $\alpha_K=\varepsilon_K$. If there is imperfect competition, it is likely that $\alpha_L\langle\varepsilon_L$ and $\alpha_K\langle\varepsilon_K$. So, there is a mark-up between factor shares and elasticities for each factor: $\alpha_L\mu=\varepsilon_L;\alpha_K\mu=\varepsilon_K$ where μ is a mark-up parameter greater than 1. Moreover, with non-constant returns to scale, $\varepsilon_L+\varepsilon_K\neq 1$. With increasing returns to scale, this sum is greater than 1 and labor and capital do not exhaust the total output created. With increasing returns to scale, perfect competition is inconsistent and there are positive economic profits. Under constant returns to scale, if F_L and F_K are partial derivatives of production function and I divide the Euler equation $F_L L+F_K K=F$ by F, I obtain $(F_L L+F_K K)/F=1$ so that the two elasticities sum to 1. Under non-constant returns to scale, the elasticities sum to a scale parameter, φ, greater than or less than 1.

I can combine imperfect competition and non-constant returns to scale:

$$\alpha_L \mu + \alpha_K \mu = \varepsilon_L + \varepsilon_K$$

$$\mu(\alpha_L + \alpha_K) = \varphi$$

$$\alpha_L + \alpha_K = (\varphi / \mu)$$

$$\alpha_K = (\varphi / \mu) - \alpha_L$$

Now, assuming Cournot behavior on the part of firms, and a mark-up that only varies across sectors, and using the first order conditions from each firm's profit maximization and eq. (2) , I get, like Harrison (1994):

$$\left(dY/Y\right)_{it} = \mu_i \alpha_L \left(dL/L\right)_{it} + \mu_i \alpha_K \left(dK/K\right)_{it} + \left(dA/A\right)_{it} \qquad (5)$$

where α_K is unobservable. α_L is observable since I have the compensations to the workers in our data set. I can divide the compensation to the workers by the value of output to get the share of labor. Note that, as shown above, the sum of factor shares can be expressed as φ / μ, where φ, scale parameter, may be greater or less than one (or equal to 1 in the constant returns case). According to Eq. (5), imperfect competition enters eq. (2) because firms with market power do not set the value of marginal product equal to factor price. The share of each input in the value of output would no longer be equal to the elasticity of output with respect to that input. In eq.(5) , the total factor productivity growth, $\left(dA/A\right)$, which is the residual in growth accounting, is incorporating imperfect competition and non-constant returns to scale. In other words, total factor productivity growth(TFPG) in eq. (5) is not the same as in eq. (2) or eq.(3) or eq.(4). In eq.(2) –eq.(4) , TFPG is the "standard" measure of TFPG. In eq.(5), TFPG is the "true" TFPG since the standard one is assuming perfect competition and constant returns to scale, whereas "true" measure is not.

To get the unbiased estimates of total factor productivity and the unbiased coefficients of its determinants, I will offer a way of correcting these biases. To this end, I calculate the difference between the "standard" TFP growth above, $\dot{TFP}$, that does not take into account non-constant returns and imperfect competition and the "true" TFP growth denoted by $\dot{TFP}^*$. I can rewrite eq. (5) as follows since the TFPG in eq.(5) is the "true" one

$$(dY/Y)_{it} = \mu_i \alpha_L (dL/L)_{it} + \mu_i \alpha_K (dK/K)_{it} + (dA/A)^*_{it} \qquad (5a)$$

The difference between the standard TFP growth in eq(3) and the true TFP growth in eq.(5a) is given by

$$(dA/A)_{it}-(dA/A)^{*}_{it}=\left[(dY/Y)_{it}-\alpha_L(dL/L)_{it}-(1-\alpha_L)(dK/K)_{it}\right]$$

$$-\left[(dY/Y)_{it}-\mu_i\alpha_L(dL/L)_{it}-\mu_i\alpha_K(dK/K)_{it}\right]$$

$$=\mu_i\alpha_L(dL/L)_{it}+\mu_i\alpha_K(dK/K)_{it}-\alpha_L\left[(dL/L)_{it}-(dK/K)_{it}\right]-(dK/K)_{it}$$

$$=\mu_i\alpha_L(dL/L)_{it}+\mu_i\alpha_K(dK/K)_{it}-\alpha_L dl_{it}-(dK/K)_{it}$$

where $dl_{it}=\left[(dL/L)_{it}-(dK/K)_{it}\right]$

Substituting $\alpha_K=(\varphi_i/\mu_i)-\alpha_L$, which is derived above, I find

$$(dA/A)_{it}-(dA/A)^{*}_{it}=\mu_i\alpha_L(dL/L)_{it}+\mu_i((\varphi_i/\mu_i)-\alpha_L)(dK/K)_{it}-\alpha_L dl_{it}-(dK/K)_{it}$$

$$=\mu_i\alpha_L(dL/L)_{it}+\varphi_i(dK/K)_{it}-\mu_i\alpha_L(dK/K)_{it}-\alpha_L dl_{it}-(dK/K)_{it}$$

$$(dA/A)_{it}-(dA/A)^{*}_{it}=(\mu_i-1)\alpha_L dl_{it}+(\varphi_i-1)(dK/K)_{it}$$

Hence, I obtain

$$(dA/A)_{it}=(\mu_i-1)\alpha_L dl_{it}+(\varphi_i-1)(dK/K)_{it}+(dA/A)^{*}_{it}$$

or

$$\dot{TFP}_{it}=(\mu_i-1)\alpha_L dl+(\varphi_i-1)(dK/K)_{it}+\dot{TFP}^{*}_{it} \qquad (6)$$

Supposing, for the moment, that $\varphi_i=1$ (ignoring non-constant returns to scale),then equation (6) shows that faster capital input growth relative to labor will lead to a negative bias in the "standard" measure when imperfect competition is present ($\mu_i \rangle 1$). When increasing returns exist, $\varphi_i \rangle 1$, the same pattern of production factor growth rates can generate either positive or negative biases. Therefore, in order to be reliable in our tests with regard to the relationship between "true" productivity growth and trade policy variables (like openness), equation (4) must be corrected for the bias in the "standard" measure.

In eq. (6) , the mark-up parameter and scale parameter might be affected by trade liberalization. If I assume that those parameters are affected by trade liberalization, and if I further assume that there is a linear relationship between trade liberalization and scale/ markup parameter, I can derive an equation that can correct for biases and still incorporates the trade policy variables (Kim, 2000). To this end , now assume that

$(\mu_i - 1)$ is affected by trade policy according to: $(\mu_i - 1) = \sigma_i + \sigma_{iTP} TP_{it}$ which shows that mark-up is a linear function of trade policy. Analogously , $(\varphi_i - 1) = \gamma_{Ki} + \gamma_{iTP} TP_{it}$, which shows that scale parameter is affected by trade policy. Scale parameters are usually regarded as depending on technology. In this case , I am implicitly assuming that trade policy is affecting technology, meaning more open economies help firms exploit external markets and increase their returns to scale. For this reason , it is implicitly assumed that the scale parameter is a linear function of the trade policy or trade liberalization.

Now, I can combine eq. (4) and eq.(6). Our main purpose here is to see whether there is a possible positive relationship between "true" productivity growth and trade policy variables. For this reason, a basic specification is as follows

$$\dot{TFP}^*_{it} = \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it}, \qquad (7)$$

In eq.(7) , true productivity growth , $\dot{TFP}^*_{it}$, is unobservable. In order to have an estimable equation, I need to convert the above equation into a regression equation in which all the variables are observable. To this end, I use eq.(6) to solve for true factor productivity growth and plug that expression into eq.(7) to get,

$$\dot{TFP}_{it} = \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + (\mu_i - 1)\alpha_L dl_{it} + (\varphi_i - 1)(dK/K)_{it} + e_{it}$$

Now, if I replace the mark-up and scale parameters by the linear functions above, I get

$$\dot{TFP}_{it} = \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} +$$

$$(\sigma_i + \sigma_{TP} TP_{it})\alpha_L dl_{it} + (\gamma_{Ki} + \gamma_{TP} TP_{it})(dK/K)_{it} + e_{it}$$

Finally I have

$$\dot{TFP}_{it} = \sigma_i \alpha_L dl_{it} + \sigma_{iTP}(TP_{it}\alpha_L dl_{it}) + \gamma_{Ki}(dK/K)_{it} + \gamma_{iTP}(TP_{it}(dK/K)_{it})$$
$$+ \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it} \qquad (8)$$

where bias correction is the whole expression before

$$\sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it}$$

I will use the coefficients of $\alpha_L dl_{it}$ and $(TP_{it}\alpha_L dl_{it})$ to find the markups since the deviation of μ_i from 1 is measured by the sum of $\sigma_i + \sigma_{iTP} TP_{it}$. The interaction term, $TP_{it}\alpha_L dl$, is also added to capture the possible impact of the trade policy on the mark up. Likewise, I will use the coefficients of $(dK/K)_{it}$ and $(TP_{it}(dK/K)_{it})$ to see whether a particular industry has increasing, decreasing , or constant returns to scale. The interaction term, $TP_{it}(dK/K)_{it}$, is also employed to see whether there is a possible relationship between openness to trade and returns to scale.

Therefore, in the presence of non-constant returns and imperfect competition, the estimated coefficient, β_{TP}, of Eq. (8), in addition to the two interaction terms would correctly measure the effects of trade policy on the true productivity growth. Here, at this stage, I can test under the null hypothesis that the mark-up and returns to scale parameter are both constant at unity for all industries and periods, $H_O: \sigma_1 = ... = \sigma_n = \sigma_{TP} = \gamma_{K1} = ... = \gamma_{Kn} = \gamma_{TP} = 0$. If I reject this joint hypothesis, then I can reject the assumption of perfect competition and constant returns to scale. The coefficient of the trade policy variable in eq. (8), if trade policy means reduced tariffs, quotas, etc. would be expected to be negative. Since reduced tariffs and quotas mean more openness, more openness (reduced tariffs and quotas) is expected (as will be tested here) to affect total factor productivity positively.

Our estimates will allow us to decide whether perfect competition and constant returns to scale or imperfect competition and non-constant returns to scale are the appropriate specifications. Under the null hypothesis, the mark-up, μ_i, and returns to scale parameter, φ, are both constant at unity for all industries and periods. If I reject this joint hypothesis, then I reject the assumption of perfect competition and constant returns to scale. I can also test for imperfect competition and non-constant returns to scale separately.

2.2. Model 2

Another way of estimating the effects of trade liberalization on productivity growth, is to run a regression with dummy variables, taking the values of one after the liberalization and zero before. In this model as well, the feature of imperfect competition and non-constant returns to scale is incorporated. To derive an equation for this purpose, replace α_K with $(\varphi / \mu) - \alpha_L$ in equation (5) to get

$$(dY/Y)_{it} = \mu_i\alpha_L(dL/L)_{it} + \mu_i((\varphi_i/\mu_i) - \alpha_L)(dK/K)_{it} + (dA/A)_{it}$$

$$= \mu_i\alpha_L(dL/L)_{it} + \varphi_i(dK/K)_{it} - \mu_i\alpha_L(dK/K)_{it} + (dA/A)_{it}$$

$$= \mu_i\alpha_L((dL/L)_{it} - (dK/K)_{it}) + \varphi_i(dK/K)_{it} + (dA/A)_{it}$$

Now, subtracting $(dK/K)_{it}$ from both sides of this equation,

$$(dY/Y)_{it} - (dK/K)_{it} = \mu_i\alpha_L((dL/L)_{it} - (dK/K)_{it}) + (\varphi_i - 1)(dK/K)_{it} + (dA/A)_{it},$$

which can be rewritten as

$$d\,y_{it} = \mu_i \alpha_L\, dl_{it} + (\varphi_i - 1)\,\mathrm{dk}_{it} + \left(dA/A\right)_{it} \tag{5b}$$

where y, l denote $Ln(Y/K)$, $Ln(L/K)$, respectively and, $dk = (dK/K)$.

The TFPG in eq.(5b) is the "true" TFPG. This equation evaluates the growth rate of total factor productivity. Total factor productivity is the "true" one in eq. (5b).

Now, I can introduce a dummy variable, D in (5b). And using an interactive slope dummy to account for changes in the competitive behavior after the trade liberalization, an intercept dummy to allow for changes in productivity growth by firms in the post liberalization period and an interactive dummy to allow the returns to scale to change with the trade reforms, I obtain

$$\begin{aligned} d\,y_{it} &= \beta_{1i}\left[dx_{it}\right] + \beta_{2i}\left[Ddx_{it}\right] \\ &+ \beta_{3i} D + \beta_{4i}\, dk_{it} + \beta_{5i}\left[Ddk_{it}\right] + (dA/A)_{it} \end{aligned} \tag{9}$$

where :

$\beta_{1i} = \mu_i$, $\beta_{4i} = (\varphi_i - 1)$, $dx = \left[\alpha_L\, dl\right]$, and $dk = (dK/K)$.

Eq. (9) is the second model which I plan to estimate. This measure has come to be known as total factor productivity because, unlike measures that consider only output and labor input, it accounts for capital input and, in a more general form, for all other kinds of inputs. β_{1i} denotes the level of the markup before the reforms, β_{2i} denotes the change in the markup. β_{3i} captures the change in the growth rate of productivity. $(dA/A)_{it}$ is "true" TFPG since eq.(9) incorporates imperfect competition and non-constant returns to scale. In practice, the rate of productivity growth will not be known. Therefore, this "true" TFPG is not observable and it is the so called "Solow residual". Since productivity growth seems to have a substantial random element, it is natural to view total productivity growth as the sum of a constant underlying growth rate and a random disturbance term as in Hall (1988) and Harrison(1994). That is, TFPG will be as follows $(dA/A)_{it} = c_i + u_{it}$. I am decomposing productivity growth into an industry specific constant and a disturbance term. Therefore, the model above can be estimated by assuming that different industries have different productivity growths and those growths are the sum of a constant and a random disturbance term. Finally, our estimating equation will be as follows

$$d\,y_{it} = c_i + \beta_{1i}\left[dx\right]_{it} + \beta_{2i}\left[Ddx\right]_{it} + \beta_{3i} D + \beta_{4i}\, dk_{it} + \beta_{5i}\left[Ddk_{it}\right] + u_{it}$$

Before going to the estimation of these two models, these models should be viewed in a different perspective. As is well known, in the neo-classical growth model, the policy variables can affect the growth in the transition period. Since in the long run, the growth effects of all policy variables die out and the economy returns to its original steady state, policy variables affect the transition dynamics, but not the long-run steady-state growth rate. In that model, productivity growth reflects the technological change, and technological change is exogenous. Therefore, in terms of the liberalization considered in this paper, improving the allocation of resources or curbing firms' excess market power only generate a one-time increase in growth in the transition interval. However, the new endogenous growth theories, Romer (1990) and Grossman and Helpman (1990), suggest that trade policies also affect long-run growth. These new growth models provide an analytical framework in which trade dynamically affects long-run growth. Moving toward free trade could permanently affect growth rates through the adoption of technological advances. Another link is the fact that imported machinery embodies the new technological advances and continuous liberalization of foreign trade can permanently increase growth. However, Grossman and Helpman also point out that protection could accelerate growth if it shifts resources to manufacturing from research and development sector in which the country does not have a comparative advantage. In the context of these theories, the impact of trade policies on long run growth is ultimately an empirical question. Therefore, one of the purposes of this paper is to shed further light on this debate by empirically examining the significance of the liberalization on productivity growth in the Turkish manufacturing industries context. The reason of focusing on productivity is the fact that, both in traditional and new growth theories, long-run growth is generated by productivity increases.

In short, in this paper, there is no explicit test about neo-classical versus new growth theories per se. Both models above are based on simple neo-classical growth model except that both models incorporate market imperfections and possibly non-constant returns to scale. The first model shows the dynamic/transitional effect of trade liberalization on productivity growth, whereas the second model shows the dynamic effects of liberalization general including trade, economic, financial, political, etc liberalization. That is, inspired by neo-classical growth accounting and benefited from the new growth theory, both models are empirically investigating the relationship between the long-run productivity growth and economic liberalization, not just short-run dynamics.

3. The Data and Preliminary Estimates of Productivity

There are two models that I plan to estimate in this paper. Eqs. (4), (8) are related to the first model, and (9) to the second. Eq.(3) will not be estimated by a regression, but total factor productivity growth will be calculated from the data according to eq.(3). For eq.(3) I have the following variables : growth rate of output (growth of value added here in our case), income share of labor in value added, labor growth, and capital growth. For these variables, data are obtained from the Publication, Communication, and Public Relations Division of the State Institute of Statistics (SIS) in Ankara via electronic file transfer.

I have nominal valued value added for each industry. I deflated this nominal value by industry specific wholesale price indexes (WPI), separate for the public and private sectors, to get the real value added. Those indexes were calculated by the same division of the SIS. For the period 1980-1991, wholesale price index calculations changed the base year three times and there are no data points for the year 1980. I converted the WPI using 1981 as the base year. For the 1980 values of the industry specific indexes, I used general (not industry specific) WPI since industry specific indexes are not available for 1980 and earlier years , which is calculated by the same division of the SIS with the 1963 base year. I converted this index again using 1981 as the base year, and assumed the same percentage change between 1980 and 1981 for industry specific indexes. In other words, the 1980 values of industry specific WPI have the same percentage change between 1980 and 1981 for all industries under considerations. For the growth of real value added, I used the log difference of real value added in two consecutive years. For the growth of real value added for the year 1980, I need the value added of 1979. For the real value added of 1979, I used again general (not industry specific) WPI by the same methodology just described above. There is some discussion in the literature about the two different measures of productivity, gross output based productivity measure and value added productivity measure. Usually, productivity levels that are based on value added have higher estimated productivity measures (Hulten 1978). I will keep this point in mind when I interpret the results in the estimation section.

Income share of labor is calculated as follows: The compensations to total number of workers are given in the data set. I multiplied those compensations with the number of workers, which is also given in the raw data set and divided by total value added.

For labor growth, the number of workers is given in the data set for the years under consideration. I used again the log difference between two consecutive years to get the growth of labor.

For capital growth, I used "installed horsepower" since there is no capital stock data for three digit industries for the years under investigation. There is investment data from which one would calculate capital stock, using perpetual inventory methodology. For this methodology, I have a couple of problems, the first of which is to find the right industry specific indexes. Secondly the beginning year is important to build a series of capital stock. The result can change dramatically if I change the beginning year of building capital stock via perpetual inventory methodology. The State Institute of Statistics calculated capital stock for two digit industries beginning in 1950. Krueger and Tuncer (1982) found this series not very useful since it generated implausibly small numbers. Their study covered the years 1963-1976. I calculated another series of capital stock by perpetual inventory methodology, assuming a different beginning year and the first 1-4 years of the period 1980-1991 generated implausibly high capital growth numbers and negative TFPG numbers. To avoid all of these measurement errors, I used "installed horsepower" as the capital stock as is done in the literature before. For capital growth, I used again the log difference in two consecutive years.

For eq. (4), I need data for total factor productivity growth, $\left(dA/A \right)_{it}$, and trade policy , TP. TFPG in eq.(4) is derived from the calculations that I made in eq.(3), assuming constant returns and perfect competition. For the trade policy variable, I use three different measures of openness to trade, total protection rates, import share in total output, and subsidy rates.

Total protection rates are derived from Aktan (1996). Total protection rates include impact of custom duties and other charges and quantitative restrictions. And the values are percentage c.i.f. prices. Total charges against imports, that is custom duties and other charges, that is taken from Aktan (1996) for a particular industry are calculated as follows:

Custom duty collected (cd)= c.i.f. * t
Municipality tax(mt)= cd*m
Stamp duty(sd)=c.i.f*s
Funds(f)= specific rates
Wharf tax(wt)=(c.i.f + cd + mt + f + sd) * w
Value-added tax(vat)= (c.i.f. + cd + mt + f + sd) *v
Deposit requirements for importation (g)
Where

t = the rate of nominal tariff
m =15 percent through the entire period
s = 1 percent , 1980-May 1985
4 percent , June 1985-December 1986
6 percent , January 1987-October 1988
10 percent , November 1988 to Date
w = 15 percent throughout
v = 0 until January 1985
10 percent , January 1985-October 1985
12 percent , November 1986-October 1988
10 percent , November 1988-1990
g = 3.8 percent, 1980
10 percent , 1981 and 1982
7 percent , 1983
7.8 percent , 1984
5.2 percent , 1985
0.6 percent, 1986
2.7 percent , 1987
4.3 percent, 1988
12.0 percent, April 1989
7 percent , May 1989
5 percent , June 1989
0 percent , 1990

Total charges against imports = cd + mt + sd + f + wt + vat + g

Aktan (1996) also includes the effects of quantitative restrictions to get total protection rates. In 1984 and 1985, quantitative restrictions against many imports were removed. The effects of these removed restrictions are included in the total protection rates by assuming that quantitative restrictions imposed an additional 50-percentage-point wedge between the landed cost of import competing items and their domestic prices in 1980 , 40 percent in 1981, 30 percent in 1982 and 1983, 20 percent in 1984, 10 percent in 1985 and zero percent thereafter. Krueger and Aktan (1992) calculated the total protection rates in the same way. However, their calculations include the period 1980-1989. Both Aktan's (1996) and Krueger and Aktan's (1992) calculations of total protection rates are subjective and the inclusion of the effects of quantitative restrictions is arbitrary. But this is the only data set with total protection rates for the period under investigation. Togan (1994) provides nominal protection rates, assuming there were no quantitative restrictions in all the period under consideration. His calculation also does not cover the whole time series since he does not provide nominal protection rates for every year. For this reason, I used Aktan (1996) and Krueger and Aktan (1992) for our regressions.

The second measure of trade openness that I used here is import share in total output. These data are derived from OECD country reports. Nominal import values are deflated by import price index that is coming from the SIS. Import share as a measure of openness is included in the regression since some recent studies have emphasized the importance of imports in terms of total factor productivity. Lee (1995) and Mazumdar(2001) show the importance of imports in the productivity growth and growth process, especially machinery and/or capital good imports.

The third measure of trade openness that I use is the total subsidy rates. This is the value of total export subsidy. It is the percentage of f.o.b. value exported. For a typical manufacturing industry, total subsidies are calculated as follows

Total Subsidies= Tax rebates + Support and Price Stabilization Fund (SPSF) + Export Credits + Corporate tax deductions + Freight subsidy + Advance payment + Resource utilization support fund.

Total subsidy rates are from Krueger and Aktan (1992).

In eqs. (8) and (9), all the variables are described above. In eq.(9) , I use a dummy variable instead of an explicit trade policy variable. The dummy variable is capturing a different period with a different trade openness as mentioned before.

This paper examines the period between 1980 and 1991. Even though I have data for some years before 1980 and after 1991 albeit incomplete, I have not used them since Turkey used other policies than just trade liberalizing policies after 1991. These policies were not a reversal of trade liberalization, but different financial regulations and establishments such as the Istanbul Stock Exchange Market. The years between 1980 and 1991 are called, in Turkish economic history, as drastic open economy years, meaning these years showed a more open trade orientation. For years before 1980, and after 1950 , I have data for two digit industries, but no protection rates.

Total protection rates take into account the impact of import duties and quantitative restrictions as talked about above, by 14 different three-digit level industries and are estimated as percentages of the c.i.f. price

3.1. Standard measures of TFPG

In this standard measure, as shown before, a bias arises if the industries, in reality, are not perfectly competitive and show non-constant returns to scale. The numbers below have possible biases and modified or true productivity measures will be discussed in the following sections

Some averages of TFPG estimates are calculated below for some periods under the assumption of constant returns to scale and perfect competition. The numbers in parentheses show the industry code. The TFPG numbers are calculated according to equation 3 rewritten as

$$(dA_t / A_t) = (dY_t / Y_t) - \alpha_L (dL_t / L_t) - (1-\alpha_L)(dK_t / K_t)$$

TABLE 1

TFPG estimates with perfect competition and constant returns to scale assumption

	1980-1984	1985-1991	1980-1991
Food Manufacturing(311)			
Total	0.000595	0.104601	0.066781
Public	-0.07246	0.165655	0.079067
Private	0.001901	0.083861	0.054057
Manufacture of food products not elsewhere classified(312)			
Total	-0.00262	0.098445	0.061695
Public	-0.02955	0.130601	0.072364
Private	-0.01275	0.075698	0.043536
Beverage Industries(313)			
Total	-0.01212	0.133658	0.080648
Public	-0.17438	0.281694	0.11585
Private	0.084097	0.051716	0.063491
Tobacco Manufactures(314)			
Total	0.129861	0.003224	0.049274
Public	0.151257	-0.01134	0.047787
Private	0.151153	0.0493	0.086338
Manufacture of Textiles(321)			
Total	0.014984	0.054115	0.039886
Public	0.01477	-0.00443	0.002553
Private	0.013702	0.060184	0.043281
Manufacture of wearing apparel, except footwear(322)			
Total	0.256075	0.028759	0.111419
Public			
Private	0.253387	0.034863	0.114326
Manufacture of leather and products of leather, leather substitutes and fur, except footwear and wearing apparel(323)			
Total	0.091481	0.102101	0.098239
Public			
Private	0.0868	0.072709	0.077833
Manufacture of footwear, except vulcanized or moulded rubber of plastic footwear(324)			
Total	0.187916	0.060054	0.106549
Public	0.219845	0.00859	0.08541

Private	0.04997	0.147049	0.111748
Manufacture of wood and wood cork products, except furniture(331)			
Total	-0.06304	0.082246	0.029413
Public	-0.05871	-0.02959	-0.04017
Private	-0.05382	0.135809	0.066852
Manufacture of furniture and fixture, except primarily of metal(332)			
Total	-0.02246	0.099539	0.055176
Public			
Private	0.06952	0.043722	0.053103
Manufacture of paper and paper products(341)			
Total	0.124074	0.047041	0.075053
Public	0.106674	0.039348	0.06383
Private	0.239352	0.036817	0.110466
Printing, publishing and allied products(342)			
Total	-0.04777	0.01245	-0.00945
Public	0.009754	0.061156	0.042464
Private	-0.03063	0.000476	-0.01083
Manufacture of industrial chemicals(351)			
Total	-0.07328	0.068514	0.016954
Public	-0.10305	-0.00463	-0.04042
Private	-0.06142	0.131739	0.061499
Manufacture of other chemical products(352)			
Total	0.030696	0.078119	0.060874
Public	-0.09802	0.008864	-0.03
Private	0.041685	0.085213	0.069385
Manufacture of rubber products(355)			
total	0.03985	0.07004	0.059062
public			
private	0.03985	0.098349	0.077076
Manufacture of plastic products not elsewhere classified(356)			
total	0.023395	0.142526	0.099206
public			
private	0.02518	0.140814	0.098765
Manufacture of pottery, china and earthenware(361)			
total	-0.04241	0.046725	0.014312

public	-0.11362	0.058966	-0.00379
private	-0.03675	0.043135	0.014085
Manufacture of glass and glass products(362)			
total	-0.04959	0.053689	0.016131
public			
private	-0.04959	0.052223	0.015198
Manufacture of non-metallic mineral products(369)			
total	-0.01725	0.054101	0.028154
public	0.01076	0.029601	0.02275
private	0.007148	0.060216	0.040919
Iron and steel basic industries(371)			
total	0.014623	0.108298	0.074234
public	0.03869	0.072295	0.060075
private	0.07586	0.088525	0.083919
Non-ferrous metal basic industries(372)			
total	-0.00021	0.09762	0.062044
public	-0.111	0.11387	0.032098
private	0.177623	0.059378	0.102376
Manufacture of fabricated metal products excepts machinery and equipment(381)			
total	0.021194	0.090219	0.065119
public	0.139884	-0.09528	-0.00976
private	0.009015	0.094532	0.063435
Manufacture of machinery except electrical(382)			
total	0.10945	0.075917	0.088111
public	0.139731	-0.01049	0.044133
private	0.066555	0.08682	0.079451
Manufacture of electrical machinery, apparatus repairing, appliances and supplies (383)			
total	0.199629	0.097557	0.134674
public	0.148211	-0.02963	0.035042
private	0.196206	0.106355	0.139028
Manufacture of transport equipment(384)			
total	0.100673	0.052397	0.069952
public	-0.06676	0.058472	0.012933
private	0.139637	0.049974	0.082579

Manufacture of professional. Scientific, measuring and controlling equipment, not elsewhere classified and of photographic and optical goods(385)			
total	0.002643	0.135393	0.08712
public			
private	0.059644	0.136848	0.108774

Averages	1980-1984	1985-1991	1980-1991
total	0.07836	0.06588	0.070418
public	0.008001	0.044407	0.031169
private	0.059358	0.077936	0.07118

From the table above, I can see that, on average, productivity is increasing in both periods (before and after liberalization) in both public and private sectors. The change in the growth rates of total factor productivity, in the public sector, on average is bigger than those of the private sector, whereas in both periods the private sector, on average, has higher total factor productivity growth rates. In the first period, in the public sector, the TFP growth is 0.8 percent. In the second period, the TFP growth is 4.4 percent on average. The TFP growths, in the private sector, 5.9 and 7.8 percent respectively. On average, the range of the productivity growth rates is reasonable even though total factor productivity estimates based on the value-added function overstate productivity growth. These productivity estimates might be biased, as mentioned before, because standard assumptions are maintained in the estimates.

4. Estimation and interpretation of the results of the models

4.1. Estimation of Model 1

To estimate the relationship between trade liberalization and productivity growth in the manufacturing industries, I need to have liberalization or openness measures. I have two sub-periods here, 1980-1984 and 1985-1991. In 1984, all the quotas, in effect, are eliminated as mentioned before so that 1984 separates the two sub-periods. I propose two different main methodologies to investigate the effects of trade liberalization. In the first model, I use some measures of openness to see their productivity effects by regressing total factor productivity on them. If these measures of openness are significant and positive, then I can conclude that trade liberalization has a positive effect on total factor productivity growth. In the second model, I can divide the whole period into two sub-periods, one of which represents a more open period. In this second model, a regime shift can be captured by dummy variables. If, in this second model, I have a significant coefficient for a dummy variable, while in the first model, where I have an explicit measure of trade liberalization, I have an insignificant coefficient of trade liberalization measure, then I can state that there might be other policy variables that I am unable to capture in the second period such as tax policy, changes in the payment regime, etc.. If I have a significant and positive coefficient for a dummy variable, it shows that in the second period, where there is a regime change, the policy changes in the second period have a positive effect on total productivity growth.

4.1.1. Estimation of Equation 4

Equation 4 assumes constant returns to scale and perfect competition. As I mentioned before, in eq.(4) , total factor productivity might be biased . I estimate eq.(4) to compare the results with eq. (8) which possibly corrects the biases.. I use three different measures of openness, sectoral protection rates, import share or import penetration ratio, and subsidy rates. In this section, I estimate eq.(4) separately for public, private, and both sectors and for three different measures of openness. The results are as follows.

TABLE 2

Estimation of sectoral total factor productivity growth

Openness measures	Coefficient	T-statistic(p-value)	Adj-R-Squared	Number of obs.
For combined (public + private) sectors				
Import shares	-0.0003	-0.30 (0.58)	0.142	132
Protection rates	-0.00016	-0.19 (0.84)	-0.004	168
Subsidy rates	0.001	1.94 (0.054)	0.004	140
For public sector only.				
Import share	-0.005	-0.890(0.37)	-0.073	96
Protection rates	-0.0007	-0.55(0.58)	-0.049	120
Subsidy rates	0.005	2.06(0.041)	-0.004	100
For private sector only.				
Import share	0.0001	0.009(0.99)	0.190	132
Protection rates	0.0004	0.060 (0.95)	0.042	168
Subsidy rates	-0.0001	-0.116(0.90)	- 0.009	140

Estimation under standard assumptions (constant returns to scale and perfect competition)
All the regressions are fixed effects models of panel estimation with White's heteroskedasticity correction for combined sector (private + public), which is totally 11 different industries for import share variable. For protection rates, there are 14 different industries , so number of observations is 168
For public sector, I have import penetration data for only 8 different industries. So the number of observations is 96. And I have protection rates for only 10 industries for public sector, so in this case the number observations is 120. The industries that are used in the regressions above
For import penetration ratio.
For combined (public&private) sectors: 321,351,355,362,371,372,381,382,383,384,385 ; for public sector, I use industries with following classification number: 321,351,371, 372,381,382,383,384. For private sector: 321,351,355,362,371,372,381,382,383, 384,385 .For total protection rates
For combined (public&privare) sectors: 311,322,323,341,351,355,362,369,371,372,381,382,383,384; for public sector:311,341,351,369,371,372,381,382,383,384 ; for private sector: 311,322,323,341,351,355, 362,369,371,372,381, 382,383,384
For subsidy rates.
For combined (public&privare) sectors: 311,322,323,341,351,355,362,369,371,372,381,382,383,384; for public sector:311,341,351,369,371,372,381,382,383,384; for private sector: 311,322,323,341,351,355,362,369,371,372, 381, 382,383,384

Table 2 shows that all measures of openness in both public and private sectors are insignificant except for subsidy rates in public and total sectors. One would think that subsidy rate is not a measure of openness. In Turkey's case, however, it might capture some part of openness since export subsidies were used to stimulate the manufacturing sector between 1982 and 1987. A particular economy is more open , the smaller is the subsidy rate, ceteris paribus. Since almost all the coefficients are insignificant, there is no need to explain why they have expected or unexpected signs. When I run the same regressions with import penetration ratio with generalized least squares (GLS) and pooled least squares, the results are roughly the same. In addition to biases via standard assumptions, the quality of the data might add the explanation of no significant relationship. One usually expects that increased imports can stimulate competition and increase productivity as mentioned in the first section. Another surprising result is the fact that most of the industries above are capital good or investment good and import competing industries. And increased import share in these industries has no significant effect on productivity growth. This result is counterintuitive and not expected. The negative and significant coefficient for import penetration ratio has been found and reported in the literature (Nishimizu and Page, 1990).

Table 2 shows that the almost all the measures of trade liberalization have insignificant results and the adjusted R-squares are very small. To ensure that model specification is robust, I run all the regressions with two stage least squares (TSLS) as well. For the TSLS, I had to find instrumental variables. Finding good instruments is a challenging task for not only this particular study but for whole empirical trade literature. I used one period lags of original trade policy variables as instruments. Since the results do not change significantly, they are not reported here.

Overall, all the regressions above show insignificant relationship and not a strong fit. As mentioned before, the quality of the data is not good. Many of the trade policy variables and their constructions are very subjective. I don't, however, have a better measure of openness. In the public sector the adjusted R-squared is low. Therefore, in general, I can conclude that TFP growth and the measures of openness used don't have a significant relationship when I make the standard assumptions of constant returns to scale and perfect competition. I now investigate if better estimates result when I relax the assumptions of constant returns to scale and perfect competition

4.1.2. Estimation of Equation 8

I can now estimate equation 8 to see whether there is a possible relationship between openness and TFPG. Equation 8 allows for imperfect competition and non-constant returns to scale. Before analyzing the results of this regression, I would like to mention some possible econometric problems with it. As is well known in the trade literature, every measure of openness raises the issue of simultaneity and endogeneity of variables as mentioned in the previous section. Therefore, running equation 8 with OLS would give us biased coefficient estimates. This bias is not the bias that I corrected for non-constant returns to scale and imperfect competition. The bias in this new case might be coming from endogenity of the trade policy variable. That is , total factor productivity growth might as well affect the trade policy variables If I had good instrumental variables, this would not have created a big problem. However, the lack of good instruments in the literature and in the data set used here leaves us running either fixed or random effects models with panel data even though I also run TSLS, with one period lagged variables of original trade policy variables as instruments. I will run a fixed effects model with either pooled least squares or generalized least squares. Another problem associated with right hand side variables may be measurement error. If it is so, then again right hand side variables will be correlated with the error term, and our coefficient estimates will be biased. Krishna and Mitra (1998) show that in the presence of the correlation between right hand side variables and the error term, the coefficient estimates will be biased upward. Therefore, in the presence of measurement error, again I have an endogeneity problem and the problem is the same one of finding a good instrument. To reduce measurement error, I limited the range of this study to 12 years (1980-1991) during which labor has not seen a significant amount of quality change. As for capital, as mentioned before, I use installed horsepower capacity as a proxy for the capital. Again here, I use either pooled least squares or generalized least squares with fixed effects with panel data. I will report here only the GLS results since pooled least squares estimation gives almost the same results as GLS.

I now test whether our model favors imperfect competition and non-constant returns to scale. I first consider equation 8 and make a joint test of perfect competition and constant returns to scale, such that markups are 1 and the scale parameter is also 1. This test is set up as follows

$$H_O: \sigma_1 = \ldots = \sigma_n = \sigma_{TP} = \gamma_{K1} = \ldots = \gamma_{Kn} = \gamma_{TP} = 0$$

Probability value of this test is 0.00000, showing that I strongly reject the joint assumption of perfect competition and constant returns to scale. This result is robust no matter what measure of openness (import penetration, import share, protection rates, and subsidy rates) is used and it is robust for the entire manufacturing sector. Tables 3.1-3.3 and 4.1-4.3 show the results for equation 8, with different trade policy / trade liberalization variables. In tables 3.1, 3.2, and 3.3, I will estimate equation 8 with common coefficients first. That is, the estimation equation takes the following specific form

$$\dot{TFP}_{it} = \sigma_i \alpha_L dl_{it} + \sigma_{TP}(TP_{it}\alpha_L dl_{it}) + \gamma_{Ki}(dK/K)_{it} + \gamma_{TP}(TP_{it}(dK/K)_{it})$$

$$+\sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it} \qquad (8')$$

define it as

$$\dot{TFP}_{it} = \sigma \, LSHLK_{it} + \sigma_{TP} \, TP{*}LSHLK_{it} + \gamma \, CPGR_{it} + \gamma_{TP} \, TP{*}CPGR_{it}$$

$$+\sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it} \qquad (8'')$$

where $LSHLK_{it} = \alpha_L dl_{it} = \alpha_L d\ln(L/K)_{it}$; $CPGR_{it} = (dK/K)_{it}$.

In equation (8'') all the coefficients are without industry subscripts, meaning I am estimating a common coefficient panel. I would like to estimate a common coefficient panel since two stage least squares is applicable to a common coefficient panel estimation, but not applicable to cross section specific panel estimation if there are many cross-section specific parameters. In my case here, if I try to estimate a TSLS with all the independent variables estimated with cross section specific parameters, then I would have a near singular matrix, and fail to estimate the model. For this reason, after estimating a common coefficient panel, I estimate a two stage least squares to capture possible simultaneity and endogeneity. The results of estimating (8'') are as follows.

TABLE 3.1
Estimation of Eq. (8) with Common Coefficients
Protection rate is the trade policy, TP, variable

Dependent Variable: sectoral TFPG.
TP=Sectoral total protection rates

for both sectors

Independent variables	Coefficient	Std. Error	t-Statistic	Prob.
TP	-0.00068	0.000584	-1.16306	0.246475
LSHLK	2.980446	1.571422	1.896655	0.05961
CPGR	-0.2222	0.378111	-0.58767	0.557555
TP*LSHLK	-0.00836	0.013979	-0.59812	0.550575
TP*CPGR	0.001093	0.003465	0.315568	0.752727
Adj-R-Squared		0.511		
for private sector				
TP	-0.00047	0.000468	-1.01329	0.312398
LSHLK	4.886062	1.416003	3.450601	0.000709
CPGR	-0.12777	0.281977	-0.45313	0.651045
TP*LSHLK	-0.01847	0.013789	-1.33942	0.182266
TP*CPGR	0.000925	0.003272	0.282595	0.777839
Adj-R-Squared		0.58		
for public sector				
TP	-0.00237	0.001421	-1.66673	0.098314
LSHLK	2.450783	1.465515	1.672301	0.097207
CPGR	0.325749	0.615952	0.528854	0.597935
TP*LSHLK	-0.01164	0.014537	-0.80055	0.425057
TP*CPGR	-0.00196	0.00698	-0.2811	0.779146
Adj-R-Squared		0.281		

Where TP is total protection rates; CPGR is capital growth, dK/K; LSHLK = $\alpha_L * d\ln(L/K)$; TP*LSHLK is an interaction term; TP*CPGR is another interaction term. Estimation is with GLS with fixed effects, cross-section and time specific fixed effects are not reported here.

In table 3.1 above, I estimate eq.(8) with common coefficients, where TP stands for total protection rates. I will estimate eq.(8) with cross-section specific parameters as well to get markups for different industries. From table 3.1 above I can observe that protection rates don't have a significant relationship with total factor productivity growth except in the public sector at 10% level of significance.. In all the regressions in table 3.1 above, the only significant coefficient, for the entire manufacturing sectors, is the coefficient of $\alpha_L * d\ln(L/K)$ with which I calculate markups. The coefficients of interaction terms are not significant. That means, according to the regressions above, that liberalized trade is not changing the markups and scale of the production. The coefficient for capital growth is not significant in any of the regressions above. This result suggests that I don't have increasing returns to scale in the industries under consideration. The insignificant coefficient for capital growth, along with the insignificant interaction term between capital growth and trade policy, TP*CPGR, suggests that industries under consideration show constant returns to scale. From the regressions above I observe that goodness of fit improved tremendously as the adjusted R-squares are much higher than those in table 2. Now I will estimate the eq.(8) with common coefficients again, but with different trade policy variables.

TABLE 3.2

Estimation of eq.(8) with Common Coefficients for all industries
Import Share is the trade policy, TP, variable.

Dependent variable:TFPG
TP=Import share

independent variables	Coefficient	Std. Error	t-Statistic	Prob.
For both sectors				
TP	-0.00101	0.00061	-1.66331	0.098716
LSHLK	2.275195	0.627292	3.627009	0.000414
CPGR	0.049788	0.191467	0.260037	0.795256
TP*LSHLK	0.015421	0.012671	1.217051	0.225842
TP*CPGR	0.002374	0.002463	0.963918	0.336919
Adj-R-Square	0.475			
for private sector				
TP	-0.00019	0.000836	-0.2333	0.815907
LSHLK	1.530846	0.584252	2.620183	0.00986
CPGR	-0.35138	0.167661	-2.09579	0.038086
TP*LSHLK	-0.0057	0.015817	-0.36027	0.719242
TP*CPGR	6.58E-05	0.002442	0.026943	0.978548
Adj-R-Square	0.503			
for public sector				
TP	-0.00956	0.008753	-1.09229	0.277688
LSHLK	0.995714	0.690951	1.441077	0.153112
CPGR	0.095046	0.361179	0.263155	0.793047
TP*LSHLK	-0.02223	0.06112	-0.36377	0.716905
TP*CPGR	0.044744	0.051465	0.869409	0.386988
Adj-R-Square	0.323			

TP is the import share in total output in each industry. CPGR, LSHLK, TP*LSHLK, and TP*CPGR are as defined before. GLS is used with cross-section specific and time specific fixed effects. Fixed effects are not reported here.

In table 3.2 above, import share as a trade policy variable is not significant in either the public or the private sector and has a negative, which is the opposite of the expected sign. It has been discussed in the literature that increased imports can increase productivity growth, that is, I would expect a positive relationship between total factor productivity growth and imports. For combined sectors, however, the coefficient of import share is negative and significant at the 10 % level. As mentioned before, negative and significant coefficients for import penetration and import share ratio are found and reported in the trade literature in Nishimizu and Page (1990). I run the above regressions with import penetration ratios, which is defined as total imports divided by the sum of total output and imports and the results do not change. I also run TSLS , using a one period lagged value as instrument, and the results either did not change or produced meaningless markup coefficients. From the above regressions in table 3.2., we see that the markup coefficient is significant and bigger than one for the entire and private industries. This is suggesting that I have imperfect competition for the industries under consideration. Both interaction terms , again , are not significant . That is suggesting that changed import shares did not affect markups and scale of the production. The coefficient of capital growth is not significant either except in the private sector. This is suggesting that industries under consideration here have either constant returns to scale or decreasing returns to scale. Now I will run the same regressions with another trade policy variable, namely subsidy rates.

TABLE 3.3

Estimation of eq.(8) with common coefficients

Subsidy Rates is the trade policy, TP, variable here.

Dependent variable : sectoral TFPG

TP=Sectoral subsidy rates

Independent variable	Coefficient	Std. Error	t-Statistic	Prob.
for both sector				
TP	0.001457	0.001131	1.2883	0.199767
LSHLK	1.268031	0.923717	1.372748	0.172026
CPGR	-0.3215	0.267468	-1.20201	0.231388
TP*LSHLK	-0.03807	0.058461	-0.65127	0.515943
TP*CPGR	-0.01249	0.02001	-0.62444	0.533356
Adj-R-Square	0.483			
for private sector				
TP	-0.00129	0.001164	-1.10591	0.270664
LSHLK	0.339192	1.075036	0.315517	0.752839
CPGR	-0.67309	0.22642	-2.97276	0.003476
TP*LSHLK	0.079103	0.059554	1.328259	0.186254
TP*CPGR	0.02061	0.018624	1.106597	0.270366
Adj-R-Square	0.562			
for public sector				
TP	0.007752	0.002831	2.738578	0.007356
LSHLK	1.437436	0.835485	1.720481	0.088567
CPGR	0.334859	0.355263	0.942565	0.34827
TP*LSHLK	-0.0051	0.032909	-0.15485	0.877264
TP*CPGR	-0.00626	0.008929	-0.70129	0.484819
Adj-R-Square	0.53			

In Table 3.3 above, I see that subsidy rates don't have significant effects on productivity growth except in the public sector. The exact content of subsidy rates is defined in Krueger and Aktan (1994) as stated in the section 3.. Especially until 1989, the export sector was promoted in Turkey since Turkey had a foreign currency crisis at the end of 1970s, and very early in the 1980s. For this reason, one of the policy objectives of the new regime right after 1980, was to increase exports, using different subsidy schemes such as tax rebates, preferential credits, etc. It would be interesting to see whether those subsidies had a positive effect on productivity growth. Interaction terms are not significant, that is, subsidies to the industries don't change markups and scale of the production. We don't have theoretical guidance with respect to what sign markups and scale of production should take. I run the above regressions by TSLS with one period lagged variables as instruments. The results were not significant and have not changed a lot. Now I will run eq. (8) with industry specific markups and scale parameters. One of the purposes of this paper is to estimate industry specific markups and to investigate how those markups are changing after the trade regime/policy changes. For this reason, I will estimate eq.(8) with cross section specific markups and scale parameters and for different trade policy variables. The results are reported in the tables 4.1, 4.2, and 4.3, for both sectors, private and public sector respectively, below and the estimation equation takes the following form

$$\dot{TFP}_{it} = \sigma_i \text{LSHLK} + \sigma_{TP} \text{TP*LSHLK} + \gamma_{Ki} \text{CPGR} + \gamma_{TP} \text{TP*CPGR} + \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it} \quad (8''')$$

As can be seen from the above estimation equation (8'''), only LSHLK and CPGR are estimated with cross-section specific parameters. In eq. (8'') I estimated equation with common coefficients as the subscripts show. Since we would like to know how markups and scale parameters change after trade liberalization in different industries, in eq. (8''') , I estimated the equation with cross section specific scale and markups parameters so that I would be able to calculate the markups and scale parameters and productivity that is affected by those. Both interaction terms and trade policy variable, TP, are still estimated with common coefficients for the industries under consideration. Estimating the equation above with all cross-section specific parameters would decrease the degrees of freedom. For this reason, I estimate the equation with cross-section specific parameters for only scale and markups parameters. This would make sense since one of the purposes of this paper is to see which industries under consideration are showing non-constant returns to scale and imperfect competition. And, the particular specification above allows us to test that question.

TABLE 4.1

Estimation of eq.(8) with cross-section specific regressors

Dependent variable: sectoral TFPG

TP=Protection rates, for combined sectors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	-7.46E-04	0.000566	-1.31633	0.190214
TP*LSHLK	0.013882	0.014607	0.950338	0.343578
TP*CPGR	0.003804	0.004109	0.925629	0.356232
LSHLK_311	0.90147	3.60865	0.249808	0.803102
LSHLK_322	-2.32048	5.329802	-0.43538	0.663959
LSHLK_323	0.85819	2.326946	0.368805	0.71283
LSHLK_341	-0.62367	2.747807	-0.22697	0.820779
LSHLK_351	-2.47321	7.233134	-0.34193	0.732918
LSHLK_355	-0.86252	1.506495	-0.57254	0.567877
LSHLK_362	2.134414	2.139281	0.997725	0.320134
LSHLK_369	5.094388	2.446537	2.082285	0.039136
LSHLK_371	0.022638	2.167366	0.010445	0.991681
LSHLK_372	2.551173	1.931771	1.32064	0.188776
LSHLK_381	-1.60535	2.088126	-0.7688	0.443306
LSHLK_382	3.484886	1.715206	2.031759	0.04407
LSHLK_383	1.993473	2.744985	0.726224	0.468914
LSHLK_384	0.478923	2.326699	0.205838	0.837216
CPGR_311	-0.48701	0.971229	-0.50144	0.616851
CPGR_322	-1.09035	0.926246	-1.17717	0.241126
CPGR_323	0.453517	0.533475	0.850117	0.396712
CPGR_341	-0.64756	0.857616	-0.75507	0.451477
CPGR_351	-0.16264	1.514527	-0.10739	0.914635
CPGR_355	-1.35459	0.439241	-3.08393	0.002462
CPGR_362	0.141011	0.645357	0.218501	0.827357
CPGR_369	-0.6621	0.579385	-1.14277	0.255086
CPGR_371	-0.63507	0.922436	-0.68847	0.492294
CPGR_372	0.282927	0.498316	0.567767	0.571103
CPGR_381	-0.95159	0.522855	-1.81999	0.070896
CPGR_382	-0.73079	0.47732	-1.53103	0.128019
CPGR_383	-1.71073	1.10957	-1.5418	0.12538
CPGR_384	-0.26982	0.646417	-0.41742	0.677014
Adj-R-Square	0.692			

Numbers next to the variables, CPGR and LSHLK are referring industries that are used in the regressions .

TABLE 4.2
Estimation of eq. (8) with cross-section specific regressors

Dependent Variable: sectoral TFPG
TP=Protection rates
Private sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	-7.14E-05	0.000509	-0.14029	0.888636
TP*LSHLK	0.010573	0.018557	0.56974	0.569767
TP*CPGR	0.002707	0.00485	0.558103	0.577666
LSHLK_311	3.531417	2.442835	1.445622	0.150518
LSHLK_322	-1.79666	5.339302	-0.3365	0.737
LSHLK_323	1.206419	2.790385	0.432348	0.666153
LSHLK_341	5.903051	2.067238	2.855526	0.004951
LSHLK_351	-4.71839	5.605574	-0.84173	0.401373
LSHLK_355	0.696049	1.803833	0.385872	0.700177
LSHLK_362	1.771636	2.83338	0.625273	0.53281
LSHLK_369	4.610612	1.709684	2.696762	0.007861
LSHLK_371	0.258048	2.1903	0.117814	0.906384
LSHLK_372	4.998591	2.185704	2.286948	0.023699
LSHLK_381	-2.59958	2.213094	-1.17464	0.242134
LSHLK_382	1.67924	2.735048	0.613971	0.540231
LSHLK_383	-1.19744	3.206417	-0.37345	0.709378
LSHLK_384	3.729369	2.354222	1.58412	0.115423
CPGR_311	-0.23692	0.446309	-0.53085	0.596362
CPGR_322	-0.99777	0.931759	-1.07084	0.286083
CPGR_323	0.451706	0.618387	0.730458	0.466331
CPGR_341	0.392386	0.39977	0.981529	0.328025
CPGR_351	0.007583	0.902115	0.008406	0.993305
CPGR_355	-1.37661	0.507428	-2.71293	0.007507
CPGR_362	0.074868	0.717897	0.104288	0.91709
CPGR_369	-0.65138	0.435318	-1.49633	0.136819
CPGR_371	-0.57804	0.561402	-1.02963	0.304957
CPGR_372	-0.4326	0.571441	-0.75703	0.450307
CPGR_381	-1.32878	0.51538	-2.57826	0.010963
CPGR_382	-1.07262	0.678374	-1.58117	0.116096
CPGR_383	-2.24905	0.838037	-2.68371	0.008159
CPGR_384	0.568968	0.554408	1.026261	0.306538
Adj-R-Square	0.692			

TABLE 4.3
Estimation of eq. (8) with cross-section specific regressors

Dependent Variable: sectoral TFPG
TP=protection rate
Public sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	-7.79E-04	0.00154	-0.50565	0.61426
TP*LSHLK	0.01961	0.019379	1.011919	0.31412
TP*CPGR	0.006806	0.009719	0.700264	0.485456
LSHLK_311	-0.7425	7.113492	-0.10438	0.917086
LSHLK_341	-1.79082	2.40951	-0.74323	0.459157
LSHLK_351	-2.97707	19.04249	-0.15634	0.876095
LSHLK_369	0.17577	1.643423	0.106954	0.915049
LSHLK_371	-1.85483	4.252067	-0.43622	0.663657
LSHLK_372	1.423173	1.935961	0.735125	0.464056
LSHLK_381	-2.23722	2.586143	-0.86508	0.389152
LSHLK_382	-0.04322	2.145327	-0.02015	0.983969
LSHLK_383	-1.03404	2.13201	-0.48501	0.628776
LSHLK_384	-3.66398	2.353093	-1.55709	0.122739
CPGR_311	-0.86978	3.063386	-0.28393	0.777078
CPGR_341	-1.33549	1.149369	-1.16194	0.248142
CPGR_351	-1.32387	4.159952	-0.31824	0.750992
CPGR_369	-0.21141	0.699418	-0.30226	0.763104
CPGR_371	-1.94721	2.576514	-0.75575	0.451648
CPGR_372	0.246548	0.693513	0.355506	0.722991
CPGR_381	-1.14697	0.915662	-1.25261	0.213391
CPGR_382	0.778224	0.898778	0.865869	0.388721
CPGR_383	0.031878	0.877794	0.036316	0.971106
CPGR_384	-1.03449	1.207559	-0.85668	0.393757
Adj-R-Square	0.35			

GLS is used with fixed effects. Cross section and time specific fixed effects are not reported here.

In tables 4.1-4.3,protection rates are not significant for the public, private and combined industries. Interaction terms are not significant, meaning more openness does not have any significant relationship between scale of production, and competitiveness of the industries under consideration. In tables 4.1-4.3, I observe that markups are higher in private sector than in public sector. Before talking more about markups , I observe that most scale parameters in both public and private sector, γ , are not significant and have a negative sign. This is suggesting that industries under consideration don’t show increasing returns to scale, and thus have either constant returns to scale or decreasing returns to scale. This is not so surprising since I would not expect most manufacturing industries to have increasing returns to scale in Turkey. Kim (2000) finds, on average, constant returns to scale in Korean manufacturing industries, whereas Harrison (1994) finds decreasing returns to scale in manufacturing sectors in Cote d'Ivory. When I run the same regression with pooled least squares, the results do not change. To check the sensitivity of our results with respects to measures of openness, I experiment with other measures of openness that I have, import share in total output and subsidy rates. Now I will run equation 8 with cross section specific coefficients again, but with different measures of openness. Following tables show the results for those regressio

TABLE 5.1

Estimation of eq.(8) with cross-section specific regressor

Dependent Variable : sectoral TFPG
TP= Import share

For combined sectors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	0.00096	0.000923	1.040432	0.300485
TP*LSHLK	-0.07414	0.031926	-2.32218	0.022116
TP*CPGR	-0.01649	0.006185	-2.66673	0.008848
LSHLK_321	-1.08789	0.977282	-1.11318	0.268127
LSHLK_351	-1.40979	6.841466	-0.20607	0.837131
LSHLK_355	0.896998	1.119318	0.801379	0.424688
LSHLK_362	4.256844	0.364849	11.66742	8.69E-21
LSHLK_371	1.299609	2.242256	0.579599	0.563403
LSHLK_372	3.484238	1.465212	2.377975	0.019182
LSHLK_381	-0.93841	2.418479	-0.38802	0.698775
LSHLK_382	6.236096	1.024518	6.086859	1.83E-08
LSHLK_383	2.586761	2.358128	1.096955	0.275124
LSHLK_384	2.503801	1.061675	2.358351	0.020172
LSHLK_385	9.54423	2.996761	3.184849	0.001898
CPGR_321	-0.75745	0.335786	-2.25576	0.026119
CPGR_351	0.046161	1.4149	0.032625	0.974034
CPGR_355	-0.94335	0.255084	-3.69821	0.000345
CPGR_362	0.664231	0.121893	5.449295	3.26E-07
CPGR_371	-0.21124	1.117852	-0.18897	0.850475
CPGR_372	0.515443	0.475533	1.083927	0.280834
CPGR_381	-0.77749	0.6264	-1.2412	0.217246
CPGR_382	-0.09742	0.293127	-0.33236	0.740269
CPGR_383	-1.80003	1.094586	-1.64449	0.103011
CPGR_384	0.459737	0.373698	1.230238	0.221306
CPGR_385	2.047479	0.705904	2.900508	0.004523
Adjusted R-squared	0.844871			

TABLE 5.2

Estimation of eq.(8) with cross-section specific regressor

Dependent variable: Sectoral TFPG
TP=import share
For private sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	3.12E-05	0.001544	0.020179	0.983938
TP*LSHLK	-0.01217	0.077623	-0.15676	0.87573
TP*CPGR	-0.00178	0.022192	-0.0802	0.936231
LSHLK_321	0.582526	0.950861	0.61263	0.541421
LSHLK_351	-4.58514	5.745172	-0.79809	4.27E-01
LSHLK_355	1.355186	1.907604	0.710412	0.478994
LSHLK_362	3.656153	0.604021	6.053021	2.14E-08
LSHLK_371	1.153197	1.232848	0.935393	0.351692
LSHLK_372	5.408279	2.065194	2.618776	1.01E-02
LSHLK_381	-0.83135	1.809701	-0.45938	0.646891
LSHLK_382	3.268281	2.088374	1.564988	0.120538
LSHLK_383	0.275038	2.2144	0.124204	0.901387
LSHLK_384	5.890564	1.213446	4.854412	4.14E-06
LSHLK_385	1.915776	11.63917	0.164597	0.869572
CPGR_321	-0.60775	0.311571	-1.9506	0.053721
CPGR_351	0.157991	0.988845	0.159773	8.73E-01
CPGR_355	-1.09533	0.368825	-2.96978	0.003679
CPGR_362	0.491196	0.182804	2.68701	0.008361
CPGR_371	-0.46165	0.3745	-1.23271	0.220386
CPGR_372	-0.34502	0.489878	-0.70429	0.482781
CPGR_381	-0.9377	0.447596	-2.09497	0.038534
CPGR_382	-0.9139	0.679124	-1.3457	0.181243
CPGR_383	-1.94133	0.659438	-2.94391	0.003976
CPGR_384	1.028842	0.34685	2.966246	0.003719
CPGR_385	-0.18268	3.153423	-0.05793	0.953911
Adjusted R-squared	0.579738			

TABLE 5.3
Estimation of eq.(8) with cross-section specific regressors

Dependent variable : sectoral TFPG
TP=import share
For public sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	-0.00913	0.011668	-0.78206	0.436675
TP*LSHLK	-0.05033	0.082284	-0.61169	0.54262
TP*CPGR	-2.31E-02	0.067751	-0.34135	0.73381
LSHLK_321	2.454597	0.784734	3.127937	0.002517
LSHLK_351	-1.84545	17.05532	-0.1082	0.914127
LSHLK_371	-0.37198	4.999287	-0.07441	0.940888
LSHLK_372	2.981297	1.107826	2.691124	8.80E-03
LSHLK_381	0.343846	0.566283	0.607198	0.545578
LSHLK_382	1.99612	0.872604	2.287544	2.50E-02
LSHLK_383	1.308292	0.760959	1.719267	0.089746
LSHLK_384	-1.24735	1.243425	-1.00316	3.19E-01
CPGR_321	1.0272	0.440201	2.333477	0.022342
CPGR_351	-0.88511	3.724146	-0.23767	0.812795
CPGR_371	-1.25616	3.18927	-0.39387	0.69481
CPGR_372	0.777342	0.770543	1.008823	3.16E-01
CPGR_381	-0.27551	0.286829	-0.96053	0.339914
CPGR_382	1.483064	0.623851	2.377273	0.020027
CPGR_383	0.700781	0.65236	1.074224	2.86E-01
CPGR_384	-0.02928	0.552106	-0.05303	0.957849
Adjusted R-squared	0.352704			

In tables 5.1-5.3 above, import share does not have a significant relationship with sectoral productivity growth rates at any conventional significance level. In the combined manufacturing and private manufacturing sectors, the coefficient of import share is positive, albeit insignificant. The possible absence of a significant relationship between import shares and productivity is explained in the previous section. Recently it has been shown in some empirical papers that capital-goods imports increased output growth as in Mazumdar (2001), Lee (1995), and Lawrence and Weinstein (1999). Therefore, an insignificant relationship between import shares and/or import penetration ratio and productivity growth is not expected. When I run the regressions with import penetration ratio instead of import share in total output, the results do not change much. Import share is defined, as stated earlier, as imports of a particular industry divided by output of that particular industry. Import penetration ratio is defined as imports divided by output plus imports of that particular industry. It is clear from the definitions of these two concepts that I would not expect a different result in terms of their effects on productivity..

Interaction terms in both private and public sector are not significant even though they are significant for the combined manufacturing industries. The effects of increased imports on markups, if it is to increase the productivity, should be positive. I have an expected sign here in the entire manufacturing industries. Increased imports are causing the scale of the production to be decreased, as the coefficient of the second interaction term is negative and significant. Theory in this case does not provide us with a priori a sign expectation. In our particular case here increased import is causing domestic scale of production to be reduced.

In tables 4.1-4.3 and 5.1-5.3, I can see from the coefficient values of the scale parameter that I can rule out increasing returns to scale in the Turkish industries under investigation since most coefficient are negative and between zero and one , this would imply , from the relationship, $(\varphi_{it} - 1) = \gamma_{Ki} + \gamma_{TP} TP_{it}$, the scale parameter is one or less than one . According to the tables above, markups are lower in the public sector than the private sector. I can surmise that public sector firms are not operating under profit maximizing constraints, have a different pricing scheme than private sector firms, and may pay higher wages. In the following section, I will run regressions with another measure of openness to trade, namely subsidy rates. The results are reported in the following tables

TABLE 6.1
Estimation of eq.(8) with cross-section specific regressors

Dependent variable: sectoral TFPG
TP=subsidy rates

For combined sectors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	0.002779	0.001253	2.21733	0.028584
TP*LSHLK	-0.01598	0.06097	-0.26212	0.793702
TP*CPGR	-1.45E-02	0.020692	-0.70041	0.485096
LSHLK_311	3.662476	2.699991	1.356477	0.177628
LSHLK_312	-4.51689	8.98844	-0.50252	0.616269
LSHLK_323	2.339083	0.833899	2.804995	0.005918
LSHLK_341	0.412598	1.962948	0.210193	8.34E-01
LSHLK_351	-13.808	8.522776	-1.62013	0.107966
LSHLK_355	1.106653	1.285662	0.860765	3.91E-01
LSHLK_362	3.512248	0.687917	5.105625	1.33E-06
LSHLK_369	10.34092	2.347743	4.404623	2.40E-05
LSHLK_371	1.713864	1.330634	1.288006	0.200352
LSHLK_372	3.793752	4.328635	0.876431	0.382639
LSHLK_381	-5.76283	2.533062	-2.27505	0.024773
LSHLK_382	4.943319	1.049859	4.708553	7.08E-06
LSHLK_383	4.531223	3.244465	1.396601	0.165247
LSHLK_384	2.024717	1.417707	1.428163	0.155979
CPGR_311	0.33715	0.899928	0.374641	7.09E-01
CPGR_322	-1.47601	1.459665	-1.0112	0.314062
CPGR_323	0.709163	0.398599	1.779138	0.077882
CPGR_341	-0.22241	0.657989	-0.33802	0.735968
CPGR_351	-1.72649	1.4898	-1.15887	0.248929
CPGR_355	-1.00495	0.229114	-4.38625	2.58E-05
CPGR_362	0.584655	0.231648	2.523892	0.012983
CPGR_369	0.402078	0.633196	0.634998	0.526702
CPGR_371	-0.21232	0.629045	-0.33753	0.736338
CPGR_372	0.496965	1.580972	0.314341	0.753836
CPGR_381	-1.90102	0.808975	-2.34991	0.020498
CPGR_382	0.139324	0.343384	0.405737	0.685696
CPGR_383	-0.48171	1.298577	-0.37095	0.711362
CPGR_384	-0.15043	0.359989	-0.41787	0.676832
Adjusted R-squared	0.672399			

TABLE 6.2
Estimation of eq.(8) with cross-section specific regressors

Dependent variable: sectoral TFPG
TP=subsidy rates

Private sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	0.002632	0.000914	2.880574	0.004743
TP*CPGR	-0.02422	0.017912	-1.35214	0.179007
TP*LSHLK	-3.48E-02	0.056241	-0.61916	0.537047
LSHLK_311	5.607928	1.263733	4.437589	2.11E-05
LSHLK_322	-3.84814	9.148592	-0.42063	0.67482
LSHLK_323	2.715934	0.989938	2.743539	0.007062
LSHLK_341	5.73412	0.902944	6.350472	4.53E-09
LSHLK_351	-0.65432	12.70851	-0.05149	0.959028
LSHLK_355	1.345	1.498436	0.897603	3.71E-01
LSHLK_362	2.769797	0.664209	4.170068	5.96E-05
LSHLK_369	7.499631	2.691086	2.786842	6.24E-03
LSHLK_371	1.132549	1.710458	0.662132	0.509223
LSHLK_372	4.490262	4.834069	0.928878	0.354915
LSHLK_381	-6.67413	1.805575	-3.6964	0.000338
LSHLK_382	2.709358	1.74341	1.554057	1.23E-01
LSHLK_383	-1.51323	1.828615	-0.82753	0.409665
LSHLK_384	5.762761	2.040549	2.824122	0.005598
CPGR_311	0.270451	0.293869	0.920313	3.59E-01
CPGR_322	-1.35795	1.49741	-0.90687	0.36639
CPGR_323	0.784912	0.456123	1.720834	0.087994
CPGR_341	0.412433	0.188377	2.189405	0.030605
CPGR_351	0.581101	1.832593	0.317092	0.751753
CPGR_355	-1.14061	0.268723	-4.24456	4.48E-05
CPGR_362	0.42007	0.190005	2.210835	0.029043
CPGR_369	-0.02019	0.653521	-0.03089	0.975408
CPGR_371	-0.71412	0.438195	-1.62969	0.105927
CPGR_372	-0.37343	0.458648	-0.8142	0.417229
CPGR_381	-2.03349	0.544797	-3.73256	0.000297
CPGR_382	-0.30207	0.546436	-0.55281	0.581479
CPGR_383	-2.20847	0.476856	-4.63133	9.70E-06
CPGR_384	1.163821	0.612857	1.89901	0.060091
Adjusted R-squared	0.812034			

TABLE 6.3
Estimation of eq.(8) with cross-section specific regressors

Dependent variable: sectoral TFPG
TP= subsidy rates
Public sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TP	0.007068	0.003517	2.009917	0.047898
TP*CPGR	-0.00358	0.016272	-0.22016	0.826321
TP*LSHLK	-4.92E-04	0.050913	-0.00966	0.992314
LSHLK_311	1.637334	10.25425	0.159674	8.74E-01
LSHLK_341	1.209873	1.631669	0.741494	0.460621
LSHLK_351	-3.17425	14.41595	-0.22019	0.826298
LSHLK_369	0.736561	1.149115	0.640981	5.23E-01
LSHLK_371	5.759087	2.317	2.485579	0.015073
LSHLK_372	4.351679	0.810219	5.370992	7.85E-07
LSHLK_381	0.858354	1.401073	0.612641	5.42E-01
LSHLK_382	1.851463	0.6596	2.806949	6.31E-03
LSHLK_383	1.246069	0.39354	3.166308	0.002203
LSHLK_384	1.087202	0.92157	1.179728	0.241694
CPGR_311	-0.03589	4.50847	-0.00796	0.993668
CPGR_341	0.108963	0.983113	0.110835	9.12E-01
CPGR_351	-1.59012	3.096794	-0.51347	0.609072
CPGR_369	-0.02889	0.682364	-0.04233	0.966341
CPGR_371	2.899625	1.488819	1.947601	5.51E-02
CPGR_372	1.483614	0.564365	2.628819	0.010316
CPGR_381	0.0379	0.472876	0.080147	0.936326
CPGR_382	1.258582	0.424102	2.967641	0.003983
CPGR_383	0.713437	0.363353	1.963485	0.053154
CPGR_384	1.166275	0.439567	2.653237	9.66E-03
Adjusted R-squared	0.563066			

In the tables 6.1-6.3 above, I observe that subsidy rates in the entire manufacturing sector, for both the public sector and the private sector, have a positive and significant effect on total factor productivity growth. I can find theoretically plausible reasons for this positive relationship. Industries that are used in the above regressions are mainly capital intensive compared to other industries in the data set. I can conclude that subsidizing capital intensive industries, increased total factor productivity in those industries. Both interaction terms in all the regressions (in public and private) ,however, do not have a significant relationship with total factor productivity growth. I would expect subsidies to increase the scale of the production and therefore to have a significant positive coefficient for the interaction term, TP* CPGR. I can here again rule out the increasing returns to scale in the industries under consideration since the most coefficients of capital growth variable are negative and between zero and one. Another observation that I also had in other regressions is the fact that markups are higher in private sector than in public sector. After observing that I can rule out increasing returns to scale, I can test whether the industries under consideration have constant returns to scale jointly. The set up of the test is as follows.

$$H_O : \gamma_{K1} = ... = \gamma_{Kn} = \gamma_{TP} = 0$$

I cannot reject the joint hypothesis of constant returns to scale. For this reason, in the next section, I will run an equation with only markup specific cross section units and other coefficients of independent variables will be estimated commonly, not industry specific. The rationale for this is that we get better estimates of markups since we gain some degree of freedom. The estimation equation takes the following specific form at this time

$$\dot{TFP}_{it} = \sigma_i \text{LSHLK} + \sigma_{TP} \text{TP*LSHLK} + \gamma \text{ CPGR} + \gamma_{TP} \text{ TP*CPGR}$$
$$+ \sum_i \zeta_i f_i + \sum_t \xi_t \phi_t + \beta_{TP} TP_{it} + e_{it}$$

The results of these regressions are as follows.

TABLE 7
Estimation of eq. (8) with markup specific coefficient
TP= Total protection rates

	Combined sectors		Private sector		Public sector	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
TP	-0.00074	-1.34802	-0.00031	-0.65264	-0.00174	-1.08183
CPGR	-0.66552	-1.69469	-0.50357	-1.81365	0.12594	0.208559
TPCPGR	0.007296	2.389308	0.005507	1.752407	0.003918	0.547423
TPLSHLK	0.021028	1.429925	0.018003	1.121433	0.00283	0.187816
LSHLK_311	0.787	0.431834	2.697769	1.586053	2.687856	1.560934
LSHLK_322	0.20771	0.082087	0.824691	0.358391		
LSHLK_323	-1.44741	-0.61509	-1.09825	-0.45007		
LSHLK_341	-0.63253	-0.37857	1.994634	1.323719	1.876355	1.328629
LSHLK_351	-4.54919	-0.67843	-6.333	-1.26145	3.496195	0.606881
LSHLK_355	2.132028	1.20533	4.118267	1.703056		
LSHLK_362	0.197334	0.087931	0.178463	0.077058		
LSHLK_369	5.506935	2.830296	5.146654	3.44675	1.780791	1.312784
LSHLK_371	-0.20019	-0.11806	0.185383	0.100446	1.825416	0.997889
LSHLK_372	0.261321	0.130853	5.168156	3.263039	2.329793	1.571553
LSHLK_381	-0.24411	-0.14172	0.45422	0.271661	1.722128	1.000925
LSHLK_382	3.559238	2.114486	2.53792	1.16394	1.198097	0.685818
LSHLK_383	3.55532	1.854002	2.906464	1.30799	0.766379	0.416784
LSHLK_384	-0.51113	-0.2675	0.658423	0.351159	-0.52616	-0.37533
Adjusted R-squared	0.651463		0.648415		0.35113	

GLS is used with fixed effects. Fixed effects are not reported here.

In table 7, the coefficient of protection rates is not significant in any of the regressions. The coefficient of capital growth and its interaction with trade policy are significant in both the combined manufacturing sector and the private sector. The coefficients of these two variables in the private sector and in the combined sectors are negative and between zero and one. This shows that I can rule out increasing returns to scale. I have, here again, markups higher in the private sector than in the public sector.

TABLE 8

Estimation of eq. (8) with cross-section specific markups

TP=import share of total output.

	Combined sectors		Private sector		Public sector	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
TP	-1.67E-04	-0.19288	6.35E-05	0.06047	-0.00915	-0.89591
CPGR	0.144595	0.74118	-0.26399	-1.35063	0.439342	1.102949
TPCPGR	-0.00132	-0.65017	-0.00156	-0.60375	0.01117	0.238563
TPLSHLK	-0.01251	-0.7424	-0.01322	-0.75307	-0.00951	-0.13599
LSHLK_321	1.294666	2.206974	1.267958	1.831142	1.481719	2.166481
LSHLK_351	-0.43628	-0.0646	-6.03346	-1.26493	4.416717	0.907455
LSHLK_355	4.676631	3.598131	4.566583	2.580358		
LSHLK_362	2.520126	3.519158	1.140352	1.227208		
LSHLK_371	1.954041	1.579138	1.165868	0.978433	1.82799	1.184084
LSHLK_372	2.58384	2.332463	5.905255	4.216349	2.373478	3.324492
LSHLK_381	2.365969	2.587719	1.56237	1.82139	1.802994	2.301861
LSHLK_382	6.144256	6.473062	4.691179	3.49839	0.698641	1.059163
LSHLK_383	5.786737	5.364576	3.798723	2.592601	0.947905	2.089325
LSHLK_384	2.354364	3.019733	1.896006	1.921248	-0.42215	-0.429
LSHLK_385	2.731897	2.211184	1.767941	1.556635		
Adjusted R-squared	0.616987		0.543787		0.200008	

GLS is used with fixed effects. Fixed effects are not reported.

In table 8, import share again does not have a significant relationship with total factor productivity growth.

TABLE 9

Estimation of eq.(8) with cross-section specific markups

TP= Subsidy rates.

	Combined sectors		Private sector		Public sector	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
TP	0.001944	1.373529	0.001922	1.500771	0.00686	2.339566
CPGR	0.013511	0.055962	0.088683	0.459413	0.792134	3.126885
TPCPGR	-0.02293	-1.04662	-0.03597	-1.73662	-0.0182	-1.96399
TPLSHLK	-0.05451	-0.88996	-0.08586	-1.39168	-0.03742	-1.3022
LSHLK_311	2.724562	3.83858	4.915422	6.571928	3.573276	5.88678
LSHLK_322	2.450764	0.704032	3.025373	0.923974		
LSHLK_323	0.90228	1.830098	1.267062	2.885986		
LSHLK_341	1.355461	1.642423	4.111935	4.71741	2.58033	4.549111
LSHLK_351	-3.45567	-0.4093	-4.73247	-0.73411		
LSHLK_355	6.713448	4.046373	7.817534	3.782778		
LSHLK_362	1.654436	2.079244	1.740806	2.587038	6.965519	1.40645
LSHLK_369	8.881061	8.525134	7.786362	8.232832	2.62149	2.402849
LSHLK_371	2.416408	3.300498	1.787642	1.039044	3.055387	4.734899
LSHLK_372	2.567445	1.813553	6.788855	2.915758	3.379559	7.099101
LSHLK_381	1.38146	1.19959	1.503012	1.35516	2.555801	4.51425
LSHLK_382	4.938062	4.83082	3.90107	3.120806	1.310133	2.756888
LSHLK_383	5.627747	4.147548	4.461311	2.683636	1.434852	5.550383
LSHLK_384	2.325985	1.791784	3.166554	2.043107	0.374885	0.64079
Adjusted R-squared	0.645898		0.746904		0.550701	

GLS is used with fixed effects. Fixed effects are not reported here.

In table 9 , subsidy rates have significant a relationship with total factor productivity in the public sector. There is again strong evidence that markups in the private sector are higher than those in public sector.

In general, estimation of equation 8, with all the versions considered and estimated here, with three different measures of openness for both public and private sectors shows superiority over the estimation of equation 4. First of all, I have convincing evidence that most industries are not perfectly competitive and that there are decreasing returns to scale. Not all the measures of openness were significant for public, private, and the combined industries. Overall, subsidy rates have a significant relationship with TFPG in the public sector mostly. Import share/import penetration and protection rates do not show a consistent and systematic relationship with TFPG. Interaction terms, most of the time, and for both public and private industries, are not significant. This shows that theory's prediction that reduced protection causes the markups to be decreased and increases competition and productivity is not confirmed despite our bias correction term.

4.2. Estimation of model 2

The above results question the appropriateness of the openness measures used. For this reason I will run another set of regressions with a dummy variable capturing the effects of openness to trade. Therefore the next step is to estimate equation 9 using estimation methodology of "within estimation", in which every variable is defined as deviation from the mean. I have, in our data set, 26 three-digit industries, for all of which, I don't have an explicit trade policy variable such as protection rates, import shares, and subsidy rates. Therefore, in equations 4 and 8, I am not able to use all 26 industries. Running equation 9 uses more information about the industries, giving us information about how the whole period that corresponds to more liberal years affects total factor productivity[2]

In our period of 12 years (1980-1991) , 5 relate to the period before liberalization. Equation 9 takes the specific form

$$dy_{it} = \beta_{1i}\left[dx\right]_{it} + \beta_{2i}\left[Ddx\right]_{it}$$

$$+ \beta_{3i} D + \beta_{4i} dk_{it} + \beta_{5i}\left[Ddk_{it}\right] + (dA/A)_{it}$$

Now , I will follow Hall (1988) , Harrison(1994) and a World Bank Study (1993) to model $(dA/A)_{it}$ as follows:

$(dA/A)_{it} = c_i + u_{it}$, that is, I am decomposing productivity growth into an industry specific constant and a disturbance.

Now our final estimation equation becomes

$$dy_{it} = c_i + \beta_{1i}\left[dx\right]_{it} + \beta_{2i}\left[Ddx\right]_{it} + \beta_{3i} D + \beta_{4i} dk_{it} + \beta_{5i}\left[Ddk_{it}\right] + u_{it}$$

or

$$dy_{it} = c_i + \beta_{1i} LSHLK_{it} + \beta_2 DUM{*}LSHLK_{it}$$
$$+ \beta_3 DUM + \beta_{4i} CPGR_{it} + \beta\ DUM{*}CPGR_{it} + u_{it} \qquad (9')$$

where

$DUM = D$; dummy variable that takes the value of zero for the years less open to trade, namely 1980-1984, that takes the value of 1 for the years more open to trade, which are 1985-1991.

$LSHLK = dx$, which is as defined before

$CPGR = dk$, which is as defined before (capital growth)

I will estimate the above specification with cross-section specific markups and scale parameters. Interaction terms and dummy variable will be estimated with common

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[2] Many other studies such as Levinsohn (1993), Harrison (1994), Krishna and Mitra (1998), run the same kind of regressions with dummy variables where the whole period (before and after liberalization) is limited to 3-4 years. In 3-4 years, the effects of liberalization might not be realized. Therefore, their results should be interpreted with this important in mind.

coefficients for all the industries. If I estimate every variable with cross-section specific coefficients, I will loose some degrees of freedom.

I could use a fixed effects model to estimate above model. Random effects model did not perform well in terms of my purpose here. In the most of the empirical literature, the differences among the industries are treated deterministic rather than random. To avoid any bias that can come from model selection, I estimate the above model by using a within-group estimator. As Hsiao (2001) and Lee(2002) showed, when we a use within-group estimator, there is no need to worry about whether c_i is treated as fixed or random since differencing removes the constant terms. For this reason there is no industry specific constants reported in the results below. However, if I am especially interested in the industry specific constant, which is not the case here, I should have a fixed effects model. The results of within-group estimation are given below.

TABLE 10.1

Estimation equation 9. for combined sector

For combined sectors

Dependent Variable: $dy_{it} = d\ln(Y/K)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	0.022932	0.006627	3.460606	0.000631
DUM*LSHLK	-0.93156	0.583739	-1.59584	0.111753
DUM*CPGR	-0.44831	0.173398	-2.58544	0.010277
LSHLK_311	3.710481	2.487833	1.491451	0.137069
LSHLK_312	-1.04281	1.430723	-0.72887	0.466746
LSHLK_313	3.683325	2.087176	1.764741	0.078795
LSHLK_314	-1.78664	5.08907	-0.35107	7.26E-01
LSHLK_321	0.080826	0.560985	0.144078	0.885551
LSHLK_322	0.506029	4.56647	0.110814	9.12E-01
LSHLK_323	3.900509	0.605457	6.442253	5.76E-10
LSHLK_324	0.824614	0.913804	0.902397	3.68E-01
LSHLK_331	2.598351	0.773328	3.35996	8.98E-04
LSHLK_332	0.151264	9.364857	0.016152	9.87E-01
LSHLK_341	1.64534	1.225003	1.343131	0.180414
LSHLK_342	2.180211	2.264178	0.962915	3.36E-01
LSHLK_351	-3.37769	5.65677	-0.59711	5.51E-01
LSHLK_352	4.019321	2.759005	1.456801	1.46E-01
LSHLK_355	1.118472	0.776797	1.439851	1.51E-01
LSHLK_356	5.197106	3.135461	1.657525	0.098633
LSHLK_361	5.86E+00	0.442594	13.234	7.75E-31
LSHLK_362	5.083426	0.389036	13.06674	2.91E-30
LSHLK_369	5.176176	1.619733	3.195696	0.001569
LSHLK_371	1.759955	1.261011	1.39567	1.64E-01
LSHLK_372	4.081822	1.032074	3.954969	9.90E-05
LSHLK_381	0.120641	0.849792	0.141966	0.887218
LSHLK_382	6.39189	0.902991	7.078572	1.39E-11
LSHLK_383	6.29762	2.554804	2.465011	1.44E-02
LSHLK_384	3.027015	1.335858	2.26597	0.024285
LSHLK_385	5.197608	1.673954	3.104987	2.12E-03
CPGR_311	0.057701	0.847148	0.068112	9.46E-01
CPGR_312	-0.77692	0.750158	-1.03567	0.301328
CPGR_313	-0.39917	0.323807	-1.23273	0.218804
CPGR_314	-0.90668	0.987898	-0.91779	0.359588
CPGR_321	-0.46368	0.211637	-2.19093	2.94E-02
CPGR_322	-0.55097	0.706251	-0.78014	0.436026
CPGR_323	0.99734	0.300318	3.320942	0.001027
CPGR_324	-0.61479	0.420735	-1.46122	0.145176
CPGR_331	0.131996	0.317298	0.416	0.677757
CPGR_332	-1.4101	2.633681	-0.53541	0.59283
CPGR_341	-0.08605	0.400671	-0.21476	0.830126

CPGR_342	0.073613	0.882012	0.08346	0.933551
CPGR_351	-0.11106	1.225079	-0.09066	0.927834
CPGR_352	0.75478	0.479864	1.572905	0.116971
CPGR_355	-0.73053	0.189274	-3.85966	0.000144
CPGR_356	0.562161	0.831923	0.675738	0.499815
CPGR_361	1.021532	0.161146	6.339166	1.03E-09
CPGR_362	0.673009	0.131542	5.116305	6.10E-07
CPGR_369	-0.87452	0.439021	-1.99197	4.74E-02
CPGR_371	-0.47029	0.629511	-0.74707	4.56E-01
CPGR_372	0.365974	0.348253	1.050886	0.294298
CPGR_381	-0.84011	0.28396	-2.95856	0.003379
CPGR_382	-0.18065	0.301672	-0.59882	5.50E-01
CPGR_383	-0.10569	1.185845	-0.08912	9.29E-01
CPGR_384	0.465174	0.431786	1.077324	2.82E-01
CPGR_385	0.649175	0.418948	1.549537	0.122483
Adjusted R-squared	0.736798			

Notice that industry specific constant are not estimated since when I difference every variable, industry specific terms are removed from the equation. Since I am not specifically interested in these constants, within group estimation technique suits our purpose. If I want to estimate and if I am interested in those constants, then within-group estimation is not suitable for us. I will use a fixed effects model to estimate those constant terms.

TABLE 10.2

Estimation equation 9. for the private sector

Dependent Variable: $dy_{it} = d\ln(Y/K)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	0.043152	0.011125	3.878771	0.000133
DUM*LSHLK	-0.44567	0.768133	-0.5802	0.562291
DUM*CPGR	-0.43951	0.190659	-2.30521	0.021952
LSHLK_311	4.571507	1.476448	3.096288	0.002177
LSHLK_312	1.662512	2.557197	0.65013	0.516189
LSHLK_313	0.737576	1.359632	0.542482	0.587957
LSHLK_314	3.340395	3.293285	1.014305	0.311391
LSHLK_321	2.077107	0.789816	2.629862	0.009057
LSHLK_322	1.416131	4.246273	0.3335	0.739029
LSHLK_323	4.199108	0.666395	6.301227	1.28E-09
LSHLK_324	3.400532	0.700249	4.856174	2.08E-06
LSHLK_331	1.472164	1.747983	0.842207	0.400455
LSHLK_332	2.284278	2.398254	0.952475	0.341751
LSHLK_341	9.118696	1.400266	6.512116	3.87E-10
LSHLK_342	3.591572	2.719691	1.320581	0.187816
LSHLK_351	-0.56934	3.070344	-0.18543	0.853037
LSHLK_352	6.373797	2.783699	2.289687	0.02285
LSHLK_355	2.487182	0.711961	3.493422	0.000561
LSHLK_356	5.267106	2.504922	2.102703	0.036464
LSHLK_361	6.369229	0.891457	7.144744	9.29E-12
LSHLK_362	5.239911	0.445474	11.76256	7.67E-26
LSHLK_369	3.933211	1.405741	2.797963	0.005532
LSHLK_371	2.51288	0.647393	3.881536	0.000132
LSHLK_372	5.680895	1.210061	4.694717	4.35E-06
LSHLK_381	1.953087	1.523878	1.281655	0.201119
LSHLK_382	3.692966	1.936442	1.907089	0.057624
LSHLK_383	3.35312	3.166409	1.058966	0.290609
LSHLK_384	7.776785	1.664525	4.672074	4.81E-06
LSHLK_385	3.13566	1.410859	2.222518	0.027119
CPGR_311	0.09902	0.402051	0.246286	0.805657
CPGR_312	-0.72912	0.668712	-1.09034	0.276584
CPGR_313	-1.06055	0.428379	-2.47573	0.013941
CPGR_314	-0.85222	0.649015	-1.31309	0.190324
CPGR_321	-0.4841	0.33184	-1.45883	0.145832
CPGR_322	-0.31409	0.649852	-0.48333	0.629273
CPGR_323	1.128824	0.312629	3.610746	0.000367
CPGR_324	0.23484	0.258282	0.909236	0.364077
CPGR_331	-0.35953	0.653756	-0.54994	0.582837
CPGR_332	-0.37455	0.742983	-0.50412	0.614611
CPGR_341	1.022006	0.298981	3.418295	0.000733

CPGR_342	0.334267	0.944923	0.35375	0.723816
CPGR_351	0.542142	1.009619	0.536977	0.591748
CPGR_352	0.836254	0.432799	1.932201	0.054434
CPGR_355	-0.70652	0.137905	-5.12327	5.90E-07
CPGR_356	0.561076	0.65517	0.856382	0.392584
CPGR_361	0.932383	0.290072	3.214321	0.001475
CPGR_362	0.670542	0.169004	3.967621	9.42E-05
CPGR_369	-0.79113	0.367935	-2.15018	0.032475
CPGR_371	-0.21683	0.304921	-0.71111	0.477662
CPGR_372	-0.33362	0.284195	-1.17391	0.24152
CPGR_381	-0.34273	0.477878	-0.7172	0.473903
CPGR_382	-0.7173	0.716817	-1.00067	0.317927
CPGR_383	-0.80594	1.04454	-0.77157	0.441076
CPGR_384	1.494901	0.365174	4.093661	5.69E-05
CPGR_385	0.135465	0.330057	0.410428	0.681834
Adjusted R-squared	0.787619			

TABLE 10.3
Estimation equation 9. for public sector

Dependent Variable: $dy_{it} = d\ln(Y/K)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	-0.00227	0.018469	-0.12282	0.902384
DUM*LSHLK	-0.41538	0.530259	-0.78336	0.434409
DUM*CPGR	-0.37362	0.249136	-1.49967	0.135388
LSHLK_311	4.156121	4.432769	0.93759	0.349664
LSHLK_312	-1.78491	1.77932	-1.00314	0.31709
LSHLK_313	-0.24575	4.982519	-0.04932	0.960715
LSHLK_314	-2.1802	3.989158	-0.54653	0.585352
LSHLK_321	2.691426	0.78411	3.432461	0.000736
LSHLK_324	-0.21228	0.838036	-0.25331	0.800308
LSHLK_331	3.470305	1.517046	2.287541	0.023284
LSHLK_341	0.565996	1.938341	0.292	0.77061
LSHLK_342	0.201304	1.602421	0.125625	0.900164
LSHLK_351	-1.93316	12.89426	-0.14992	0.880986
LSHLK_352	-0.03534	1.145487	-0.03085	0.975422
LSHLK_361	2.03005	0.772499	2.627899	0.009305
LSHLK_369	0.503242	2.303739	0.218446	0.82732
LSHLK_371	0.02254	2.249467	0.01002	0.992016
LSHLK_372	2.919415	1.185381	2.462849	0.014689
LSHLK_381	0.938852	0.798354	1.175985	0.241096
LSHLK_382	1.821657	0.930916	1.956844	0.051855
LSHLK_383	2.432782	0.536041	4.538425	1.01E-05
LSHLK_384	-0.91273	1.806906	-0.50513	0.61406
CPGR_311	0.543588	1.914923	0.283869	0.776824
CPGR_312	-1.22287	1.052379	-1.162	0.246715
CPGR_313	-0.92039	0.535669	-1.71821	0.087413
CPGR_314	-0.69414	0.686663	-1.01089	0.313376
CPGR_321	0.647342	0.444035	1.457862	0.146556
CPGR_324	-1.28538	0.48373	-2.65723	0.00856
CPGR_331	1.049976	0.942202	1.114384	0.266545
CPGR_341	-0.6334	1.074507	-0.58948	0.556248
CPGR_342	-1.81005	0.893094	-2.02672	0.044112
CPGR_351	-1.00061	2.732385	-0.3662	0.714627
CPGR_352	-0.94387	0.655573	-1.43976	0.151607
CPGR_361	-0.29698	0.350202	-0.84803	0.397506
CPGR_369	-0.38661	0.861996	-0.44851	0.654307
CPGR_371	-1.46588	1.615105	-0.90761	0.365253
CPGR_372	0.380933	0.62019	0.614219	0.539817
CPGR_381	-0.5016	0.396145	-1.2662	0.207016

CPGR_382	0.928724	0.67465	1.376602	0.170281
CPGR_383	0.772418	0.333478	2.316249	0.021629
CPGR_384	-0.36419	0.828487	-0.43958	0.66075
Adjusted R-squared	0.789201			

As can be seen from tables 10.1-10.3 , the coefficient of the dummy variable which captures the change in productivity growth is significant for combined sectors and private sector and varies between 0.023 and 0.043. This is comparable with the studies of Harrison (1994) and Krishna and Mitra (1998). These numbers are average numbers for combined manufacturing industries and private manufacturing industries respectively. The coefficients of LSHLK illustrate the markups before the years of trade liberalization and are higher than expected. As Hall (1988), Levinsohn (1993) , and Harrison (1994) point out, in the presence of correlation between the right hand side variables and the error terms, the coefficients of the right hand side variables are overestimated. To correct for this correlation, I don't have reasonable instruments. Our main goal here, however, is to estimate the ***change*** in the markups and in the scale parameters after the trade liberalization. If there is a simultaneity between right hand side variables and dependent variable, same kind of simultaneity would persist after the trade liberalization. Therefore, since it is controlled for simultaneity, I can observe the change. This is assuming that bias is invariant with respect to trade policy. The "degree" of endogenity can be, of course, different in the two different periods if one of the periods has a different trade policy. However, the measurement of the differences in the "degree" of endogenity and fixing it are more difficult and can cause more problems if one has wrong instruments to fix the endogenity. For this reason , in the empirical literature, endogenity is implicitly assumed to be invariant with respect to trade policy as in Harrison (1994) and Kim (2000). The coefficient of interaction term, in all the regressions above, DUM*LSHLK, is insignificant. The coefficient on the interaction term is actually fairly large, ranging from –0.42 to –0.93. However, the standard errors associated with these estimates are fairly large as well, ranging from 0.53 to 0.77. The interpretation is that we are unable to conclude that trade policy affects markups. However, we are also unable to rule out the possibility that trade policy has economically substantial impact on markups. I see that markups are on average between 2 and 3. The coefficient of the other interaction term, in the private and combined sectors, DUM * CPGR, is negative and significant, suggesting that private sector firms reduced their scale of production. For this coefficient, the literature does not provide us with a robust theory that can give us sign expectations a priori. Possibly, before liberalization, private firms were exploiting the domestic market to a greater extent than after liberalization. For the public sector, in the regression above, I have insignificant coefficients for the first three common coefficient variables. One point that is clearly observable in the public sector, however, is the fact that it has lower markups. In the previous regressions and tables, I have the same tendency of markups in the public sector to be much smaller than those in the private sector.

Most coefficients of scale parameters for dk_i=CPGR, in both public and private sector, are not significant. Most of them have negative signs, which is expected since scale parameter is calculated as $\beta_{4i} = (\varphi_i - 1)$. Since most coefficients are not significant and range between 0 and –1, there is strong evidence that I don't have increasing returns to scale in the industries under investigation. To check for this, I will conduct the hypothesis test, $H_0: \beta_{4,311} = ... = \beta_{4,385} = 0$, to test whether the industries under investigation have constant returns to scale. I cannot reject this hypothesis for the combined manufacturing and for the public sector. For private sector, I reject this joint hypothesis. For private sector results, however, from the table 10.2, I have strong evidence that I don't have increasing returns to scale. I can test the joint hypothesis of perfect competition for industries under consideration. The hypothesis test for that is as follows: $H_0: \beta_{1,311} = ... = \beta_{1,385} = 1$, to test whether industries are jointly perfectly competitive or not. I reject this hypothesis for overall manufacturing, private manufacturing, and public sector firms. Therefore, there is strong evidence that industries in our sample are not perfectly competitive.

After these tests, I could either run the equation 9 without scale parameter at all, meaning assuming constant returns to scale in all industries or I can run the same equation with common scale parameter for all industries instead of individual scale parameters as in table 4. In the following analysis, I will follow the second approach, namely I will run equation 6 with common scale parameter since this estimation can give us some information, on average, about returns to scale. In tables 11.1-11.3, I have the following regression equation

$$dy_{it} = \beta_{1i}\left(dx\right)_{it} + \beta_2\left(Ddx_{it}\right) + \beta_3 D + \beta_4 dk_{it} + \beta_5\left(Ddk_{it}\right) + \left(dA/A\right)_i$$

To establish consistency with (9') in terms of notation, I rewrite the above equation as follows:

$$dy_{it} = c_i + \beta_{1i} LSHLK_{it} + \beta_2 DUM{*}LSHLK_{it} + \beta_3 DUM + \beta_4 CPGR_{it} + \beta_5 DUM{*}CPGR_{it} + u_{it} \qquad (9'')$$

TABLE 11.1

Estimation of equation 9 with cross-section specific markups

Dependent Variable: $dy_{it} = d\ln(Y/K)$

For combined sectors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	0.02538	0.007519	3.375491	0.00084
DUM*LSHLK	-0.78867	0.649692	-1.21391	0.225797
DUM*CPGR	-0.45113	0.210414	-2.144	0.032888
CPGR	0.116419	0.17883	0.651002	0.515575
LSHLK_311	3.883671	0.550571	7.053898	1.35E-11
LSHLK_312	0.496888	1.126735	0.440998	0.659552
LSHLK_313	6.656675	1.107683	6.009548	5.73E-09
LSHLK_314	3.566169	4.705767	0.757829	0.449186
LSHLK_321	1.226404	0.553742	2.214757	2.76E-02
LSHLK_322	3.469049	1.800643	1.926561	5.50E-02
LSHLK_323	2.010069	0.395914	5.077035	6.97E-07
LSHLK_324	2.347932	0.449275	5.226048	3.37E-07
LSHLK_331	2.555144	0.434673	5.878312	1.17E-08
LSHLK_332	4.863822	4.018752	1.210282	0.227184
LSHLK_341	2.158515	0.594261	3.63227	3.34E-04
LSHLK_342	2.273407	0.716122	3.174606	1.67E-03
LSHLK_351	-2.27731	5.916658	-0.3849	7.01E-01
LSHLK_352	1.438297	1.374665	1.046289	2.96E-01
LSHLK_355	3.966061	0.935978	4.237345	3.07E-05
LSHLK_356	3.52E+00	0.695772	5.064374	7.41E-07
LSHLK_361	3.643338	0.546847	6.662439	1.41E-10
LSHLK_362	3.267306	0.725973	4.500588	9.92E-06
LSHLK_369	7.893375	1.268468	6.222764	1.76E-09
LSHLK_371	2.815401	0.857993	3.28138	1.16E-03
LSHLK_372	3.41807	0.739359	4.623019	5.76E-06
LSHLK_381	3.175124	0.687481	4.61849	5.88E-06
LSHLK_382	6.89167	0.74758	9.218639	7.23E-18
LSHLK_383	6.622284	1.119769	5.913976	9.64E-09
LSHLK_384	1.990003	0.806054	2.46882	1.41E-02
LSHLK_385	3.18682	0.890578	3.578373	4.07E-04
Adjusted R-squared	0.706845			

TABLE 11.2

Estimation of equation 9 with cross-section specific markups, private sectors

Dependent Variable: $dy_{it} = d\ln(Y/K)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	0.040725	0.010609	3.83871	0.000153
DUM*LSHLK	-0.35019	0.847093	-0.4134	0.679625
DUM*CPGR	-0.25329	0.236261	-1.07208	0.284601
CPGR	-0.20847	0.210032	-0.99257	0.321771
LSHLK_311	3.647038	0.774868	4.706659	3.95E-06
LSHLK_312	3.765284	1.575013	2.390637	0.017475
LSHLK_313	3.804787	0.887644	4.28639	2.50E-05
LSHLK_314	6.076756	2.70455	2.246864	0.025422
LSHLK_321	2.626931	0.858632	3.059436	0.002431
LSHLK_322	2.35358	2.092431	1.124806	0.261628
LSHLK_323	1.301657	0.47839	2.720914	0.006915
LSHLK_324	2.222274	0.579193	3.836842	1.54E-04
LSHLK_331	1.882354	0.570899	3.297176	1.10E-03
LSHLK_332	2.868763	0.975034	2.942219	3.53E-03
LSHLK_341	3.452088	0.928226	3.719017	2.41E-04
LSHLK_342	1.934431	1.230872	1.571594	0.117166
LSHLK_351	-2.93567	2.704316	-1.08555	0.278605
LSHLK_352	2.558065	1.634538	1.565009	1.19E-01
LSHLK_355	3.983464	1.209217	3.294251	1.11E-03
LSHLK_356	2.390908	0.805959	2.966539	3.27E-03
LSHLK_361	3.261249	0.824464	3.955599	9.66E-05
LSHLK_362	2.419809	0.866646	2.792153	5.59E-03
LSHLK_369	5.83802	1.027236	5.68323	3.29E-08
LSHLK_371	2.68328	0.693101	3.871412	0.000135
LSHLK_372	6.420643	1.164038	5.515838	7.85E-08
LSHLK_381	2.72629	0.836953	3.2574	0.001262
LSHLK_382	4.910323	1.345172	3.65033	0.000312
LSHLK_383	4.915226	1.099267	4.471368	1.13E-05
LSHLK_384	2.14982	1.259337	1.707105	0.088903
LSHLK_385	2.137656	0.77413	2.761364	0.006134
Adjusted R-squared	0.754184			

TABLE 11.3
Estimation of equation 9 with cross-section specific markups, public sectors

Dependent Variable: $dy_{it} = d\ln(Y/K)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM	-0.00059	0.018647	-0.03186	0.974614
DUM*LSHLK	-0.02532	0.501845	-0.05045	9.60E-01
DUM*CPGR	-0.31456	0.225594	-1.39436	1.65E-01
CPGR	-0.23496	0.204004	-1.15176	0.250759
LSHLK_311	2.348106	0.628947	3.733392	0.000245
LSHLK_312	-0.52351	1.122382	-0.46643	6.41E-01
LSHLK_313	6.786932	2.19027	3.098673	0.002217
LSHLK_314	0.003521	2.553702	0.001379	0.998901
LSHLK_321	1.159132	0.422554	2.743154	0.006624
LSHLK_324	1.243739	0.614798	2.023006	0.044371
LSHLK_331	1.436403	0.438443	3.276146	0.001236
LSHLK_341	1.246906	0.605711	2.058582	4.08E-02
LSHLK_342	2.417432	0.996254	2.426522	1.61E-02
LSHLK_351	1.453213	3.655562	0.397535	0.691387
LSHLK_352	1.183479	0.393653	3.0064	0.002974
LSHLK_361	1.911576	0.519823	3.677359	3.01E-04
LSHLK_369	0.858322	1.062759	0.807636	0.420236
LSHLK_371	1.53283	0.882024	1.737856	0.083738
LSHLK_372	1.825077	0.668111	2.731698	0.00685
LSHLK_381	1.463838	0.425871	3.43728	7.11E-04
LSHLK_382	0.515077	0.662801	0.777121	0.437983
LSHLK_383	1.161576	0.480417	2.417851	0.016487
LSHLK_384	-0.86477	1.162539	-0.74386	0.457813
Adjusted R-squared	0.769884			

From tables 11.1-11.3, I observe that there is evidence that trade liberalization caused an increase in total factor productivity in both the private and combined sectors as the coefficient of the dummy variable is positive in both sectors. The magnitude is changing between 0.025 and 0.041, which is very realistic and comparable to other studies (Krishna and Mitra, 1998). In both private and public sector, the coefficients of dk are -0.21 and -0.23 respectively and they are insignificant. This is suggesting that there is a weak evidence that returns to scale is between 0.70 and 0.80. When I run all the regressions above with GLS with fixed effects instead of "within-group estimation", I get very similar results and the coefficient of capital growth in those regressions, dk, is -0.70. Hence, I have decreasing returns to scale in the industries under investigation. Both interaction terms in both public and private sectors are not significant. Here again the standard errors are large, which is the explanation for the insignificant coefficient estimates. In combined sectors, the interaction term of dummy variable with capital growth is significant and negative. This is suggesting that policies that are used in the more open period cause the scale of the production to be reduced as the coefficient of interaction term suggests. That is, in the second period, foreign competition is curtailing the domestic production.

As for the estimation and magnitude of markups, those in the private sector are between 2 and 3 . For the public sector, markups are between 0.51 and 1.91 except for negative markups for two industries. Manufacture of food products not elsewhere classified(312) and manufacture of transport equipment(384) have markups with values of -0.52 and -0.86 respectively. Negative markups, in the private sector, would be very difficult to explain if they were at the same time significant. As I can observe from table 5, almost all of the markup estimations are statistically significant and have the expected signs, with only one exception in the private sector and in the combined sector. In the private sector and in the combined sectors, the manufacture of industrial chemicals(351) has a negative markup estimation of - 2.93 and -2.27 respectively, but it is insignificant. For the public sector, the markup is positive. A negative markup is difficult to interpret since markup in this study is defined price/marginal cost. For a markup to be negative, either price or marginal cost has to be negative, which does not make any economic sense. Therefore, this industry (especially the private sector) will need to be investigated further to determine why the markup is negative.

The range of markups, especially in the private sector, might seem to be higher than expected. As Hall (1988) states, "…when such an industry operates below capacity, its price remains far above the cost of the variable component of labor. Profit often remains positive, so labor's share, α , is less than one. The ratio of Δq to $\alpha \Delta n$ is, say, three, not one. The appropriate conclusion is that price is three times marginal cost, and the firm is far from competitive…" Even though Hall (1988) finds markup ratios as high as 3 reasonable, most of the industries in his study , have markups higher than 3. The quotation above is appropriate for this study since, in private sector, 18 industries, out of 26 industries, have markups between 2 and 3. Some other industries have markups around 1 and some between 0 and 1. If I assume that the degree of competitiveness, in many industries, is higher in the USA than in Turkey, then markups that I estimate here , compared to markups that Hall(1988) gets for American industries, are not implausible since one would expect that industries in the USA would have a higher degree of competitiveness than in Turkey. Markups lower than 1, as Levinsohn (1993) suggests, might be related to the presence of adjustment and sunk costs. In the presence of adjustment costs or sunk costs, firms might endure some economic losses in the short run. Markups that are lower than 1 in the public sector would not surprise anyone since in many cases public firms are selling their products less than their marginal costs. There is one markup that is negative. In the manufacture of industrial chemicals (351), for the private and combined sectors, markups are –2.93 and –2.27 respectively. For the public sector, markup is positive. A negative markup is so difficult to interpret since markup in this study is defined price/marginal cost. For a markup to be negative, either price or marginal cost has to be negative, which does not make any economic sense. From the raw data set for this industry, I don't see anything wrong. The inputs are growing in a usual way and all the other variables are comparable with the other industries. Therefore, this industry (especially the private sector) needs to be investigated closely to determine why the markup is this industry is negative. However, this is not in the scope of this study.

Marginal cost, in this study, is the cost of increased value added. Most of the industries under consideration here require higher overhead labor. And if the industries are below capacity, which is the case here, an increase in value added has a small marginal cost. So when it is compared to price, a large difference can be found in many industries. Here in this paper, however, markups are not as high as in Hall (1988).

Some of the markups are outliners. For example, in beverage industries(313), the markup in public sector, 6.78, is a lot higher than the markup in the private sector, 3.80. These two numbers are quite large. Marginal costs might not be high with respect to price in this industry. Most raw material of this industry is abundant in Turkey and cheap. Also, the public sector dominated the industry until 1991. Until 1991, the public sector share of the total value added was always greater than the private sector. In 1970, the public sector share in value added was four times higher than the private sector share. In 1991, the shares were almost fifty-fifty. In the public sector, markups that are higher than one don't mean that in those industries, public firms are necessarily gaining positive or extra normal economic profits since positive economic profit can occur when price/average cost ratio is more than one, not when price/marginal cost is more than one

In the regressions above, I observe that I either have a constant returns to scale or decreasing returns to scale as the coefficient for the variable of capital growth, dk, suggests. The coefficient in both sectors is between -0.20 and –0.30. Then the return to scale is between 0.70 and 0.80, which is decreasing returns to scale. In most industries with CRS and DRS and imperfect competition, empirically, firms stop producing where average cost is greater than marginal cost, $AC > MC$. When price to average cost ratio is one, then I have zero economic profits. With $AC > MC$, the price to average cost ratio is less than the price to marginal cost ratio in the same industry with one price. A price to average cost ratio that is higher than one can be interpreted as positive economic profit. A price to marginal cost that is higher than one does not necessarily tell us that I have positive economic profit for that industry or firm. In fact, a price to marginal cost ratio that is bigger than one can mean an economic loss since it might be the case that price is greater than marginal cost but less than average cost. Therefore, in the public sector, markups that are higher than one should not be interpreted as positive economic profits in those public firms. In fact, many public firms were suffering economic loses for many years, including the time period which is studied in this study. If, however, price to marginal cost ratio is less than one, then I can, for sure, say that there is an economic loss.

In tables 11.1-11.3, as in the previous tables and regressions, markups in the public sector are much lower than in the private sector. As is known, the price equals marginal cost condition is the allocative efficiency condition. Therefore, does it mean that the public sector is more allocatively efficient than the private sector since I have smaller price to marginal cost ratio? I cannot answer this question positively since marginal costs might be so much higher in the public sector if the public sector is producing a perfect or close substitute good. Indeed, in Turkey, the public sector firms are producing a close substitute, so the prices are so close to each other in the public and private sector. Therefore, the difference between two markups is coming from the cost side. If marginal costs are higher in the public sector, then the public sector has a smaller markup. This, of course, does not mean that the public sector is allocatively more efficient. As for technical efficiency, however, I cannot make any reasonable comparison unless I have marginal cost structures of the public and private sector industries known to us. Wages might be higher in the public sector and that makes the average cost curves higher than average costs curves for the private sector firms. In fact, payments to workers, in my data set, have higher value per person, in the public sector than in the private sector. Now, I can include the markups in the recalculation of the total factor productivity, which will be modified to include effects of imperfect competition and non-constant returns to scale.

4.3. Estimation of markups

From tables 11.1-11.3, I know that coefficients of LSHLKs are the markups since the interaction term is not significant in the both public and the private sector. Therefore, estimated markups have not changed in the second period for both the public and private sector.

Markups, for private, public, and combined manufacturing industries are as follows. Markups below are the averages for the whole period. In the second period markups are not changing.

TABLE 12
Markups

industry	private sector	public sector	combined sector
311	3.647038	2.348106	3.883671
312	3.765284	-0.52351	0.496888
313	3.804787	6.786932	6.656675
314	6.076756	0.003521	3.566169
321	2.626931	1.159132	1.226404
322	2.35358		3.469049
323	1.301657		2.010069
324	2.222274	1.243739	2.347932
331	1.882354	1.436403	2.555144
332	2.868763		4.863822
341	3.452088	1.246906	2.158515
342	1.934431	2.417432	2.273407
351	-2.93567	1.453213	-2.27731
352	2.558065	1.183479	1.438297
355	3.983464		3.966061
356	2.390908		3.52365
361	3.261249	1.911576	3.643338
362	2.419809		3.267306
369	5.83802	0.858322	7.893375
371	2.68328	1.53283	2.815401
372	6.420643	1.825077	3.41807
381	2.72629	1.463838	3.175124
382	4.910323	0.515077	6.89167
383	4.915226	1.161576	6.622284
384	2.14982	-0.86477	1.990003
385	2.137656		3.18682

Now I can estimate the true total factor productivity growths after taking into account imperfect competition and non-constant returns to scale. For this, I will use the following TFPG measure.

$$\left(dA/A\right)_{it}=\left(dY/Y\right)_{it}-\left(\mu_i\left(\alpha_L dl\right)\right)-\left(\left(\varphi_i/\mu_i\right)-\alpha_L\right)*\left(dk\right) \qquad (10)$$

This equation is giving us the modified total factor productivity growth as opposed to standard measures of total factor productivity which are given in the table 1. So, eq. (10) is the modified version of the equation 3., from which I obtained the standard measures of total factor productivity growth.

TABLE 13
Modified TFPG for private sector

Results for private sector

	constant returns to scale in the entire period		
industry	1980-1984	1985-1991	1980-1991
311	0.037391	0.111959	0.084844
312	0.039211	0.090434	0.071807
313	0.027364	0.074968	0.069436
314	0.228909	0.056408	0.119136
321	0.021198	0.087505	0.063393
322	0.218804	0.07382	0.126542
323	0.094243	0.058756	0.071661
324	0.059439	0.140386	0.110951
331	-0.05679	0.153041	0.076739
332	0.164358	0.07484	0.107392
341	0.087835	0.11053	0.102278
342	-0.09001	0.033891	-0.02482
352	0.069394	0.116307	0.099248
355	0.028028	0.122373	0.088066
356	0.038039	0.153599	0.111577
361	-0.0305	0.123195	0.067304
362	-0.15615	0.059676	-0.01881
369	0.030607	0.101548	0.075751
371	0.089086	0.136936	0.119536
372	0.106634	0.080741	0.090156
381	0.007257	0.123408	0.081171
382	0.076278	0.125814	0.107801
383	0.159344	0.118364	0.133266
384	0.158344	0.093779	0.117257
385	0.12007	0.16704	0.14996

In Table 13, I have constant returns to scale and imperfect competition. Markups are coming from table 12. I have constant returns to scale since the coefficient of capital growth, $\beta_{4i} = (\varphi_i - 1)$, is insignificant. Then I can not reject the hypothesis of $\varphi_i = 1$. And the coefficient of interaction term of capital growth and dummy variable is not significant either. This is showing that returns to scale are not changed in the second period.

For the public sector

In the public sector, I will list two sets of productivity growth numbers. The first set is assuming constant returns to scale and imperfect competition. The second set shows decreasing returns to scale (the scale parameter is 0.70) and imperfect competition. Markups are coming from the table 12. The first set is in the first three columns of the table 14 below, and the second set is in the last three columns. The scale parameter and markups are not changing in the second period since the interaction terms are not significant most of the time.

TABLE 14
Modified TFPG for public sector

	constant returns			decreasing returns		
industry	1980-1984	1985-1991	1980-1991	1980-1984	1985-1991	1980-1991
311	-0.04377	0.170864	0.092814	-0.03957	0.172037	0.095089
313	0.103273	0.138841	0.125907	0.117832	0.130913	0.126156
321	0.023397	0.005115	0.011763	0.038219	0.015987	0.024071
324	0.146812	0.026673	0.07036	0.075971	0.045662	0.056683
331	-0.0347	-0.01974	-0.02518	-0.01427	-0.01644	-0.01565
341	0.111545	0.056325	0.076405	0.121318	0.07393	0.091162
342	0.095421	0.073442	0.081434	0.108978	0.075099	0.087419
351	-0.10251	0.00021	-0.03714	-0.09776	0.021815	-0.02167
352	-0.06621	0.030451	-0.0047	-0.00398	0.065339	0.04013
361	-0.02183	0.061409	0.031139	0.009226	0.058276	0.04044
369	0.01393	0.023121	0.019779	0.009184	0.035571	0.025976
371	0.108245	0.057992	0.076266	0.145294	0.05123	0.085435
372	-0.03112	0.126617	0.069258	0.001834	0.116261	0.074651
381	0.070068	-0.04211	0.008175	0.047723	-0.04211	0.008175
382	0.191864	-0.04937	0.03835	0.163109	-0.03364	0.037908
383	0.214087	-0.02716	0.060566	0.354451	-0.05186	0.095887

TABLE 15
Modified TFPG for the combined manufacturing sectors

1	2	3	4	5	6	7	8	9
industry	1980-1984	1985-1991	1980-1991	1985-1991	1980-1991	1985-1991	1980-1991	
311	0.026476	0.125515	0.089501	0.124559	0.088892	0.127546	0.090793	3.095001
313	0.059737	0.109609	0.091474	0.111664	0.092781	0.111002	0.09236	5.868005
314	0.228488	0.057329	0.119569	0.048269	0.113803	0.054144	0.117542	2.777499
321	0.02143	0.062189	0.047368	0.004171	0.010447	0.02941	0.026508	0.437734
322	0.171476	0.054795	0.097224	0.068066	0.10567	0.085331	0.116657	2.680379
323	0.096232	0.074134	0.08217	0.091085	0.092957	0.073952	0.082054	1.221399
324	0.051991	0.07634	0.067486	0.072194	0.064847	0.080736	0.070283	1.559262
331	-0.05105	0.106544	0.049239	0.098492	0.044114	0.103916	0.047566	1.766474
332	0.061303	0.149155	0.117209	0.145598	0.114945	0.149504	0.117431	4.075152
341	0.099273	0.092337	0.094859	0.070055	0.08068	0.089159	0.092836	1.369845
342	-0.09508	0.044564	-0.00622	0.060381	0.003848	0.043278	-0.00704	1.484737
352	0.049317	0.097885	0.080224	0.041308	0.04422	0.074705	0.065473	0.649627
355	0.028165	0.121303	0.087435	0.116688	0.084498	0.122881	0.088439	3.177391
356	0.030449	0.154808	0.109587	0.155865	0.110259	0.159646	0.112665	2.73498
361	-0.02244	0.120635	0.068608	0.11366	0.06417	0.124911	0.071329	2.854668
362	0.05127	0.074691	0.066175	0.070264	0.063357	0.072744	0.064935	2.478636
369	-0.00712	0.094948	0.057834	0.095574	0.058232	0.09794	0.059738	7.104705
371	0.104122	0.110148	0.107957	0.109358	0.107454	0.109369	0.107461	2.026731
372	0.052773	0.112642	0.090872	0.102206	0.08423	0.097819	0.081439	2.6294
381	0.011272	0.126017	0.084292	0.118792	0.079694	0.123866	0.082923	2.386454
382	0.061198	0.12685	0.102977	0.124056	0.101199	0.126034	0.102457	6.103
383	0.140067	0.107082	0.119076	0.110154	0.121031	0.112438	0.122485	5.833614
384	0.11917	0.095283	0.103969	0.067902	0.086545	0.09328	0.102694	1.201333
385	0.082837	0.136279	0.116846	0.151475	0.126516	0.165121	0.1352	2.39815
averages	0.05714	0.101295	0.085239	0.09466	0.081016	0.101197	0.085176	

In columns 2,3,and 4 , markups are the averages for the entire period. That is, no change in the markups in the second period exists. And constant returns to scale is assumed in those columns. In columns 5 and 6, markups are changed in the second period (getting smaller) and still constant returns to scale is assumed. In columns 7 and 8 ,both markups and returns to scale change in the second period. I have decreasing returns to scale in those columns. In column 9, I have markups in the second period when they are changed. Numbers in column 9 is calculated as follows: I have the original markups from Table 12. I subtract the coefficient of DUM*LSHLK from every industrial markup from Table 12 for the combined sector.

In table 15, I calculated three sets of TFPG. In the first set, I calculate TFPG with the same markups (from table 12) for the entire period (1980-1991) and constant returns to scale in the first three columns of table 15. In the second set, I have decreased markups in the second period (1985-1991) since there is weak evidence in table 11.1 markups are decreased. The second set is listed in columns 5 and 6. In the third set of TFPG, I have changed both markups and returns to scale in the second period. In the second period, both markups and returns to scale are decreased. New markups are listed in the last column of the table 15. There is a weak evidence that in table 11.1-11.3 and in other specification and estimation methodologies that the new scale parameter , in the second period, is between 0.70 and 0.80. Therefore, in table 15 above, I have 0.70 as the new scale parameter in the second period (1985-1991) and a third set with changed markup and returns to scale parameter is listed in columns 7 and 8.

5. Concluding Remarks

Before commenting on the results of regime shift in the 1980s in the private, public, and combined sectors, and on the models that I estimate, I will analyze the sensitivity of productivity growth with respect to market structure and production structure, that is, how productivity is changing with the changes in markups and scale parameters. Table 16 below portrays this sensitivity.

TABLE 16

Sensitivity of TFPG with respect to returns to scale and markups

for public sector

	Standard measures	With imperfect competition and scale parameter=1	With imperfect competition and scale parameter=0.7
1980-1984	0.006067	0.048656	0.06484
change	0.035558	-0.00911	-0.01997
1985-1991	0.041625	0.039542	0.04487
1980-1991	0.028695	0.04345	0.05324

for private sector.

	Standard measure	With imperfect competition and scale parameter=1
1980-1984	0.059358	0.061135
change	0.018577	0.042438
1985-1991	0.077936	0.104573
1980-1991	0.07118	0.088066

for the combined sectors

	Standard measure	With imperfect competition and non-CRS.
1980-1984	0.045551	0.05714
change	0.030755	0.044155
1985-1991	0.076266	0.101295
1980-1991	0.065083	0.085239

As the table above shows, if I use the standard measures of total factor productivity growth, I would underestimate the changes in the productivity growth between two periods for combined sector and private sector and overestimate the change in public sector. I see that in the combined sector and private sector, in both periods, TFPG is higher than in the public sector. This result is not surprising since, in Turkey as well as other countries, the public sector does not score very well in terms of productivity. In our regression estimation results above in table 11.1-11.3, I found, on average, that the coefficient of the dummy variable was between 2.5% and 4.1% . The coefficient of dummy variable is showing the change in the productivity growth between the two periods. Our actual numbers are confirming the regression results. Now I can compare the growth rate of value added and productivity growth. Thus, I can use growth accounting methodology to see the contribution of the total factor productivity growth. Before I use growth accounting, I would like to talk about the magnitude of the numbers. These productivity measures might seem to be high, but as mentioned before not implausibly so. As is discussed in Hulten (1978) and McGuckin and Nguyen (1993), when value added is used instead of gross output, productivity values are higher. Mc Guckin and Nguyen (1993) explains in greater detail the advantages and disadvantages of using gross-output based and value-added based productivity growth. One of our main purposes here, however, is to look at the change before and after liberalization or after the regime shifts. Therefore, since it is controlled for a possible bias, I should not worry about the magnitudes of the productivity growth values above. Beside, productivity values themselves must be supplemented by output growth (or value added growth) to compare the two. Lee (1996) finds 6 % percent annual productivity growth for Korea between 1963-1983. Krishna and Mitra(1998) , as mentioned before, find 4-6% increase in the productivity between two period, before and after liberalization. Since there are no previous studies about Turkey's case, there is no comparison available for Turkey. Now I can look at the growth accounting.

TABLE 17
Growth Accounting

	for public sector	
	growth of value added	Productivity growth
1980-1984	0.073	0.048
1985-1991	0.036	0.039
	for private sector	
	growth of value added	Productivity growth
1980-1984	0.087	0.061
1985-1991	0.125	0.10

As can be seen from the table , in the second period , both the growth of value added and productivity growth in the private sector is higher than in public sector.

The table above shows that, in private sector specifically, all increases in output growth, in the second period, derives from an increase in productivity growth and productivity growth is contributing more than 50% of the growth in value added. In the public sector, productivity growth is also positive and the share of productivity growth in value added growth in the second period is more than 100%. In the public sector, in the second period, the annual rate of growth of output is smaller (3.6 %) compared to the first period (7.2 %). Productivity growth is also smaller in the second period (3.9 %) compared to first period (4.8%).

With taking into account the effects of imperfect competition and non-constant returns to scale, I can say that the second period, which is more open to international trade has seen increased total factor productivity. The change in annual productivity growth is 4.2 % in the private sector and 4.4 % in the combined sector. Similar increases were also found in other studies such as, Krishna and Mitra (1998) and Lee (1996). The contribution of productivity growth to output growth in the more open period is higher for both the private and public sector. That is, the ratio of productivity growth to growth of value added in the more open period in both the private and public sector is higher. In the public sector, the change in productivity growth is negative. That is, I have a smaller productivity growth in the second period. Therefore, in the private and combined sectors, reforms of the second half of the 1980s increased the total factor productivity in the Turkish manufacturing industries. I am not necessarily sure that this increase was coming from trade liberalization because our explicit measures of openness to trade produced insignificant regression results in eqs (4) and (8). I would like to look at the total protection rates that are used in the regressions above.

TABLE 18

Average Total Protection Rates For Different Industries

Industry	Average 1980-84	Average 1985-91	Percentage reductions
311	93.44	56.91	**39**
322	115.7	46.24	**60**
323	153.18	57.78	**62**
341	81.08	45.17	**44**
351	94.9	54.07	**43**
355	110.48	47.68	**57**
362	172.92	68.47	**60**
369	65.84	32.92	**50**
371	72.24	41.8	**42**
372	90.68	39.47	**56**
381	118.9	69.94	**41**
382	147.22	66.04	**55**
383	128.24	86.75	**32**
384	150.6	95.18	**37**
Average	113.9586	57.74	**49**

In Table 18 above, the second column show the averages between 1980-1984, whereas the third column shows the average total protection rates between 1985-1991. As is clear from the table above, total protection rates averaged, over fourteen industries, as 113.9 percent between 1980-1984 and 57.75 percent between 1985-1991. In the second period, actually total protection rates is reduced 50 percent. 57.75 percent protection rates, however, is still considered to be high protection rates. Therefore the intensity of liberalization was not that strong in terms of total protection rates in the second period as well. From the table we can see that most protected industry on average, in the first period, was glass and glass product. Why this industry was the most protected industry is not in the scope of this paper. From the table above, one sees that most industries have total protection rates more 100 percent between 1980-84.

Model 1, which used explicit measures for trade liberalization, produced insignificant results for the private, public and combined sectors with respect to almost every measure of trade openness used in this study. Even though some authors claim that in the second half of the 1980s, there was a reversal of the trade liberalizing policies (Taskin and Yeldan, 1996), I think that total protection rates were much lower in the second half of the decade than the first half. Even though total protection rates, on average, were around 36% in 1990, as Taskin and Yeldan (1996) also mention, this number was lower than the protection rates in 1980 and before.

In model 2, I used dummy variables for the regime shifts. This model allowed me to use information about the 26 three-digit manufacturing industries, and has the advantage of not using explicit openness measures that might have measurement error in them and of including all the industries. More importantly, model 2 allowed me to include other liberalizing policies in the analysis. As mentioned in the introduction section in detail, Turkey used also other policies, along with trade liberalizing policies, in the second half of the decade like financial liberalization, changes in the public investment policies, privatization policies, democratization of the country (evidenced by the first free elections after the influence of military coup and regime in the first half the decade), as increased wages in the second period, especially in the public sector, changes in the price regime, etc. All these changes are part of the liberalization movement and should be included in the analysis. According to model 2, productivity increases occurred in the second half of the decade. This is the most significant and important finding of this paper: while explicit measures of trade liberalization alone did not show a significant relationship with total factor productivity, trade liberalization along with many other complementary liberalizing policies did show a significant and positive relationship with total factor productivity. For policy implications, this is an important result: trade liberalization policies by themselves, such as reducing tariffs or eliminating quotas, without complementary liberalizing policies, does not necessarily provide countries or industries with higher productivity growth. Most studies of Turkey's liberalization have only investigated trade liberalization. This study has shown that economic liberalization in all its forms increased total factor productivity in the second half of the 1980s. In interpreting the estimates of both model 1 and model 2, it is clear that trade liberalization alone could not have caused the increase in the productivity observed in the second half of the decade if it had not been accompanied by other forms of liberalization.

Regarding some technical points of using production functions, instead of using cost functions in estimating productivity and in calculating and identifying markups and scale parameters, there is weak evidence that estimating productivity from a production function might cause some endogeneity problem and bias the estimates upward. Using production function has its own advantage to define a scale parameter. For further work, in the future, estimating markups from a dual cost function might cause no endogeneity problem as in Roeger (1995). This approach, however, has the disadvantage of not being able to identify the scale parameter.

My paper has established some important initial findings on the effects of economic liberalization in Turkey in the 1980s. Further work for Turkey is warranted to capture more fully the effects of trade liberalization per se. In this area, there is need for more disaggregated data sets, and constructing these data sets is a top priority for future work.

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