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SENSITIVITY OF RESOURCE ALLOCATION SHIFTS TO THE SIZE OF TARIFF REDUCTIONS

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A general equilibrium model which provides a framework for estimating the directions in which resources would be reallocated when tariff duties are reduced at different rates is developed and applied to the Turkish economy. Sectoral output expansions and contractions are simulated under 10,20,30 and 50 percent across - the - board tariff reductions. By comparing sectoral output expansions and contractions for all solutions, we can establish whether or not the direction of changes in sectoral output levels is sensitive to the size of tariff reductions in the short - run. Such an exercise would be helpful in finding the possible direction of resource reallocation which might be induced by a unilateral move on the part of Turkey in liberalizing her foreign trade policy. Furthermore, solution results will also provide a criterion on the basis of which we can identify Turkish industries which show static comparative advantage.

1. Introduction

Recent contributions to the theory of effective protection have focussed on some of the fundamental difficulties associated with the development of a general equilibrium concept of ERP indices which would serve as predictors of resource allocation effects of changes in tariff structures where input substitution occurs. [Ramaswami and Srinivasan (1971), Bhagwati and Srinivasan (1971), and Jones (1971)]. Using two - sector models in which

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limited input substitution entered by way of separable production functions, Corden (1971), and Jones (1971) have attempted to develop ERP indices within a general equilibrium framework. More recently Bruno (1973), Khang (1973), and Bhagwati and Srinivasan (1973) have attempted to identify sufficient conditions under which the Ramaswami-Srinivasan "perverse" case would not apply, such that ERP indices could be expected to predict correctly the directions of resource flows resulting from changes in a tariff structure within an economy.

The first important conclusion to emerge from these studies is that in the fully general case of substitution between primary factors and imported inputs an ERP index cannot be defined. A second conclusion is that even if an attempt is made to construct an ERP index by restricting the range of input substitution and of tariff changes, in an N - industry framework it will not be possible to use such indices to rank industries for the purpose of predicting directions of resource flows.

These results of course increased the importance of multi-sectoral, general equilibrium models of production and trade as theoretical and empirical tools of analysis of resource allocation and commercial policy. This is supported by the recent increase in the number of studies using empirical general equilibrium models. For example, Cabezon (1969), Lage (1970), and Evans (1971) utilized linear programming models in estimating resource allocation effects of commercial policies in the countries which were the subject of their studies.[1] Later Taylor and Black (1974) and Staelin (1976) used Johansen-type price-responsive, multi-sectoral models to analyze empirically the resource allocation effects of changes in commercial policies.[2] In the latter group of models, Walrasian - type, non - linear general equilibrium systems are linearized in terms of proportional changes and used

(1) In Evans' model, capital is industry-specific and investment is endogenously determined by means of a fixed stock-flow factor. Evans solved his system to obtain a "snapshot" of the long-run state of the Australian economy ten years after a tariff reform. Lage's model is applied to Japan and simulates the resource-pull effects of tariffs. Cabezon applied his model to the Chilean economy.

(2) Taylor and Black performed a sensitivity analysis with different production specifications and found that resource-pull effects are sensitive to changes in substitution elasticities. Staelin's model incorporates noncompetitive pricing behavior. His results show that resource allocation effects of a commercial policy change also depend on the type of pricing behavior.

to obtain local general equilibrium solutions to simulate short-run resource-pull effects of "small" changes in tariffs.

De Melo (1977, 1978a, 1978b), following the latter group, also developed a Johansen-type general equilibrium model with Walrasian structure. But, De Melo solved his non-linear system directly without linearizing it. This approach enabled him to obtain "global" rather than "local" solutions. De Melo applied his model to the Colombian economy and obtained estimates of welfare costs of factor market and trade distortions. He also used his model in order to simulate possible resource allocation effects of some assumed changes in the foreign trade policy of the Colombian economy.

As for the dynamic simulation models, we can mention the non-linear multi-sector dynamic models developed by Derviş (1975) and De Melo and Derviş (1977). In the former study, Derviş applied his model to analyze the equilibrium growth path effects of different rates of increase in real wages in Turkey, and the main focus is on the effects of capital - labor substitution on employment. However, Derviş's model is also suitable for simulating the long-run growth rate and employment effects of trade liberalization. In the latter study, static resource reallocation costs of Turkey's protectionist trade policy are compared with the dynamic benefits of the same policy.

In this study, a general equilibrium model which provides a framework for estimating the directions in which resources would be reallocated when tariff duties are reduced at different rates is developed and applied to the Turkish economy. Sectoral output expansions and contractions are simulated under 10,20,30, and 50 percent across - the - board tariff reductions. However, before obtaining solutions under tariff reductions, separate solutions are also obtained for the complete free trade case in which all trade barriers are removed, and for a restricted trade case in which import quotas are removed but import duties are kept intact. The free trade solution will provide a criterion which will be used in ranking Turkish industries according to their static comparative advantage, and it will also serve as a reference solution in the comparison of other solutions. The restricted trade solution obtained in the absence of import quotas will provide information about the possible resource reallocation effects of removing these quotas.

By comparing sectoral output expansions and contractions for all solutions, we can establish whether or not the direction of changes in sectoral output levels is sensitive to the size of tariff reductions in the short-run. Such an exercise would be helpful in finding the possible direction of resource reallocation which might be induced by a unilateral move on the part of Turkey in liberalizing her foreign trade policy. Remembering that there is indeed a trend towards "liberal" economic policies in Turkey (which is also observed in the changing foreign trade policies) since the beginning 1980, and that Turkey has been gradually liberalizing her trade relations with the EEC since the beginning of transitionary period in early 70s, estimation of the direction of possible shifts in resource allocation, as explained above, would be of some practical importance. Furthermore, solution results will also provide a criterion on the basis of which we can identify Turkish industries which might have comparative advantage in the world trade.[3]

An examination of the likely dynamic effects of tariff reductions on Turkey's employment, rate of growth, scale and efficiency of industries is beyond the scope of this study. However, recent attempts to deal with these questions suggest that countries which have moved away from import substitution policies have experienced increases in growth rates, (Balassa, 1977; Michaely, 1977; Krueger, 1978a : Chapter 11). Likewise, results reported by Krueger, 1978b) suggest that LDCs which adapt export-oriented policies experience increases in employment opportunities.

The outline of the paper is as follows.[4] The model is presented in Section 2. Section 3 contains information on sources of data

(3) Since the domestic relative price structure is affected by the domestic microeconomic policies of the government, a comparison of domestic and world relative prices (even if we use a more realistic foreign exchange rate) will not enable us identify those industries in which Turkey might have static comparative advantage. We need to generate shadow prices within a general equilibrium framework, which reflect the opportunity cost of domestically produced tradables. Using such information we can then identify those domestic industries might have strong or marginal comparative advantage.

(4) A section covering Turkey's foreign trade and economic development policies during the last couple of decades will expand the size of this paper beyond a reasonable limit. Therefore such an attempt is not made. However, interested reader may refer to Krueger's (1974) work which provides a detailed account of Turkey's policies for economic development and trade for the 1950-70 period.

and procedures used for transforming these into appropriate forms. Further, a method developed for estimating world prices (i. e., free trade prices, assuming that Turkey is a "small" country) from tariff-inclusive domestic prices is described. These procedures were time-consuming and are crucial in determining quality and reliability of results. Results are presented in Section 4.

2. Methodology and the Model

Since we are interested in quantifying the possible static resource reallocation effects of assumed changes in Turkey's tarif structure, it is appropriate to use a static general equilibrium model for simulating sectoral output expansions and contractions to be induced by tariff reductions. In this study simulation solutions are generated with the help of a static linear programming model.

Linear programming models can easily be used to generate solutions which simulate general equilibrium effects of "large" tariff changes, and are therefore appropriate to deal with the substantial changes such as 30 and 50 percent reductions. Obviously, an important feature of a linear programming model is the ability to generate results which are consistent with structural (i.e., inter-industry) constraints, with primary and natural resource constraints, and with the clearing of home - goods markets. Also a large number of production activities and constraints on production can be incorporated into such models. Solutions yield shadow prices for these constraints, and thus provide extremely useful information. Of course, extreme care must be taken in interpreting any set of shadow prices and in analysing solution results based on such prices (on this see, for example, Taylor, 1975 : pp. 59-83). In this study a subset of these shadow prices, obtained for the free trade case, is used to rank industries which produce traded goods according to their static competitive advantage in the world trade. These rankings should be of considerable value, at least for short-run purposes, because they are derived from a highly disaggregated model of the Turkish economy.

It is important to note that failure to allow for input-substitution raises doubts about reliability of results of studies dealing with resource reallocation effects of tariff changes. The model developed here simulates first-order effects of tariff changes, but does not pick up secondary effects of input substitution. This should not create a serious problem in this study because we are mainly concerned with directions of output responses rather than with magnitudes. Taylor and Black (1974, p.37) demonstrated that "the specification in which intermediate inputs enter the production function is numerically important in determining output responses to tariff changes", but their results also show that directions of predicted output responses for the Chilean economy are not affected by the form of the production function (Taylor and Black, 1974: p.49, Table 3). If we were to use a Johansen-type multi-sector non-linear model which incorporates price-responsive Walrasian structure, we would have limited ourselves to a fairly aggregated system. The reason for this is not theoretical. Rather, it is caused by technical and data problems. As the number of industries is increased, the number of production parameters that must be estimated by econometric methods increases exponentially. Furthermore, there are still technical difficulties faced when such models are solved globally. Depending on the characteristics of the system and the problem at hand different solution techniques must be developed. Therefore, when such models are used for simulating resource reallocation effects of changes in the foreign trade policies of countries under examination, researchers must restrict themselves to an economy which is subdivided to a fairly small number of sectors. For example, De Melo (1977, 1978a, 1978b) applied his model to a 15-sector Colombian economy. But under such conditions, intra-industry resource pull effects of policy changes cannot be captured. Whereas, there is ample evidence that tariff changes do affect intra-industry resource and trade flows (Balassa, 1966; Wonnacott, R.J. and Wonnacott, P., 1967; Grubel, 1967; Lerner, 1973; Grubel and Lloyd, 1975; Wonnacott, R.J., 1975).

It is true that one can linearize a non-linear system by solving the model for proportional changes in endogenous variables. But when such an approach is chosen, which allows a large number of sectors, the system can only be solved for local deviations. In other words, solutions can be obtained for "small' changes in a given tariff structure. Whereas, in this study we also want to experiment with fairly large tariff reductions of 30, 50, and in one case 100 percent.

Up to this point, we tried to point out that, although, non-linear general equilibrium models allow input substitution, because of the state of art in solving such systems, their use is still restricted to solutions which incorporate a small number of sectors. On the other hand the model used in this study is based on fixed input-output coefficients. Against this drawback, it does allow a large number of production activities (identified as sectors in this study). Therefore, although the model does not allow for input substitution within each production activity, input substitution is indirectly allowed since we are able to include a large number of industries (or sectors). This point can be explained in more detail with the help of the following two diagrams. In Figure 1, one of the isoquants of a highly

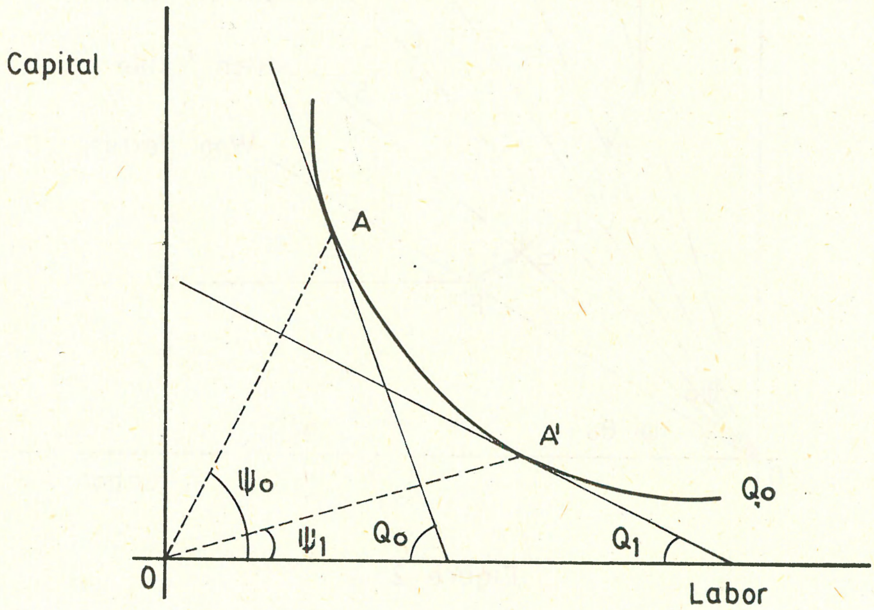

Figure 1

aggregated production activity (e.g., textile industry) is shown. If we assume that the production function which generates this isoquant is of Cobb-Douglas type, then the elasticitiy of substitution between capital and labor equals unity. When tariff rates are altered, domestic relative commodity and factor prices will change (even when the whole tariff structure is altered by the same proportion, because most commodity specific tariff rates will be different to start with). Consequent to these changes, input substitution will take place in this production activitiy towards relatively cheaper input. However, since the relevant sector is highly aggregated, we will be unable to see whether or not there is a resulting intra-industry resource-pull when such a highly aggregated industry is incorporated into a simulation model which is non-linear.

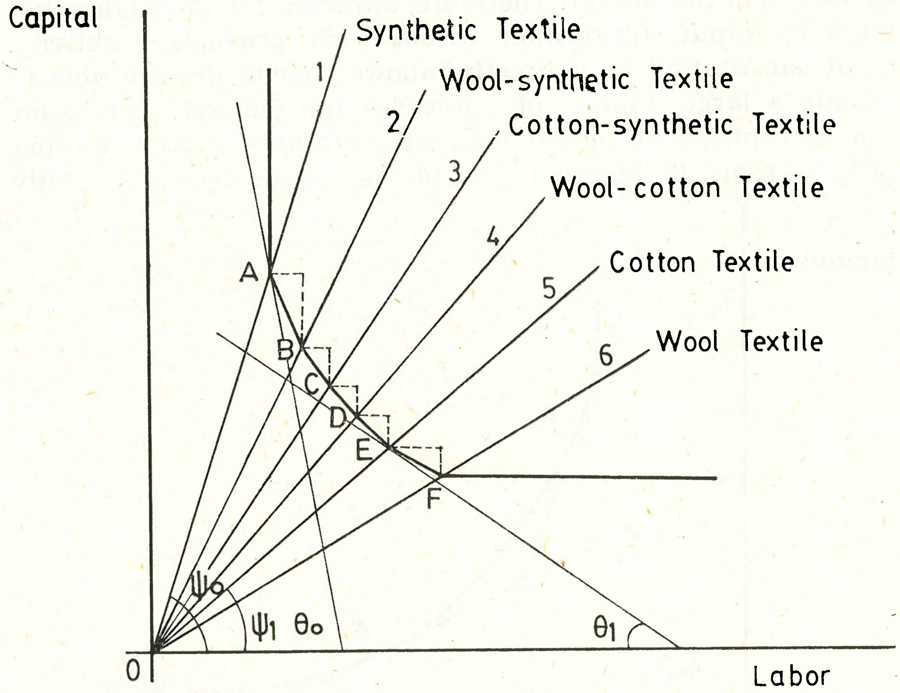

Figure 2

In Figure 2 we consider the same industry, but this time we disaggregate this industry into six different production activities, each producing a "composite" good. We treat each of these six activities as one industry. Figure 2 is drawn on the assumption that each production activity has a Leontief - type production technology which implies zero elasticity of input substitution. Isoquants that are represented by broken lines are assumed to be unit-value isoquants, which represent quantities that would earn one unit of foreign exchange at constant world prices. The relevant isoquant for the whole textile industry is represented by the continuous line going through points A,B,C,D,E, and F. As also implied by the diagram, the maximum number of activities which will be in operation at any time equals two, which equals the number of inputs used in the production processes. Depending on the relative input prices, one or two of these activities will be in operation. Therefore, when relative factor prices change as a consequent of changes in tariff rates, a different production process(es) will become active as shown on Figure 2. Thus, although there is no input-substitution within each activity, input-substitution nevertheless takes place within the textile industry as new production activities become active.

This explanation should clarify the point made above, that is, linear programming models do allow input-substitution indirectly when the number of industries is kept as high as possible.

In addition to fixed input-output coefficients, the model used in this study also incorporates the following basic assumptions. First, international prices of traded goods are assumed to be exogenous in the system.(5) Second, fixed proportions in consumption are assumed; hence the model abstracts from substitution in consumption. In the presence of non-traded goods it is necessary to specify the pattern of final demand in order to have a deterministic model. The assumption of constant proportions serves this function, and enables simultaneous determination of production and consumption equilibria. Since we are mainly concerned with production shifts resulting from liberalization of trade, and since international prices are exogenous, abstracting from substitution in consumption should not significantly affect results.(6) Furthermore, this approach to modelling the consumption pattern permits the objective function to be expressed in terms of one endogenous variable.

In the application, simulation is based on 1973 production technologies and the input-output coefficients are obtained from the 1973 input-output table for Turkey, the most recent available

(5) The "small" country assumption is made since Turkey's production and trade volumes are exteremely small in relation to those of the world.

(6) Any change in Turkey's consumption pattern is not expected to affect the world prices of traded goods, although the relative prices of non-traded goods in Turkey may change.

at the time the study was undertaken. Consequently, the actual consumption proportions existing in 1973 are used in solutions. Thus, if in 1973 the ratio of the actual final consumption quantities of the i^{th} and j^{th} good were c_{ij} (i.e., $\bar{C}_i/\bar{C}_j = c_{ij}$) then it is assumed that c_{ij} will remain constant at its 1973 value (for all i and j, $i \neq j$). This, of course, implies zero price and unitary income elasticities for all commodities.

Structure of the Model.[7] The Model is solved for 69 sectors, each producing a single "homogeneous" good. The first 54 sectors produce internationally traded goods, and the remaining sectors produce non-traded goods.

Physical units are defined such that one unit of the i^{th} good equals the quantity of the i^{th} good which could have been bought with one monetary unit (one million Turkish lira) at 1973 tariff-inclusive domestic prices. Consequently, tariff inclusive domestic prices of all goods are normalized at unity.

Below ,first the structure of the model, in the form which is used to simulate resource allocation effects of the free trade case, is presented and explained. Later, the particular form in which the model is solved for the case of tariff - reductions is explained, together with the reinterpretation of some of the variables which appear below.

The model is constructed to maximize the international value of domestic final consumption (including household consumption, government consumption, investment and changes in inventories)[8] subject to a system of linear constraints. Thus, the primal problem is to determine non-negative values of final consumption quantities C_i, output levels X_i, exports E_i, and imports M_i such that they

(7) Variables are defined in Appendix, with the exception of those which are defined in the main text. The dual system and dual variables are also given in Appendix, because they are of importance in interpreting equilibrium conditions at the margin.

(8) In the application, components of final demand are lumped together as "final consumption". This by no means should imply that investment and/or all of government spending is considered as consumption. The study is **not** concerned with effects of trade liberalization on the private sector's investment spending in newly produced capital goods (and furthermore the model is not a planning model). Rather it is concerned with possible resource reallocation effects of a switch in Turkey's trade regime on **existing** stocks of primary factors. Therefore, no attempt was made to generate sectoral investment levels endogeneously. [For an analysis of alternative methods of determining investment demand endogenously in multi-sector models see, for example, Taylor (1975)].

Maximize $C = \overline{P}_1^W C_1 + \ldots + \overline{P}_{54}^W C_{54} + P_{55}^d C_{55} + \ldots + P_{69}^d C_{69}$ (A.1)

Subject to

$$-X_i + \sum_{j=1}^{69} a_{ij} X_j + E_i - M_i + C_i \leqslant 0 \text{ for } i = 1, \ldots, 69 \quad \text{(A.2)}$$

$$(\text{where } E_i \equiv 0 \text{ and } M_i \equiv 0 \text{ for } i \geqq 55)$$

$$\sum_{j=1}^{69} l_j X_j \leqslant \overline{L} \quad \text{(A.3)}$$

$$\sum_{j=1}^{69} k_j X_j \leqslant \overline{K} \quad \text{(A.4)}$$

$$\sum_{j=1}^{69} m_j X_j - \sum_{i=1}^{54} \overline{P}_i^W E_i + \sum_{i=1}^{54} \overline{P}_i^W M_i \leqslant \overline{B} \quad \text{(A.5)}$$

$$X \leqslant \overline{X}_i^u, \text{ for } i = 1, \ldots\ldots, 54 \quad \text{(A.6)}$$

$$-X_i \leqslant -\overline{X}_i^L, \text{ for } i = 1, \ldots., 54 \quad \text{(A.7)}$$

The objective function (A.1) can also be interpreted as the maximization of the international value of Turkish GDP since a constant trade deficit is assumed. Exogenous international prices of traded goods $\overline{P}^w_i$ ($i = 1, \ldots\ldots, 54$), which Turkey would face under free trade conditions, are derived from unitary tariff-inclusive domestic prices and sectoral tariff rates adjusted for quantitative restrictions. Prices of non-traded goods under the free trade regime, P^d_i ($i=55, \ldots\ldots, 69$), are endogenous in the system, and their equilibrium values are determined by domestic supply of and demand for these goods. In the initial solutions an arbitrary, non-zero set of prices is inserted for the non-traded goods. Free trade, equilibrium prices for these goods then are generated by an iterative procedure.[9]

In order to accomodate the assumption of fixed consumption proportions, the objective function is expressed in a different

(9) For the initial solution, unitary prices are inserted in the objective funciton for non-traded goods. If the solution values of shadow prices for non-traded goods differed from those entering the objective function, the system is solved again this time inserting shadow prices of non-traded goods generated by the previous solution into the objective function. The process is repeated until the two sets of prices converge. Only a couple of runs were needed for "almost" full convergence.

form. C_i is replaced by $\overline{C}_i\lambda$, where λ is a consumption scalar which gives the value of the ratio of endogenously determined, final consumption quantity of good i (C_i) under the simulated policy change to the actual quantity consumed of that good in 1973 ($\overline{C}_i$). The consumption scalar λ has the same value for all goods and therefore satisfies the assumption of fixed proportions in consumption.(10) The modified objective function has the form,

$$\text{Maximize } C = \left(\sum_{i=1}^{54} \overline{P}_i^W \, \overline{C}_i + \sum_{i=55}^{69} p_i^d \overline{C}_i \right) \lambda$$

Since all P^d_i (i=55,.....,69) are determined through an iterative procedure, λ is the only endogenous variable in the objective function.

Also, note that the value of the consumption scalar for actual final consumption quantities in 1973 equals **one** by definition. This value corresponds to Turkey's 1973 market conditions, which were affected not only by foreign trade distortions but also by factor market distortions and structural rigidities. However, the model assumes competitive markets and excludes structural rigidities. Consequently, the difference between the value of λ for the free trade solution and unity represents an estimate of Turkey's proportionate static gain (in terms of the international value of 1973 actual Turkish GDP) from removal of trade barriers and domestic market distortions.(11)

After obtaining the free trade solution, the model is then solved, first for the protection case by holding the existing trade barriers intact but assuming that import quotas are removed. Later, the model is solved under tariff reductions, again assuming that import quotas are absent. In all of these solutions absence of domestic distortions is also assumed. For solving the model under protection and tariff reductions, tariff-ridden prices are entered in the objective function as well as in the balance of payments constraint. In this form, solutions would simulate competitive behavior of the economy under protection and tariff

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(10) If $C_i = \overline{C}_i\lambda$ for all i (i=1,...., 69) then $C_i/C_j = \overline{C}_i \lambda / \overline{C}_j \lambda = c_{ij}$ hence the fixed consumption proportions assumption holds.

(11) Solution results related to estimates of these static gains are reported in a separate paper (Baysan, 1981).

liberalization; (the model assumes that the state economic enterprices would also respond to market signals). The justification for expressing the balance of payments in tariff-inclusive domestic relative prices in the latter set of solutions is that all real quantities will be generated on the basis of tariff-ridden relative prices under the stated conditions, including exports and imports. The right-hand constant in the balance of payments constraint can be interpreted, for this set of solutions, as a "real resource transfer" from the government to the private sector as suggested by Taylor (1975 : p. 73).[12]

The constraints included in the system are: (1) the input-output material balance constraints (A.2) **viz** domestic output plus imports must be at least as large as intermediate demand plus final (domestic) consumption demand and exports; (2) demand for labor, and for capital cannot exceed their fixed endowments (constraints A.3 and A.4 respectively); (3) the difference between the international value of competitive plus non-competitive imports and the value of exports cannot exceed a fixed level of trade deficit (constraint A.5); and (4) output levels of the sectors producing tradables cannot differ from their 1973 actual levels by more than a specified percentage in either direction (constraints A.6 and A.7).

The last set of constraints, apart from reflecting some real life limitations to factor mobility, thereby adding realism to the model, serve a two-fold purpose. First, they eliminate the possibility of solutions which imply extreme cases of specialization. This is a well-known problem in multi-sector trade models where constant-returns-to-scale production functions are used and in which the number of commodities (prices of which are fixed externally) exceeds the number of factors (for which prices internally determined).[13] Second, the shadow prices for output constraints in the free trade solution can be used to rank Turkish industries producing tradables, given the technical coefficients existing in 1973, according to their competitive advantage in the

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(12) The value of λ generated by these solutions must, of course, be adjusted for net tariff revenues before it can be compared with the free trade value of λ. Details of this adjustment are discussed in Baysan, 1980.

(13) Alternative methods of overcoming the "extreme specialization" problem have been discussed in the literature, and other approaches have been used in empirical studies [for details see Taylor (1975 : pp. 75-88)].

world trade. Since shadow prices for output constraints (and for other constraints) are marginal changes in the value of the primal objective function resulting from small changes in these constraints in the neigbourhood of an equilibrium, it follows that these shadow prices or "rents" are measured in terms of a common numeraire, which is the international value of Turkish GDP as expressed in the primal objective function of the free trade solution. Moreover, shadow prices for output cinstraints represent differences between free trade prices and unit costs in the relevant industries (dual relationships B.2, Appendix), and therefore they are indicators of the competitive advantage of Turkish industries.

In order to test for consistency and sensitivity of results to changes in output constraints, three solutions were computed for each trade policy alternative. These correspond to maximum allowable output variations, above or below 1973 levels, of 10,20, and 50 percent. However, in setting output constraints for the agricultural sectors, 5,10, and 25 percent deviations from the 1973 actual output levels were considered appropriate.[14] This reflects the fact that mobility of primary factors between agricultural and manufacturing sectors involves higher transfer costs than those incurred when factors move within manufacturing sectors. Also, the share of agricultural production in Turkish GDP is large, so that, for example a 5 percent expansion in agriculture may require transfers equivalent in volume to that involved in a 10 percent expansion in the non-agricultural sectors. In order to avoid the possibility of misinterpretation by the reader, we must emphasize that our analysis is a comparative static analysis, and it is not a dynamic analysis. Our objective is to estimate directions of resource-pull effects of simulated liberalization attempts in Turkey's foreign trade policy. Therefore, by experimenting with output capacity constraints determined by the above stated output variation percentages, we do not mean that the corresponding sectors could grow by these

(14) Whereas, for the **Crude Petroleum and Natural Gas Production** sector, these output level deviation percentages are 5,10, and 10. The reason for the low percentages is self-explanatory. This is a natural-resource based industry, and output level depends on the known reserves. Therefore, it would be meaningless to allow this sector's output level to change by 20 or 50 percent.

percentages in one period. This approach simply allows us to perform a sensitivity test.

3. Data

In the application of N-sector empirical models, estimates of resource-pull effects of simulated (or actual) change in a given trade policy will be affected by the level of disaggregation of input-output data of the economy under study. Whether the results show that a sector attracts resources or contracts following a simulated policy change depends on what happens to the relative price of the composite good assumed to be produced within the sector. Relative price of a composite good, being a weighted average of individual commodity prices, will change according to changes in the relative prices of individual component goods. If the input-output table incorporated into the model is highly aggregated most sectors producing traded goods will include some exportables and some importables. Consequently, when an attempt is made, for example, to obtain estimates of resource allocation effects of trade liberalization, then estimates of resource pulls and of competitiveness will be downward (upward) biased for sectors which are basically export (import-competing) oriented because the averaged change will necessarily be smaller (greater) than for the exports' (imports') component of the entire sector. The latter problem becomes particularly serious when general equilibrium models are used for trade policy studies for LDCs where input-output tables tend to be highly aggregated. This particular issue received little attention in the literature.

In this study, the 1973 64-sector Turkish input-output table was disaggregated into a 69-sector table (the most disaggregated form which was feasible). Disaggregation was applied to the **Agriculture** sector of the original table so as to seperate traditional and non-traditional export goods. As a result the following six sectors were distinguished: the **Industrial Crops**, **Cereals-Animal Feed-Pulses**, **Fruits**, **Citrus Fruits**, **Nuts**, and **Vegetables.**

The augmented 1973 input-output table supplied some of the data used in solving the model. However, further adjustments were necessary, after the disaggregation, in order to calculate values of coefficients and constants which entered solutions.

A major effort was also devoted to estimation of the set of free trade prices (of traded goods) which appear as exogenous variables in the objective function and the balance of payments constraint of the free trade solution. These prices correspond to those which would have prevailed in Turkey had Turkey adapted a free trade policy in 1973. Because the model is applied to a single country it is appropriate to calculate these prices using the relationship $\bar{P}^d_j = (1+t_j)\,\bar{P}^w_j$ where $\bar{P}^w_j$ is the exogenous free trade price of the traded good produced by the j^{th} sector, t_j is the "average" tariff rate (adjusted for the relative price effects of quotas) for the j^{th} sector $\bar{P}^d_j$ is the domestic market price (inclusive off all indirect import taxes and monopoly rents resulting from quantitative restrictions) of the j^{th} good. Since $\bar{P}^d_j$ is normalized at unity, the free trade price $\bar{P}^w_j$ equals $1/(+t_j)$.

The most difficult part of this exercise arose from the well-known problems associated with the calculation of t_j's (Cooper, 1964; Basevi, 1971). If biases are to be minimized, this procedure requires detailed information on commodity tariff - rates and information which will allow choice of the appropriate weights to attach to component items comprising a sector. In this case further complications arose because Turkey's tax structure includes numerous indirect takxes on imports (stamp duty, municipality share, wharf duty, and production tax, in addition to tariff duty), and export tax rebates have existed since 1964. Determination of average tariff rates for sectors therefore entailed calculation of commodity specific tariff rates (at the six digit BTN commodity level) taking account of all the above taxes and subsidies, and the use of 1973 import and export proportions as weights to give sectoral average tariff rates. Some of the estimates of sectoral tariff rates had to be adjusted further to take account of downward biases resulting from relatively small weights for highly protected commodities and of monopoly rents generated by quantitative restrictions.[15] This ensured that estimates of sectoral tariff rates reflected the true proportionate differences between domestic and free trade prices.

(15) For a detailed explanation of the estimation and adjustment procedures adapted in this study, see Baysan (1978). In the latter study a method of tariff averaging is explained and applied for obtaining sectoral weighted tariff averages for 1967-68. In the present study, the same method is utilized for obtaining sectoral (weighted) tariff averages for 1973.

Estimates of sectoral (weighted) tariff everages (i.e., t_j's) are used in obtaining 1973 exogeneous free trede prices of 54 traded (composite) goods, which are in turn used in solving the model for the free trade case. Exogeneous free trade prices and t_j's are used in determining tariff-inclusive domestic prices which would have existed under the simulated tariff reductions. The latter set of prices are necessary for solving the model under tariff reductions.

Details of the other adjustments made on the augmented 1973 input-output table, and of the methods of determining values of coefficients and constants which appear in the model will not be discussed here because of the space problem. However, interested reader can contact the author directly for further information.

4. Results and Their Interpretation

a) Simulation Solutions

Simulation solutions are identified in Table I. Information provided in this table is self-explanatory. There are altogether 18 simulation solutions, 3 free trade, 3 restricted trade, and 3 for each of the simulated tariff-reduction alternative.

b) Sensitivity of Resource Allocation Shifts to the Size of Tariff Reductions

The main objective of this study was to look at the sensitivity of resource allocation shifts to the size of tariff reductions. Basically, we want to examine whether or not the direction of shifts is the same as the size of tariff reductions increases.

Simulation results are summarized in Table II. Since our main concern is with the **direction** of changes in the production levels of sectors producing traded goods. Table II shows only the direction of output responses. If a sector's simulated output level is larger (less) than the 1973 actual quantity, in response to the simulated change in the trade policy, this is shown by the letter A (E). This way of presenting the results simplifies the comparison and interpretation.

First three columns show the results obtained from the restricted trade solution.[16] But the estimates that concern us the most are those obtained under tariff reductions.

Simulation results obtained by solving the model under tariff reductions are listed in the appropriate columns of Table II. Based on these, we can list the following observations: Results show output expansions, for all cases of tariff reductions, in the **Industrial Crops, Cereals-Animal Feed-Pulses, Fruits, Citrus Fruits, Nuts, Vegetables, and Fishing** sectors. Obviously, tariff reductions would change the domestic relative price structure in favor of the commodities produced by these industries, thus increasing their profitability. Consistency of output expansions in these sectors also imply that the latter industries would continue to show international competitiveness and probably increase it upon tariff liberalization; (note that the **Industrial Crops** sector includes the traditional export goods cotton and tobacco). The **Animal Husbandry** sector showed output contractions under 10 and 20 percent tariff reductions and expansions under 30 and 50 percent reductions. In the **Forestry** sector, for 10,20 and 30 percent tariff-reductions, output expansion, and for 50 percent tariff-reduction, output contraction is observed. This result could be explained, to some degree, by the simulated output contraction in the **Manufacture of Wood and Wood Products** sector for the 50 percent tariff reduction case.

All metallic and non - metallic mineral sectors, with the exception of the **Crude Petroleum and Natural Gas Production** sector, and the **Stone Quarrying** sector showed consistent output expansions for all cases of tariff reductions. These results indicate that Turkey's mining sectors would pull resources upon tariff liberalization. Furthermore, consistency of output expansions also support the belief that Turkey has potential comparative advan-

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(16) Free trade solution results are used in ranking Turkish industries according to their static comparative advantage, and they are not included in Table II. However, the latter estimates are also consistent with the general trends implied in Table II.

TABLE I. Identification of Simulation Solutions

	Free Trade Solutions	Restricted Trade solutions obtained under the assumption that market distortions are absent and quotas are replaced by tariffs which create the same price effect	Solutions obtained under simulated tariff liberalization: For these solutions 1973 actual tariff rates were reduced by the stated percentages and quotas are assumed to be absent.			
			10 percent across - the - board tariff reduction	20 percent across - the - board tariff reduction	30 percent across - the - board tariff reduction	50 percent across - the - board tariff reduction
10 percent output capacity limits	S.10	K.10	V.10.10	V.20.10	V.30.10	V.50.10
20 percent output capacity limits	S.20	K.20	V.10.20	V.20.20	V.30.20	V.50.20
50 percent output capacity limits	S.50	K.50	V.10.50	V.20.50	V.30.50	V.50.50

tage in minerals such as coal, iron-ore, copper, chrome, borate etc.. A rational mining policy and additional investments in these sectors would be necessary for increasing domestic output and exports of these minerals. The **Crude Petroleum and Natural Gas Production** sector showed output contraction for all cases of tariff reductions. This is an expected result. This sector's output response to changes in domestic relative prices and its comparative advantage largely depends on the known reserves of crude petroleum and natural gas, whereas, Turkey's known reserves in these natural resources are very limited, and a large portion of domestic demand is met from imports. Under these conditions, tariff liberalization would lead to an increase in the **ex ante** import demand for these resources, and our results indirectly support this.

Solutions showed output expansions in the **Slaughtering, Preparing and Preserving Meat, and Manufacture of Vegetable and Animal Oils and Fats** sectors for all tariff reductions, and similar results were also obtained for the **Canning and Preserving** of **Fruits and Vegetables sector**, except for the 50 percent tariff reduction case for which the latter sector showed output contraction. These results show that the latter group of sectors would attract resources upon tariff liberalization.

The **Grain Mill Products, Sugar**, and **Alcoholic Beverages** sectors showed output contractions for all sizes of tariff reductions. This implies that the latter sectors do not have static comparative advantage with the 1973 production technologies. Simulation results showed output expansion for 10 percent tariff reduction and output contractions for 20,30, and 50 percent tariff reductions in the case of the **Manufacture of Other Food Products** sector. However, despite this result, in the next section it will be argued that the latter sector is among those sectors in which Turkey has potential comparative advantage. This will be based on the free trade estimation values of the dual variables corresponding to the capacity constraints; (free trade optimal values of these variables show relative profitability of Turkish industries under free trade conditions; see Appendix).

Solutions showed consistent output expansions in the **Soft Drinks and Carbonated Waters** and **Tobacco Manufactures** sectors for all sizes of tariff reductions. This is also an expected result. Tariff liberalization would change relative price and cost structure in favor of these industries as well. Noting that these sectors obtain their basic intermediate inputs from relatively cheaper domestic sources, it would not be surprising to observe output expansions in these sectors upon tariff reductions. They should also be able to compete in the foreign markets, and increase their exports depending on increases in their production capacities.

The following sectors also show consistent output expansions for all sizes of tariff reductions: The **Manufacture of Textiles, Manufacture of Leather and Fur Products, Manufacture of Wood Furniture and Fixtures, Printing, Publishing and Allied Industries, Manufacture of Cement and Manufacture of Railroad Equipment.** On the other hand, sectors which show output expansions for small tariff reductions, and contractions for larger tariff reductions are the following: the **Manufacture of Wearing Apparel, Manufacture of Wood and Wood Products (excepting furniture), Shipbuilding and Repairing, and Ginning** sectors.

Simulation results showed consistent output contractions for the remaining 20 sectors, which mainly produce import-competing goods. Since the change in the domestic relative price structure, upon tariff liberalization, would be unfavorable for the latter group of sectors, it is normal that resources would be pulled away from these sectors. Based on these results, we could state that Turkey's import-competing industries would be unable to survive against foreign competition with their 1973 production technologies if quotas are removed and tariff liberalization takes place. These industries, which have been protected by quota and tariff barriers, may continue their existence upon liberalization of trade only by improving their economic efficiency and utilizing any existing economies of scale so as to reduce their unit production costs. However, it will be unrealistic to expect such an adjustment from all of these industries. Unfortunately, because of the structure of the model, we are unable to analyse possible efficiency and scale effects of simulated tariff reductions.

We could summarize the observations listed above by stating that simulation results showed consistent output expansions, under all tariff reductions, in agricultural, mining, and in those manufacturing sectors with export potential. On the other hand, consistent output contractions were estimated for import-competing sectors.

c) Static Comparative Advantage Ranking of Sectors Producing Tradables

It was stated in the introduction section that an attempt will be made to rank Turkish industries according to their (static) comparative advantage in the world markets. Of course, such a ranking necessitates a criterion which in turn must be based on the free trade performance of these industries. Since such information is not available to us, we can only generate it by way of simulation. For this purpose, we solved the model under free trade conditions so that we can generate estimates of unit profits (or losses) that the Turkish industries would incur under free trade and with the 1973 production technologies. These estimates of unit profits and losses correspond to the free trade solution values of shadow prices of capacity constraints, i.e., they are the free trade optimum values of dual variables u_i and v_i's (see Appendix). If, for example, the i^{th} sector has comparative advantage (disadvantage) under free trade conditions with the 1973 production technologies, then solutions will show output expansion (contraction) in this sector or at least its output level will not be less (more) than the 1973 actual level. In such cases, estimation value of shadow price of the upper (lower) output limit u_i (v_i) will be positive or zero, showing the unit profit (loss) in the i^{th} sector under the stated conditions (see Appendix). Furthermore, the optimum solution values of u_i and v_i's are measured in terms of the same numeraire, that is the free trade value of optimum final consumption quantities (or the maximum value of Turkey's GDP valued at free trade prices). Therefore, these values are comparable. In short, the free trade solution values of u_i and v_i's provided the criterion that we were seeking. We ordered the estimation values of u_i and v_i's according to their algebraic magnitudes. In this ordering, v_i's were taken as negative magnitudes since they showed the size of unit loss for the corresponding industries. This ordering also gives us the relative ranking of Turkey's agricultural, mining, and manufacturing sectors according to their relative (static) comparative advantage in the world markets. This ranking is of course valid under the 1973 production technologies as implied by the augmented 1973 input-output table. However, new rankings can be obtained as more up to date data become available.

The ranking is given in Table III. In the first column the sectors are identified, in the second column free trade solution values of the shadow prices of capacity constraints (i.e., u_i and v_i's) are listed, and in the third column the order of ranking is given. The sector with the highest competitive standing is ranked 1st. This ranking is based on the free trade solution obtained with the 50 percent output capacity constraints. The reason for choosing the latter solution is that the latter set of maximum and minimum output limits provides more flexibility in the system and thus making the simulation results more meaningful. Nevertheless, the free trade solutions obtained with 10 and 20 percent capacity limits gave more or less the same ranking.

Sectors which take the first 21 positions in the ranking show definite static comparative advantage. In other words, had Turkey unilaterally adapted a policy of free trade in 1973, these 21 sectors would have been able to compete in foreign markets and export their products. Included in this group, we see all agricultural and mining sectors, **Stone Quarrying, Animal Husbandry, Fishing,** and some of the manufacturing sectors. Manufacturing industries which show static comparative advantage are, according to the order of ranking, the following: the **Printing-Publishing and Allied Industries, Tobacco Manufactures, Soft Drinks and Carbonated Waters Industries, Manufacture of Railroad Equipment, Manufacture of Vegetable and Animal Oils and Fats, Manufacture of Leather and Fur Products, Slaughtering, Preparing and Preserving Meat, and Manufacture of Textiles.**

Simulation results show that sectors, which take positions 22 and below in the ranking, would have been unable to compete with the foreign suppliers both in the domestic and foreign markets under free trade conditions with the 1973 technologies. However, an examination, from the second column of Table III, of the unit losses estimated for these sectors will indicate that there are important differences in the degree of comparative

TABLE III. Ranking of Sectors Producing Tradables According To Their Static Comparative Advantage

	Shadow Prices of Output Capacity Constraints* (2)	Ranking (3)
Nonferrous - Ore Mining	0.284166	1
Iron - Ore Mining	0.279818	2
Fishing	0.180987	3
Nonmetallic Mineral Mining	0.180624	4
Printing, Publishing and Allied Industries	0.176517	5
Coal Mining	0.158402	6
Tobacco Manufactures	0.085426	7
Soft Drinks and Carbonated Waters Industries	0.077538	8
Fruits	0.073301	9
Nuts	0.072881	10
Citrus Fruits	0.063855	11
Vegetables	0.060241	12
Manufacture of Railroad Equipment	0.054081	13
Industrial Crops	0.045669	14
Cereals - Animal Feed - Pulses	0.029606	15
Manufacture of Vegetable and Animal Oils and Fats	0.021650	16
Manufacture of Leather and Fur Products	0.020062	17
Slaughtering, Preparing and Preserving Meat	0.019725	18
Stone Quarrying	0.008629	19
Animal Husbandry	0.00	20
Manufacture of Textiles	0.00	21
Manufacture of Wood Furniture and Fixtures	—0.000419	22
Ginning	—0.005837	23
Canning and Preserving of Fruits and Vegetables	—0.011447	24
Manufacture of Wearing Apparel	—0.019289	25
Manufacture of Cement	—0.028579	26
Manufacture of Wood and Wood Products	—0.039670	27
Forestry	—0.049895	28
Manufacture of Other Food Products	—0.051628	29
Manufacture of Petroleum and Coal Products	—0.108869	30
Manufacture of Footwear	—0.110281	31

TABLE III. (Continued)

	Shadow Prices of Output Capacity Constraints* (2)	Ranking (3)
Manufacture of Glass and Glass Products	—0.126783	32
Nonferrous Metal Basic Industries	—0.130596	33
Grain Mill Products	—0.153472	34
Manufacture of Agricultural Machinery and Equipment	—0.165776	35
Manufacture of Fabricated Metal Products	—0.170626	36
Shipbuilding and Repairing	—0.172457	37
Manufacture of Other Nonmetallic Mineral Products	—0.178574	38
Other Manufacturing Industries	—0.200436	39
Manufacture of Motor Vehicles	—0.223836	40
Manufacture of Electirical Machinery	—0.251835	41
Manufacture of Drugs and Medicines	—0.259733	42
Iron and Steel Basic Industries	—0.261522	43
Manufacture of Paper and Paper Products	—0.267136	44
Manufacture of Rubber Products	—0.274656	45
Manufacture of Other Transport Equipment	—0.275908	46
Manufacture of Machinery Except Electrical	—0.301481	47
Manufacture of Fertilizers	—0.307494	48
Sugar	—0.315069	49
Manufacture of Other Chemical Products	—0.324835	50
Manufacture of Plastic Products	—0.328322	51
Petroleum Refineries	—0.330898	52
Alcoholic Beverages	—0.449803	53
Crude Petroleum and Natural Gas Production	—0.483595	54

(*) Estimation values of shadow prices of maximum and minimum output limits (u_i and v_i's) listed in this column were obtained from the trade solution S. 50 (See Table I). These values are measured in units in which the numeraire of the system is measured. The numeraire of the system, by necessity, is the maximum value of the objective function, which itself represents a composite commodity combination. That is, the numeraire is the optimum free trade value of Turkish GDP, and since valuation is done in million T.L., u_i and v_i's are also measured in million T.L.

disadvantage shown by this group of sectors. On this basis, we divided this major group into three subgroups. The first subgroup will be identified as "marginal" sectors with export potential. Unit losses estimated for these sectors are negligible. Increased economic efficiency and the utilization of existing economies of scale, (factors which we were unable to take into account because of the structure of our model), could enable these sectors become competitive in the world markets by lowering their unit production costs. This observation is also supported by the periodic exports of these sectors realized in the past. These "marginal" sectors are the following: the **Manufacture of Wood Furniture and Fixtures, Ginning, Canning and Preserving of Fruits and Vegetables, Manufacture of Wearing Apparel, Manufacture of Cement, Manufacture of Wood an Wood Products, Manufacture of Other Food Products,** and a nonmanufacturing sector included in this group, the **Forestry** sector. Comparative advantage ranking of the **Ginning** sector included in this group must be reinterpreted carefully. Because of the way in which the 1973 input-output table was constructed, the Ginning sector appears as the sector which buys cotton from the **Industrial Crops** sector and exports it. On the other hand, **Textile sector** buys cotton from the latter sector as an input and exports cotton textile items. Therefore, output and exports of the **Ginning** and **Textile** sectors (which use cotton as input) and cotton production level are strongly related. For example, given the volume of cotton production, in order for the **Textile** sector to increase its cotton textile output and export levels, there must be a fall in the output or export level of the **Ginning** sector. Therefore, although the free trade solution estimated output contraction for the **Ginning** sector (thus generating unit production loss, however small it may be), this by no means implies that the **Ginning** sector does not have comparative advantage. It is well established that Turkey has a continuing advantage in the production and exports of cotton.

The second subgroup includes the following sectors: the **Manufacture of Footwear, Manufacture of Glass and Glass Products, Non-ferrous Metal Basic Industries, Grain Mill Products, Manufacture of Agricultural Machinery and Equipment, Manufacture of Fabricated Metal Products, Shipbuilding and Repairing,** and **Manufacture of Other Non-metallic Mineral Products.**

These sectors also show comparative disadvantage under free trade conditions. Here, we are of course referring to static comparative disadvantage based on the 1973 production technologies. Therefore our results are valid in the short-run, and they can not provide any information regarding **dynamic** comparative advantage or disadvantage of Turkish industries. Thus, some of the industries which show comparative disadvantage according to free trade simulation results, may indeed improve their competitive standing in the long - run by taking necessary economic mesaures in their production activities. However, if we were to list those industries which show static comparative disadvantage according to our simulation results, but have the highest chance of becoming competitive in the world markets, we could include first the "marginal" sectors comprising the first subgroup and then list the sectors included in the second subgroup mentioned above.

The third and the last subgroup of sectors which show static comparative disadvantage take the 39^{th} through 54^{th} positions in the ranking. These are the sectors with much smaller chance of becoming competitive in the long-run. In this group, 5 sectors with the lowest competitive standing are the following : the **Manufacture of Other Chemical Products, Manufacture of Plastic Products, Petroleum Refineries, Alcoholic Beverages, and Crude Petroleum and Natural Gas Production.**

Because the analysis applies to sectors which in some cases include broad categories of goods, the results and their evaluation as presented above should be interpreted with some care. Some of the general conclusions derived from simulation results in relation to individual sectors cannot and should not be considered valid for each individual commodity included in these sectors. Detailed commodity specific studies are necessary in order to make commodity specific generalisations.

APPENDIX

1. Notation*

(*) Bars identify exogeneous variables, and small letters (with the exception of r, u, v, w, λ, and δ. which are endogeneous variables) refer to fixed coefficients.

a_{ij} the quantity of the i^{th} good necessary to produce one unit of the j^{th} good (i, j=1,...,69).

$\bar{B}$ fixed amount of trade deficit. It is expressed in units of million Turkish Lira since the international prices are expressed in domestic currency units.

$\bar{K}$ fixed amount of capital stock. It is expressed in value terms as the total value of services rendere din 1973 by the available stock.

k_j the value of services of the capital stock necessary for producing one unit of the jth good (j=1,...,69).

$\bar{L}$ fixed amount of labour endowment. It is expressed in value terms as the total value of services rendered in 1973 by the active labour force.

l_j the value of services of labour necessary for producing one unit of the jth good (j=1,...,69).

m_j non-competitive imports (valued at international prices) necessary for producing one unit of the jth good (j=1,...,69).

P_i the shadow price of the i^{th} traded good (i=1,...,54). These are domestic, equilibrium prices which would have prevailed if the economy operated under competitive and free trade conditions, as described by the model.

r the shadow price of a unit of capital services.

u_i the dual variable (unit rent) corresponding to the upper production limit of the ith traded good sector (i=1,...,54); u_i also gives the value, in domestic currency units, of the foreign exchange that could be earned from producing one more unit of the ith traded good.

v_i the dual variable (unit rent) corresponding to the lower output limit of ith traded good sector (i = 1,....,54); v_i gives the value of the foreign exchange that could be earned from producing one less unit of the ith traded good.

w the shadow price of a unit of labour service.

$\overline{X}^u_i$ the fixed upper production capacity limit for the ith traded good sector $(i=1,...,54)$.

$\overline{X}^L_i$ the fixed lower output limit for the ith traded good sector $(i = 1,...,54)$.

$\hat{\delta}$ the shadow price of one unit of foreign exchange.

2. The Dual Problem

The primal problem is a value maximization problem (or an "allocation" problem) which is formulated for determining optimum **quantities**, the corresponding dual problem is a value minimization problem (or a "pricing" problem) which aims at determining the opportunity costs or unit **values** of scarce resources.

In the dual problem, the value of resources used for producing the optimum bill of goods is minimized subject to a system of appropriate linear constraints, and it is stated as follows: determine non-negative values of P_i's, P^d_i's, w, r, δ, u_i's, and v_i's in order to

$$\text{Minimize} \quad \overline{L}_W + \overline{K}_r + \overline{B}\,\delta + \sum_{i=1}^{54} \overline{X}^u_i u_i - \sum_{i=1}^{54} \overline{X}^L_i v_i \qquad \text{(B.1)}$$

subject to

$$-P_j + \sum_{i=1}^{54} a_{ij} P_i + \sum_{i=55}^{69} a_{ij} P^d_i + l_j w + k_j r + m_j \delta + u_j - v_j \geqslant 0$$

$$\text{for } j=1,...,54 \qquad \text{(B.2)}$$

$$-P^d_j + \sum_{i=1}^{54} a_{ij} P_i + \sum_{i=55}^{69} a_{ij} P^d_i + l_j w + k_j r + m_j \delta \geqslant 0,$$

$$\text{for } j=55,...,69 \qquad \text{(B.3)}$$

$$P_i - \overline{P}^W_i \delta \geqslant 0, \quad \text{for } i=1,...,54 \qquad \text{(B.4)}$$

$$-P_i + \overline{P}^W_i \delta \geqslant 0, \quad \text{for } i=1,...,54 \qquad \text{(B.5)}$$

$$\sum_{i=1}^{54} \overline{C}_i P_i + \sum_{i=55}^{69} \overline{C}_i P^d_i \geqslant \sum_{i=1}^{54} \overline{C}_i \overline{P}^W_i + \sum_{i=55}^{69} \overline{C}_i P^d_i \qquad \text{(B.6)}$$

The dual objective function, (B.1), is the summation of opportunity values of fixed primary factor endowments and the fixed amount of foreign exchange plus the net total amount of rents resulting from the utilization of upper and lower output limits. The constraints (B.2) and (B.3), when rearranged, take the form

$$\sum_{i=1}^{54} a_{ij} P_i + \sum_{i=55}^{69} a_{ij} P_i^d + l_j w + k_j r + m_j \delta + u_j - v_j \geqslant P_j \quad \text{(A.14)}$$

($u_j \equiv 0$ and $v_j \equiv 0$, for i=55,...,69)

which is the standard zero profit condition. Since (B.4) and (B.5) must be satisfied simultaneously, they imply, $P_i = \bar{P}^w_i$, for i=1,...,54 since, by construction, the optimal value of δ equals one. Thus, under free trade, the domestic, equilibrium prices of traded goods equal international prices. This is an expected relationship since we have abstracted from transportation costs. The last constraint, (B.6), allows us to define a **numeraire** for the domestic relative prices of the model.

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Ö Z E T

KAYNAK DAĞILIMI KAYMALARININ GÜMRÜK TARİFE İNDİRİMLERİNİN BÜYÜKLÜĞÜNE OLAN DUYARLIĞI

Çalışma, kuramsal ve ampirik yönden güncel önemi olan bir temel soruyu kantitatif olarak yanıtlamayı amaçlamıştır. Soru özetle şudur :

Gümrük tarifelerindeki indirimlerin yaratacağı kaynak dağılımı kaymalarının tarifelerdeki indirim oranlarının büyüklüğüne olan duyarlılığı nedir ?

Çalışmada ayrıca, dış ticareti yapılan mal üreten sektörlerin statik karşılaştırmalı üstünlüklerine göre sıralanmasını sağlayacak bir ölçüt de türetilmiştir.

Söz konusu temel sorunun yanıtlanmasında statik bir genel denge modeli kullanılmıştır. Model, uygulama aşamasında, 69 sektöre bölünmüş Türkiye ekonomisine uygulanmış ve yüzde 10, 20, 50 ve 100 oranlarında gerçekleştiği varsayılan gümrük tarifeleri indirimleri için simulasyon çözümleri elde edilmiştir.

Çözümler, tarım, maden ve ihracat potansiyeli olan sanayi sektörlerinin büyük bir kısmında tutarlı olarak üretim artışları göstermiştir. Diğer taraftan, ithal ikamesi malları üreten sektörlerin üretim düzeylerinde, tüm tarife indirimi uygulamalarında azalmalar gözlenmiştir.

Sektörlerin statik karşılaştırmalı üstünlüklerine göre sıralanması sonucu belirlenen bulgular özetle şöyledir : Türkiye, 1973 teknolojisi ile, tarım ürünleri, canlı hayvan, madenler, tarıma dayalı sanayi malları, mezbaha ürünleri, tekstil ürünleri, deri eşyalar ve demiryolu malzemelerinde belirgin bir karşılaştırmalı üstünlüğe sahiptir. Türkiye'nin karşılaştırmalı üstünlüğe sahip olabileceği marjinal üretim alanları ve mallar ise şunlardır : Kereste ve keresteden eşya, giyim eşyası, çimento, hazırlanmış (bazı) gıda maddeleri, ayakkabı, cam ve cam eşya, unlu mamuller ve demir dışındaki metal ana sanayii malları.