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Piecemeal Trade Reform in Partially Liberalized Economies

An Evaluation for Turkey

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Thomas F. Rutherford
and
David G. Tarr

Given Turkey's already extensive trade liberalization, a move to uniform external incentives would bring most of the benefits of full trade liberalization. Moreover, it is not enough to have piecemeal reform of tariffs *or* export subsidies alone. Harmonizing Turkey's already low tariffs to the European Community's tariff structure will improve Turkey's welfare only if Turkey at the same time removes or reduces its export subsidies.

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Turkey undertook a major liberalization of trade policy in the 1980s. Import quotas have virtually disappeared, the Turkish lira was made convertible, and tariffs are generally lower. Those changes and the export subsidies that remain have, on the whole, removed the anti-export bias from Turkey's external incentive regime.

Using a 40-sector computable general equilibrium model, Harrison, Rutherford, and Tarr consider several more trade liberalization options available to the Turkish government. They conclude that uniformity of tariffs and export subsidies would substantially improve Turkey's welfare.

Although the "Ramsey" optimal import taxation would call for non-uniform import taxes inversely proportional to the elasticity of import demand in each sector, the *observed* dispersion of the tariff structure in Turkey is inconsistent with optimal departures from uniform protection. In fact, in Turkey uniformity achieves an extremely high proportion of the benefits of full trade liberalization because, in the absence of a general anti-export bias, the principal distortion remaining in the trade regime derives from *dispersion* of the tariff and (especially the) export subsidy structure.

Like Turkey, an increasing number of developing countries — including Chile, Indonesia, Mexico, and Poland — have in recent years undertaken extensive trade liberalization. It is no longer clear that these economies retain an anti-export bias in their trade regime. Perhaps the most important policy conclusion the authors reach is that one must be wary of advocating piecemeal reform of tariffs *or* export subsidies alone. In Turkey, piecemeal across-the-board tariff reductions do not always improve welfare; they must generally be coordinated with reductions in export subsidies to ensure improved welfare. The authors counterfactually assume that Turkey's tariffs are at the 1985 level (about twice the 1989 level of the authors' benchmark model) — which reintroduces an anti-export bias. In this case, piecemeal tariff reduction to the 1989 level is beneficial.

In Turkey, even small export subsidies are not always beneficial, despite the rule of thumb that small export subsidies are a welfare-enhancing offset to the anti-export bias of import tariffs. Why? Because export subsidies in Turkey are highly dispersed, and piecemeal reductions in the export subsidies reduce that dispersion. When the authors counterfactually impose uniformity of tariffs and export subsidies, they resurrect the rule of thumb that small export subsidies are beneficial as a piecemeal policy for offsetting the anti-export bias.

Policymakers in developing countries have occasionally applied export subsidies in individual sectors with high tariffs as a means of encouraging exports in a sector that may otherwise rely only on the highly protected domestic market. The authors show that in Turkey high export subsidies in sectors with high tariffs are particularly counterproductive — because at the multisector level the distortion introduced by the export subsidy (by encouraging too many resources into the protected sector) dominates the reduction in the overall anti-export bias.

Turkey's proposed policy of harmonizing its tariff to the European Community's common external tariff would yield only small welfare changes, which would be small losses as the European Community interprets harmonization. Why? Because harmonizing to EC tariffs will require lowering Turkish tariffs from already low levels, in the presence of export subsidies almost as large as the existing average effective tariff rate. But harmonizing to the EC tariff structure can be beneficial if at the same time export subsidies are removed or reduced.

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Piecemeal Trade Reform in Partially Liberalized Economies: An Evaluation for Turkey

by
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1. INTRODUCTION

Turkey has undertaken a major liberalization of trade policies in the decade of the 1980's. Import quotas are virtually non-existent, the Turkish lira has been made convertible, and tariffs have generally been lowered so that the average nominal tariff rate is less than 10 percent. Given these changes and remaining export subsidies, Turkey has *on average* removed the anti-export bias from its external incentive regime.

The impact on Turkey of its import-substitution trade policies in the 1970's and of its trade liberalization in the early 1980's has been the subject of a number of earlier studies, notably Baysan [1984], Baysan and Blitzer [1988; 1991], Rodrik [1988b] and Grais, de Melo and Urata [1986]. We take as our point of departure the relatively liberal trade regime of Turkey in the late 1980's, and, employing a 40 sector computable general equilibrium model, consider several further trade liberalization options that are now open to the Turkish government. The first option is the principal trade policy change Turkey is planning to implement: harmonization of the tariff structure to the *common external tariff* of the European Communities (EC). This option is part of Turkey's effort to continue to press its case for membership in the EC. The second option is for Turkey to completely *remove all trade barriers*, including import tariffs and export subsidies. The third option is the adoption of a *uniform protection structure*, removing the sectoral dispersion of nominal tariffs and export subsidies. The final option is to consider *sectoral liberalizations* of tariffs or export subsidies. We present a formal quantitative model that allows an evaluation of the effects of these options.

The first conclusion that we draw from our analysis is that tariff and export subsidy uniformity yields substantial benefits in welfare terms for Turkey. Although "Ramsey" optimal import taxation would call for non-uniform import taxation inversely proportional to the elasticity of import demand in each sector, the *observed* dispersion of the tariff structure in Turkey is inconsistent with optimal departures from uniform protection. In fact, in the case of Turkey uniformity achieves an extremely high proportion of the benefits of full trade liberalization. This result is explained primarily by the substantial trade liberalization Turkey has undertaken during the decade of the 1980's. Given the prevailing export subsidies and low level of import protection, the trade regime no longer

has a general anti-export bias. The principal distortion remaining in the trade regime derives from the *dispersion* of the tariff and export subsidy structure, especially the latter.

The evaluation of removal of trade barriers yields what is perhaps our most important finding: first best rules-of-thumb that may be appropriate for highly distorted economies need not be appropriate for economies that have liberalized as much as Turkey. In particular, piecemeal across-the-board tariff reductions are not always beneficial from a welfare perspective, and generally must be coordinated with export subsidy reductions in order to ensure welfare gains. If we counterfactually assume that the tariff level of Turkey is at the level of 1985 (about twice the 1989 level of our benchmark model), this reintroduces an anti-export bias in the external incentive regime. In this case piecemeal tariff reduction to the 1989 tariff level is beneficial. Moreover, in the case of Turkey, even small export subsidies are not always beneficial, despite the rule-of-thumb that small export subsidies are a welfare enhancing offset to the anti-export bias of import tariffs. The reason is that export subsidies in Turkey are highly dispersed, so that piecemeal reductions in the export subsidies are beneficial because the dispersion is reduced as a result. We show that if we counterfactually impose uniformity of export subsidies and the tariffs, the rule-of-thumb that small export subsidies are beneficial as a piecemeal policy for offsetting the anti-export bias of the tariff is resurrected.

As Turkey turned away from import substitution in the early 1980's, it adopted strong export promotion measures. Few would object to the stongest measures it took in swithching incentives toward exports, namely the reduction in high import barriers and real exchange rate depreciation. However, the more direct export incentives (such as budgetary transfers) have been the subject of controversy regarding their effectiveness and their welfare effects.[1] During the last half of the 1980's, however, direct export incentives have also been reduced. In order to assess whether there were benefits of the export subsidy reduction, we counterfactually scale up all export subsidies so that the average export subsidy is at the higher level of 1985 (as well as some other years), and simulate the effects of the Turkish policy of lowering export subsidies toward the level of 1989. Starting from the level of import protection of 1989, this tilts the external incentives toward export promotion and, more importantly, greatly

[1]See Milanovic [1986], Rodrik [1988a] and Arslan and van Wijnbergen [1990] for discussions of the export incentive program and estimation of its effectiveness in encouraging exports. These studies, however, did not assess the welfare effects of the export incentives.

increases the dispersion in the export subsidies as well; then the policy of export subsidy reduction yields very substantial welfare benefits.

Like Turkey, in recent years an increasing number of developing countries, such as Mexico, Chile, Indonesia and Poland, have undertaken extensive trade liberalization. It is no longer clear that these economies retain an anti-export bias in their trade regime. Our results show that in such cases one must be wary about advocating piecemeal reform of tariffs *or* export subsidies alone.

Policy-makers in developing countries have occasionally applied export subsidies in individual sectors with high tariffs as a means of encouraging exports in a sector that may otherwise rely only on the highly protected domestic market. We show that this policy is particularly counterproductive, because at the multisector level the distortion that the export subsidy adds by encouraging too many resources into the protected sector dominates the reduction in the overall anti-export bias.

Another important policy conclusion that we draw is that the EC harmonization strategy is significantly inferior to any of the other strategies. Our examination of the policy of harmonizing the Turkish tariff to the common external tariff of the EC shows that there are generally small welfare changes involved.[2] This result follows simply from the fact that harmonization to EC tariffs will require a lowering of Turkish tariffs from already low levels, in the presence of export subsidies almost as large as the existing average effective tariff rate. Beyond small reductions in the tariff, the export subsidies become the dominant distortion to the trade regime, and the economy becomes too export oriented. We argue, however, that harmonization to the EC tariff structure can be a welfare enhancing policy if accompanied by a policy of removing or reducing export subsidies. The important policy lesson for Turkey from this exercise is that if it intends to proceed with harmonization to the EC common external tariff, it is important to accompany that policy with a reduction in export subsidies.

The model that we use is deliberately very simple, to facilitate the confrontation of policy-makers' intuition with easily interpreted simulations. The model assumes no terms-of-trade effects, a single household, no capital accumulation, and constant returns to scale production with competitive pricing. In work in progress we examine

[2] For small reductions in the tariff, which was Turkey's interpretation of harmonization, there are small welfare *gains*. For larger tariff reductions, which is the interpretation of the EC, there are small welfare *losses*.

in detail the implications of relaxing some of these assumptions in the present model. We readily concede that relaxing these assumptions could alter our conclusions, but they would not facilitate our assessment of the rules-of-thumb in a clean and simple environment.

An important component of any practical trade liberalization package is the way in which the revenue effects of the policy are treated. We exploit the ability of a "simulation laboratory" to control for these effects by adopting an explicit replacement tax such that government revenue remains constant. We allow the value added tax or a lump-sum tax serve as replacement taxes for any changes in revenue. In the absence of any other changes in policy the first tax effects distortionary replacements, whereas the lump-sum tax is non-distortionary in our model (there is no labor-leisure choice). In the case of Turkey we find that the value added tax is an excellent "real-world" alternative to the theorists' lump-sum replacement tax, in the sense that it has a relatively small marginal excess burden for the range of revenue replacements required here.

In Section 2 we outline the model that has been developed, including the procedures used to empirically estimate the model to the Turkish economy using 1985 input-output data and 1989 protection data.[3] In Section 3 we report the results of our policy simulations. Finally, in Section 4 we draw our conclusions for policy.

2. A SMALL OPEN ECONOMY MODEL

2.1 General Model Structure

Our Small Open Economy (SOE) model is designed for trade policy analysis with a large number of sectors. The model is a "generic" general equilibrium model of a single economy along the lines of de Melo and Tarr [1992]. The distinguishing feature of the model is that it effects a simple closure with respect to foreign trade such that the economy experiences no terms-of-trade effects.

[3] Formal details of the algebraic structure are presented in Appendix A. Appendices B and C provide additional details about recent developments in the trade regime in Turkey and the specific estimates used in our model.

Goods are produced using primary factors and intermediate inputs. Primary factors include labor and capital.[4] In export sectors a composite output is produced which distinguishes between goods destined for domestic and export markets. This trade-off is characterized by a constant elasticity of transformation frontier. Production may either exhibit constant, increasing or decreasing returns to scale. When there are constant or decreasing returns, producers behave competitively, selecting output levels such that marginal cost at those output levels equals the given market price. In the present version of the model we assume constant returns to scale in production for all sectors.

Final demand by private households arises from nested constant elasticity of substitution utility functions. At the first level imported goods trade off with corresponding domestic products, with possibly different elasticities of substitution by commodity. At the top level different types of goods enter in a constant elasticity aggregate. All income elasticities are unity.

Five types of trade distortions are included in the model: (i) *ad valorem* tariffs (or subsidies) on imports, (ii) *ad valorem* export subsidies, (iii) non-tariff barriers in the form of fixed, tariff-equivalent *ad valorem* price wedges, (iv) import quotas, and (v) voluntary export restraints. Tariff revenues and export subsidy payments appear in the government budget, while all rents from NTBs, import quotas and VERs are returned lump-sum to domestic consumers.[5]

In order to capture the effects of geographically discriminatory protection policies we allow imports and exports to bear different tariffs or subsidies depending on their source or destination. This feature allows us to study policies such as harmonization or accession to a free trade area, albeit in the absence of any terms-of-trade effects. Imports from different sources substitute with each other at a lower nest in utility to form a composite import good for each sector which enters the top-level of the utility function.

Government expenditures and investment demand are exogenous. Funding of government expenditures is provided by net tax revenues. There are three other components of government income in addition to import tariffs

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[4] The general model structure accommodates additional factors such as land (for agricultural production), resources (for extractive industries), or sector-specific capital (in the Ricardo-Viner tradition).

[5] There is no rent-dissipation, so the model only measures the distortion cost of trade restrictions. Thus our welfare measures neglect rent-seeking losses if any are present.

and export subsidies. These are (i) value-added taxes on factor inputs to production, (ii) *ad valorem* production subsidies or excise taxes on production output, and (iii) lump-sum taxes on domestic consumers. In a counter-factual scenario one or more of the tax instruments adjusts endogenously to balance government (net) tax revenues with expenditures. This equal-yield constraint is accommodated through an endogenous proportional adjustment of value-added tax rates or lump-sum transfers. Thus the welfare effects of changes in trade policy explicitly incorporate the appropriate marginal excess burden of raising government revenue from other sources.

Demand functions are uncompensated, so Walras law guarantees that the value of private consumption equals the income from primary factors, taxes, and import and export quota rents. Public consumption is balanced with the value of public endowments and tax revenue.

World market import and export prices are given, and there are no endogenous changes in the terms of trade. In other words, import supplies and export demand are infinitely elastic. The current account balances the value of exports and imports taking into account exogenously-specified capital inflows.

2.2 The Turkish SOE Model

The SOE model is relatively easy to implement empirically. One requires a consistent set of Input-Output accounts or a Social Accounting Matrix showing the standard intermediate, final demand and value added transactions. Additional estimates of tariff rates, tax rates, or subsidy rates may also be needed, depending on the detail of the Input-Output database. Estimates of elasticities must be assembled for primary factor substitution, import demand, import source, domestic demand, and the transformation of domestic supply into domestic and exported products.[6]

We employ a 1985 Input-Output table distinguishing 64 production sectors.[7] We aggregate this to 40 sectors, selecting to aggregate the smallest 24 sectors which account for only 5.1% of the value-added of the

[6] In detail, these elasticities refer to the elasticity of substitution between primary factors of production in each sector; the elasticity of substitution between domestic production and an imports composite in each sector; the elasticity of substitution between imports distinguished by source, also by sector; the elasticity of substitution between domestic consumption of each good (the components of which are, in turn, composites of domestic and imported production); and the elasticity of transformation of domestic production into domestic uses and export.

[7] This is the latest Input-Output table available for Turkey as of late 1990.

Table 1: Sectors and Policies in the Turkish Model (percentages)

ID	Sector	1985 Tariffs	1989 Tariffs	Export Subsidies	VAT	Production Subsidies
AGR	Agriculture	4.1	6.0		0.9	4.2
AIR	Air Transport				2.3	
ALC	Alcoholic Beverages	22.0	72.3	8.2	4.7	
ANI	Animal Husbandry	15.6	6.0		0.9	
APP	Wearing Apparel	8.3	22.8	13.5	12.8	
BLD	Building Construction				16.5	
CEM	Cement	3.9	2.6	18.0	7.5	
CHM	Other Chemical Products	19.8	15.7	15.7	11.4	2.4
COL	Coal Mining	0.7	0.7		7.8	3.4
COM	Communication	2.5	6.3	2.8	2.0	
CON	Other Construction				4.5	
ELE	Electricity				3.6	2.0
ELM	Electrical Machinery	35.3	11.0	29.7	9.4	
FAB	Fabricated Metal Products	46.4	10.0	69.7	12.8	
FIN	Financial Institutions & Insurance				9.7	
FIS	Fisheries	23.5	34.9		0.3	
FOR	Forestry	20.5	3.9		1.1	
FRT	Fertilizers	1.3	2.5	15.7	2.5	0.9
GAS	Gas Manufacture & Waterworks				3.4	
GLS	Glass & Glass products	63.0	31.8	16.9	5.2	
IRN	Iron & Steel	16.3	4.6	21.4	20.1	
LND	Other Land Transport				3.6	0.8
MAC	Machinery except Electrical	20.2	10.5	9.6	6.0	0.6
MEA	Meat Processing	13.7	4.2	8.2	1.8	
OFP	Manufacture of Other Food Products	38.7	30.1	8.2	15.0	
OMP	Other Non-metallic Mineral Production	27.1	32.5		9.5	
OWN	Ownership of Dwellings				2.0	
PPS	Personal & Professional Services	0.6			18.9	
PUB	Public Services					
REF	Petroleum Refineries	150.7	16.2		15.7	
RES	Restaurants & Hotels				9.2	
RUB	Rubber Products	49.8	25.3	20.0	7.7	
SUG	Sugar	16.9	32.3	8.2	8.4	9.0
TEX	Textiles	26.2	19.4	13.5	14.1	
TOB	Tobacco	52.1	57.3		2.4	
TRD	Wholesale & Retail Trade				10.5	
VEG	Vegetable & Animal Oils & Fats	2.9	3.9	8.2	12.1	0.6
VEH	Motor Vehicles & Equipment	24.6	20.1	15.1	25.8	
WAT	Water Transport				2.3	2.8
WOO	Wood & Cork Products	23.0	13.7	1.6	13.6	

economy in 1985. Given that one of the trade policy options that we seek to evaluate is protection uniformity, we were anxious not to bias results by aggregating the model excessively.[8] Table 1 displays the names of each of our sectors along with a 3-letter acronym for later reference.

In Table 1 we also list each of the tax instruments in the Turkish model. Domestic taxes consist of the value added tax (VAT) and production subsidies.[9] Foreign trade taxes consist of import tariffs and export subsidies. The most important instruments from a revenue perspective are tariffs and the VAT. There are no import quotas or voluntary export restraints (VER's) in the Turkey model, reflecting their virtual absence from the economy in 1989, the benchmark year for the tax and trade policies.

Using benchmark import and export shares as weights the average import tariff in the model is 8.115% and the average export subsidy 7.399%. These values are substantially lower than prevailed throughout the earlier part of the 1980's. Nonetheless, there is still considerable dispersion in these rates across sectors, which turns out to be crucial for our welfare evaluation of their distortionary effects.[10]

The benchmark values of all elasticities in the model are reported in an appendix. Virtually all of the values have been selected from literature searches.[11] There are many elasticities that must be specified here that we do not have (good) data on. Our "remedy" for this problem, which is endemic to any large-scale model of this kind,

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[8] By aggregating even further (at least according to the criteria of value-added) we would tend to bias the model towards showing smaller welfare benefits from uniformity, since benchmark tariffs would be more uniform in the benchmark equilibrium solely as an artifact of the process of aggregation. One alternative to employing a disaggregated model such as ours, which would reduce aggregation bias, is to use an explicit decision-theoretic metric in selecting sectors to be aggregated, such as advocated by Harrison and Manning [1987]. This would involve aggregating sectors with similar levels of protection. Given that the current state of modelling technology does not constrain us to aggregate significantly, we elect not to.

[9] The VAT rates listed in Table 1 show a great deal of variation across sectors. Part of the reason is there is some slight statutory difference in the rates. More important, however, is that our rates are derived from observed collections in 1985, the year the VAT was barely introduced. There were a great many administrative difficulties in collection procedures, yielding different observed collection rates. Further elaboration is provided in appendix B.

[10] Moreover, just nine sectors account for 79% of the total tariff revenue: CHM (20.7%), ELM (7.3%), IRN (4.2%), MAC (13.4%), OMI (5.2%), REF (6.1%), TEX (4.5%), TOB (3.5%) and VEH (14.1%).

[11] The elasticity of transformation is set at 2.9 in all sectors and is based on estimates by Faini [1988]; it has a standard error of 1.3 in our sensitivity analyses. The primary factor substitution elasticities are based on the regression estimates of Harrison, Jones, Kimbell and Wigle [1991], and have standard errors as reported there. They range between 0.293 for refined petroleum products (REF) up to 3.125 for restaurants and hotels (RES), but the vast majority are close to unity. The elasticity of substitution between domestic and imported goods is based on detailed estimates from the ORANI model of Australia reported in Dixon, Parmenter, Sutton and Vincent [1982]. There do exist some estimates on these elasticities for Turkey, reported in Grais, de Melo and Urata [1986; Table 5, p.75], but these were not sufficiently disaggregated for our purposes. The import-source substitution elasticities are set at 5 on the basis of our priors. Similarly, the price elasticity of the Armington aggregate is likewise set at 2 on the basis of our priors. In addition there is an elasticity of substitution between intermediate inputs and value-added in each sector. The tradition, no doubt borne of Input-Output modelling habits, is to set this elasticity at zero. We do likewise, but also consider values of 0.25, 0.5, 0.75 and 1 (for each sector) in our sensitivity analysis. Apart from these sector-specific elasticities, there is one further elasticity reflecting substitutability of consumption in the "top-level" of our consumers utility function. We assume a value of 1 in this instance, again reflecting our priors and little hard evidence.

is to undertake systematic sensitivity analyses of our major results with respect to plausible bounds on these elasticities. Even if we are unable to specify a point estimate with any precision, our priors over the likely bounds that these elasticities could take are quite strong. To the extent that our major conclusions are robust to perturbations over these bounds, we do not see our uncertainty over specific values of these elasticities as a weakness of the model.[12] We report the results of these sensitivity analyses, which involve 1000 simulations for each counterfactual policy, in Section, 5. They allow us to conclude that our main results are robust, at least with respect to plausible uncertainty over elasticities.

In the present version of the model we only have one private household in Turkey. It is important to note, however, that there are several powerful theorems in international trade theory to show that one can effect Pareto-efficient reforms for multiple households providing there are aggregate (real) income gains and one accepts some weak conditions on patterns of demand and ownership.[13] These results do not rely on the availability of lump-sum redistributive taxes, nor do they address the issue of an optimal reform package. What they do show is that one can focus initially on aggregate gains in income and welfare, knowing that the redistributive aspects of the problem do have a solution that leaves each household at least as well off as before the reform. This is not a complete substitute for actually solving for the equity effects of a reform package, but it is a partial substitute.[14]

The SOE model is generated with the GAMS software developed by Brooke, Kendrick and Meeraus [1988] and solved with the MPS/GE software developed by Rutherford [1989].[15]

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[12] These remarks should not be interpreted as denying the value of any new empirical work on generating such elasticities. On the contrary, any effort that could generate better bounds on these point estimates is useful in generating policy conclusions that carry greater credibility, even if those conclusions will still be probabilistic in nature.

[13] See Dixit and Norman [1980; pp. 79/80] [1986]. The conditions on demand and factor ownership patterns are primarily to rule out "pure exchange" economies. These conditions are trivially met in our model.

[14] It would be a relatively straightforward matter to extend our model to accommodate multiple households if corresponding data were available.

[15] The systematic sensitivity analyses reported in an appendix are undertaken with the MPSS software implementing the procedures developed by Harrison and Vinod [1992].

3. POLICY ANALYSIS

We present our results by examining each of four trade policy options currently facing Turkey: uniformity, across-the-board liberalization, sectoral liberalization, and harmonization with the external tariff of the European Communities.

3.1 Uniformity

Background

A brief overview of the literature of uniformity will assist the interpretation of the results. Import taxes are an inefficient method of generating government revenue because they discriminate between the domestic and imported variety of the product, and therefore distort consumption and production decisions. However, it has been known at least since Ramsey [1927] that if one is going to utilize import taxes to generate a given amount of revenue in an economy with only final goods, then that revenue can be generated with the least efficiency cost by imposing tariffs in inverse proportion to the elasticity of import demand. That is, there are strong theoretical reasons why non-uniform tariffs may be optimal.

There are a number of problems, however, with implementing Ramsey optimal import taxes. First, when there are intermediate goods included in the economy, or one accounts for cross-price elasticities, an extended Ramsey optimal import tax structure still exists but its computation is empirically complicated. More importantly, practitioners of trade policy usually recommend tariff uniformity because the observed pattern of import taxation in developing countries often follows political economy considerations, with cascading protection for final goods, rather than Ramsey optimal prescriptions.

Regarding non-discriminatory domestic taxes, it has been shown that if all goods are taxable and labor supply is perfectly inelastic, then uniform taxation is optimal for the purpose of raising a given amount of revenue.[16] Since a uniform tax on all goods is equivalent to a tax on labor alone, a uniform tax will minimize

[16] See Atkinson and Stiglitz [1980].

distortion-induced resource movement if labor supply is perfectly inelastic. That is, uniformity is optimal because agents cannot escape the tax by reallocating their production or consumption decisions.

Similarly, if labor supply is not perfectly inelastic then it becomes optimal to impose higher taxes on those goods that are better complements with leisure.[17] The tax on the good would include a component that is intended to tax leisure. If there are other goods in the economy that cannot be taxed then the same logic would apply: higher taxes should be applied on those goods that are complements with the aggregate of all goods that are not taxed. As a practical matter there are many goods that are left out of the taxation system, with varying and uncertain complementarities to taxed goods, so it becomes very difficult to determine the optimal non-uniform tax.[18] In our model, however, there is no labor-leisure choice and all goods are taxable.[19] Therefore we would expect that there should be welfare gains from movements towards uniformity of domestic taxation. The only question remaining, then, is how significant they are quantitatively.

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[17] Assuming that leisure cannot be effectively taxed.

[18] To illustrate, consider the simple example posed by Harberger [1990] in which we consider extending a VAT to cover bicycle repair shops in the formal and hitherto untaxed sector. By taxing this sector we will cause some substitution towards other activities in the taxed sector, as well as some substitution towards other untaxed activities such as the informal bicycle repair sector. (There may also be some sectors whose outputs are net complements to the output of the newly taxed sector, but we can ignore those for present purposes. In general we would expect that the output of the large groups of sectors that we are talking about here, the "currently taxed sector" and the "remaining untaxed sector", will be relatively large and hence net substitutes with the output of the sector in question.) Welfare goes down due to the loss in consumer surplus from the contraction of the bicycle repair shop, but will go up due to the gain in consumer surplus from the expansion in the other taxed and untaxed sectors. Which effect dominates? The net effect on welfare will depend on the degree of substitutability between the outputs of the newly taxed sector and untaxed sectors. If there are sufficiently strong substitutes in the untaxed sector, such as informal bicycle repair shops or personal leisure (i.e., self-repair as a hobby), then we would expect that net welfare would fall. The logic behind this conclusion is the same as the Ramsey Rule logic which seeks to raise a given amount of revenue with least deadweight efficiency loss. If adding a distortion of a given amount on the formal bicycle repair sector generates an arbitrarily small increment in revenue because everybody substitutes informal repair services that are completely untaxed, then one must keep increasing the distortion until it is arbitrarily large so as to generate the required increment in revenue. Such large increases in distortions will eventually ensure a welfare loss from the exercise, even if the increment in revenue is redistributed in a lump-sum manner back to households. Hatta and Haltiwanger [1986] provide a succinct formal demonstration of this result, providing that we re-interpret their lowest-taxed activity as the newly taxed activity of this example. Harberger [1990; p.80] draws out the implications for the practical design of uniform taxation schemes.

[19] In the context of international trade and uniform tariff policies, the analogue of "untaxed activities" is smuggling. To the extent that different goods are easier to smuggle one might find that nominal tariff uniformity will have a non-uniform distortionary effect (see Panagariya [1990]).

Results

Our results for Turkey, presented in Figure 1, show that there are indeed considerable benefits from uniformity of incentives in export subsidies and the external regime as a whole.

If uniformity is limited to the tariff regime[20] then benefits are obtained but they are relatively modest. Nonetheless, the result verifies the intuition of practitioners: the actual pattern of import taxation departs significantly from Ramsey optimal import taxes.[21] When uniformity of external incentives is extended to include export subsidies[22], the benefits of uniformity increase dramatically and exceed one percent of GDP. This is because there is great dispersion in export subsidy rates, with many sectors receiving no incentive and others receiving large incentives to export (see Table 1). When we add a uniform VAT and production subsidies[23] to uniform external taxation we increase the benefits further, consistent with the fact that all goods are taxable and labor supply is perfectly inelastic in our model.

We demonstrate in the next section that the principal distortion remaining in the external regime of Turkey is the *dispersion* of the incentives rather than the *level* of the incentives.

3.2 Across-the-Board Liberalization

Background

A number of developing countries, including Turkey, have progressively liberalized their import regimes. Quantitative restraints are virtually eliminated and tariffs have been lowered, but some export subsidies remain. Often the sectors with high tariffs are the same ones that have high export subsidies. Although these countries stand ready to reduce tariffs further, in such a situation does it enhance welfare to continue to reduce tariffs across-the-board while leaving export subsidies in place? Conversely, would it be beneficial to increase export subsidies as an offset to the anti-export bias of the tariff, as a second-best measure to reducing the tariff? We first consider the

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[20] The uniform tariff is set at 8.115%, which is the benchmark import-weighted average tariff. It is applied to all sectors, irrespective of their trade status in the benchmark. Virtually identical results obtain if one applies it only to those sectors with benchmark imports or import tariffs. The same generalization applies to the other uniformity packages considered below.

[21] If it did not depart from the Ramsey optimal tax structure then uniformity would, by definition, imply welfare losses.

[22] The uniform level of export subsidies is 7.399%, which is again based on trade-weighted benchmark data.

[23] The uniform VAT is 6.520% and the uniform production subsidy is 0.730%.

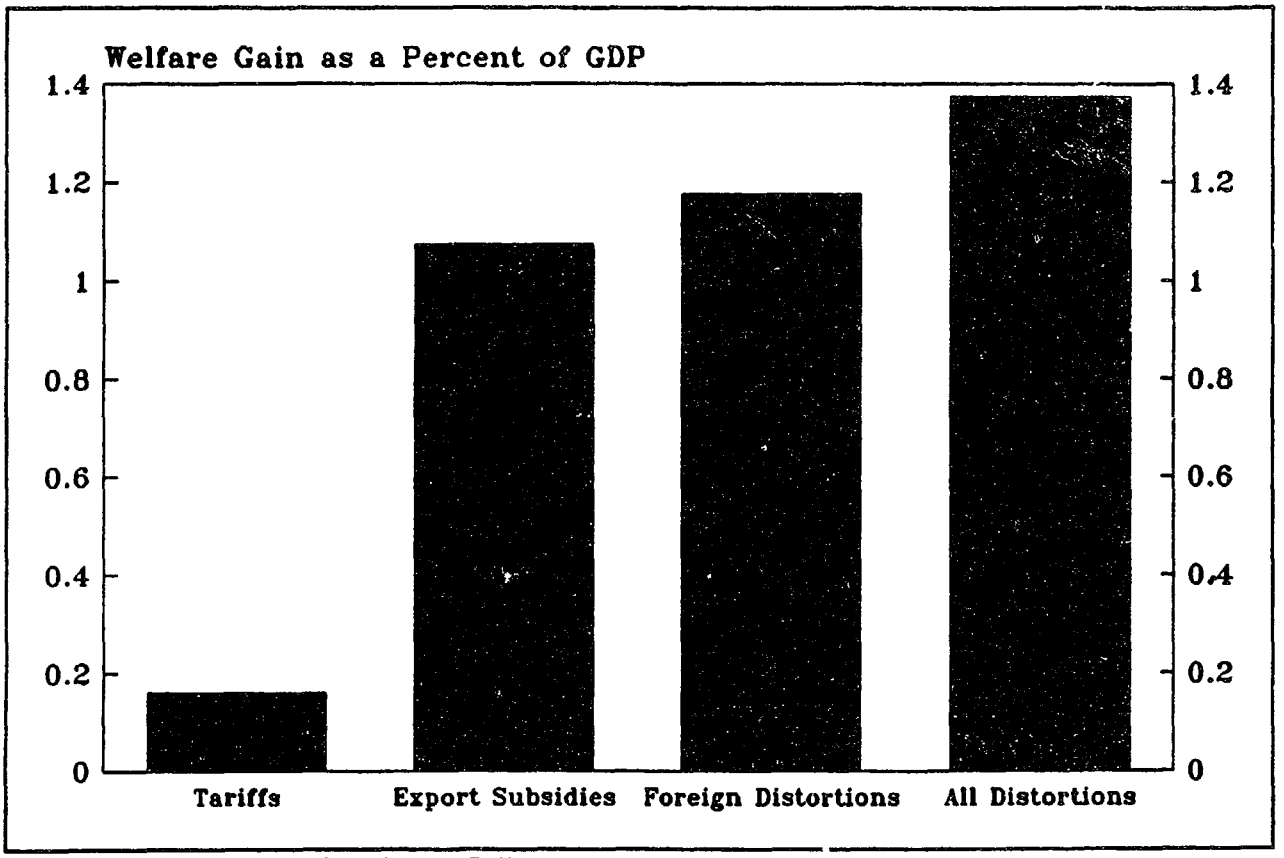

Figure 1: Welfare Effects of Uniformity Policies

theory and conventional policy advice on this question in the context of the arguments for export subsidies.

The classic argument for export subsidies rests on the theoretical foundation of the Lerner [1936] symmetry theorem, which states that a tax on imports is equivalent to a tax on exports. It follows that if a two-sector economy has an unremovable import tax in the import competing sector it can offset the resulting anti-export bias with an export subsidy to the exporting sector.[24] Based largely on this argument, Balassa [1987] argued that for most developing countries an anti-export bias will likely prevail, even after tariff reduction and devaluation, which calls for export promotion measures. Krueger [1984; p.528] noted that many "export promotion" measures employed by policy-makers in developing countries are nothing more than partial offsets to the overall bias in the regime toward

[24] There are other theoretical justifications for export subsidies that have been less important in the policy debate. For example, a justification for export subidies has been offered by Itoh and Kiyono [1987], who argue that targeted export subsidies to non-traditional export sectors will enhance welfare when additional traditional exports of a country will suffer a terms-of-trade loss. In addition, strategic trade policy considerations have been used to justify export subsidies, for example by Brander and Spencer [1985] as a method of shifting profits in oligopolistic industries. Eaton and Grossman [1986], however, have shown that the arguments for policy intervention based on oligopolistic profit shifting are not robust with respect to the specification of oligopolistic interaction.

import substitution. Large export subsidies, however, generally create problems and are thus typically not recommended. These problems may include budgetary problems for the government and various types of rent-seeking behavior such as falsification of export documents, lobbying to seek higher subsidy rates, and export and re-import to obtain the subsidy.[25]

Since export subsidies *per se* in the manufacturing sector are proscribed by the GATT, those who argue for export subsidies suggest the use of export subsidies that are legal under the GATT. Thus Balassa [1987] has recommended that developing countries rebate import duties and indirect taxes on exports, both to direct and indirect exporters, as well as provide preferential export credit and export insurance in the absence of private insurance. These "duty drawback" schemes have the effect of automatically linking tariff and tax reform with export subsidy reform.

Results

Figure 2 displays the welfare effects of reducing tariffs and export subsidies across-the-board. Reductions of tariffs alone cause some welfare gains initially, but these deteriorate into a welfare loss for reductions greater than 40%. This welfare loss is attributable to the Lerner symmetry effect discussed above. As the average tariff is only slightly above the average export subsidy, there is only a slight anti-export bias in the external incentives. As tariffs are progressively reduced in a piecemeal manner, the external incentives eventually become biased toward exports.

[25] Nogues [1987] has shown that in Argentina export subsidies lead to fraud, corruption and rent-seeking. He concludes that in Latin America the level of import protection has been so dominant that the provision of fully offsetting subsidies would introduce budgetary problems and rent-seeking behavior that would be counterproductive, and is clearly inferior to the first best policy of reducing the import protection. Based on evidence such as this, Thomas, Nash and Associates [1991] have concluded that large export subsidies are not recommended.

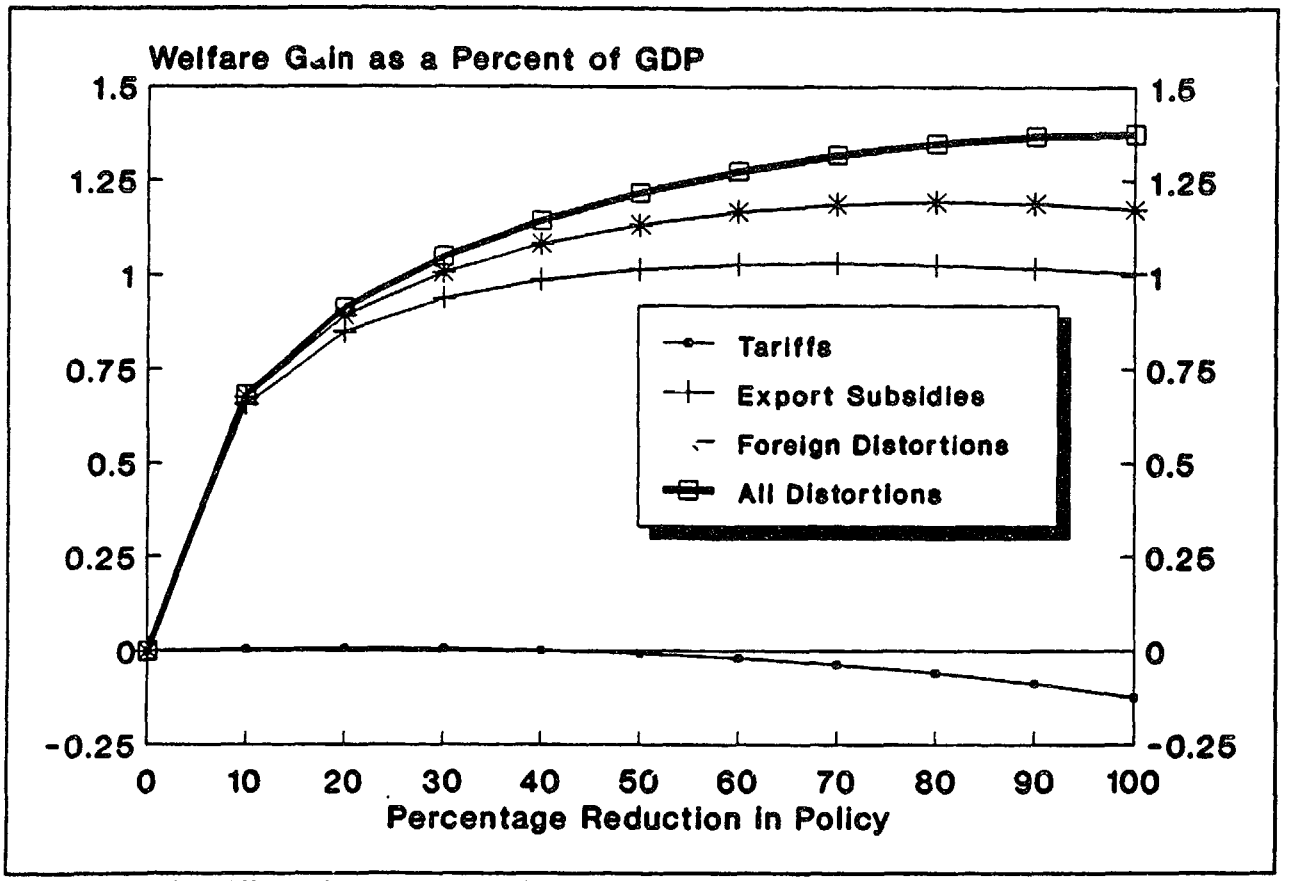

Figure 2: Welfare Effects of Across-the-Board Trade Liberalization

Figure 2 also displays the welfare effects of reducing export subsidies across-the-board.[26] Contrary to the case of tariff reductions, the benefits of export subsidy reductions continue up to a 70% reduction and are much more substantial at about one percent of GDP. The stark contrast in the effects of export subsidy reduction and tariff reduction appears at odds with the Lerner symmetry theorem, since the average tariff and export subsidy are about equal. The puzzle is resolved by recognizing that there is significantly greater *dispersion* in benchmark export subsidies. As shown above, the Turkish economy would gain about one percent of GDP from uniformity of export subsidies, but less than 2/10 of a percent from tariff uniformity. The process of taking an across-the-board reduction

[26] There has been some debate over the claim that export subsidies in Turkey have an "anti-agriculture" bias. This claim derives from the observation that nominal export subsidies appear to be concentrated in manufacturing industries rather than agricultural or food-related sectors. It is a straightforward matter to test this claim by looking at the effects on domestic output when we remove export subsidies. In the benchmark year agricultural industries constituted 23.85% of Turkish output. "Agriculture" is here defined as consisting of AGR, ANI, FIS, FOR, MEA, OFP, SUG, TOB, and VEG; this definition errs on the side of inclusiveness, but more narrow definitions would not change our conclusions. This value *expands* slightly when we just remove export subsidies, and *expands* even further when we jointly remove export subsidies and tariffs. We therefore conclude that there is no evidence of any general equilibrium bias against agriculture due to export subsidies.

in export subsidies has the simultaneous effect of also reducing the dispersion in export subsidies, and it is the reduction in dispersion that is driving the result of Figure 2 for export subsidy reduction.

Reducing export subsidies and tariffs *jointly* leads to even greater welfare gains than just reducing export subsidies. This is again indicative of the offsetting effects of tariffs and export subsidies from the Lerner symmetry theorem: large reductions in tariffs result in welfare losses, whereas the effect of adding the same tariff reductions to reductions in export subsidies is to enhance the welfare gains.[27] Removing all domestic and foreign distortions results in further enhancements of welfare, albeit not as large as those due to export subsidy removal.

To further bolster our interpretation that the dispersion in the export subsidy regime is the principal cause of the gains from export subsidy reduction, Figure 3 addresses the question of export subsidy and tariff removal again but with the difference that benchmark tariffs *and* subsidies are set equal to their uniform values. Thus we eliminate the dispersion in each *before* reducing the level of the policy.

In this case the results are much more consistent with the practical rule-of-thumb derived from the Lerner symmetry theorem. Recall that the benchmark average tariff of 8.115% is slightly higher than the average export subsidy of 7.399%, resulting in a slight import-bias in this new benchmark. Any reductions in export subsidies result in welfare losses that persist at the margin because the regime becomes biased further toward imports. There is a very slight welfare gain from reducing tariffs by as much as 30%, with the maximal gain occuring at around the 10% level when imports tariffs just offset export subsidies exactly. There are much larger welfare losses from reductions in tariffs by more than 30%, paralleling the losses obtained from reducing export subsidies alone. The welfare effects of reducing the level of foreign distortions, given that they are both initially uniform and approximately equal, are also negligible. Recall from Figure 1 that just making foreign distortions uniform results in a welfare gain of 1.2%.

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[27] For example, consider the 100% reduction in tariffs and subsidies. Reducing tariffs alone by 100% results in a welfare loss of 0.125%, whereas reducing export subsidies alone results in a welfare gain of 1.004%. The implied effect of their joint reduction would be a welfare gain of only 0.879% (= 1.004-0.125) if there were no interaction term and their welfare effects additive. However the welfare gain from their joint removal is 1.174%, well above the 1.004% attributable to export subsidy reductions alone. In other words, the welfare gain from the interaction term is 0.295 (=1.174-0.879) in this instance. It is also useful to note that there are weak second-best constraints on the reductions in export subsidies and foreign distortions. In the case of export subsidies the optimal reduction is only 70%, due to other distortions remaining in place. Similarly, reductions in foreign distortions fail to generate welfare gains at the margin when they reach the 80% level, due to the presence of domestic distortions. Only when all distortions are removed do we find that the optimal policy is to reduce them by 100%, as expected since this is the "first-best" policy.

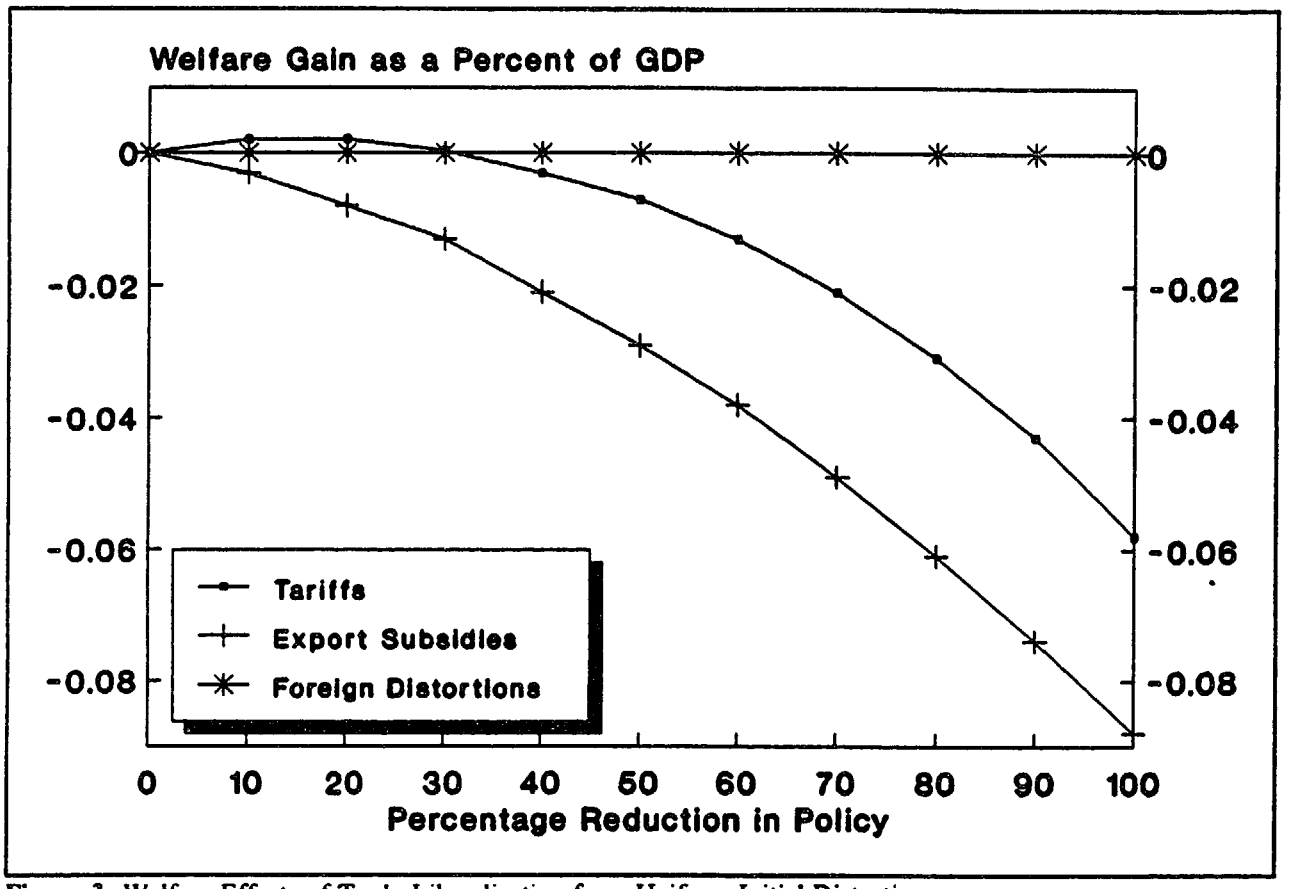

Figure 3: Welfare Effects of Trade Liberalization from Uniform Initial Distortions

Uniformity of external incentives yields almost all the benefits achieved by removal of both export subsidies and tariffs. The reason that uniformity yields welfare benefits almost as large as full liberalization is explained by the fact that Turkey starts from a trade regime that is not significantly biased toward import substitution or export promotion. During the 1980's Turkey undertook a significant trade liberalization which left it with a relatively low level of protection but a relatively high level of export subsidies. In other words, in our benchmark equilibrium it has a structure of external incentives that tends to be neutral with respect to either import substitution or export promotion. The principal distortion in the Turkish trade regime is the dispersion in the incentives across industries and not, as is often the case in developing countries, an across-the-board anti-export bias. *Ceteris paribus*, the more the economy is protected and the greater the anti-export bias, the smaller will be the proportion of the welfare benefits of liberalization that uniformity will achieve.

We perform some additional experiments to verify this interpretation. We benchmark our model to the tariff rates prevailing in 1985, reported in Table 1. These were about double those applying in 1989, averaging 17.623%. Although this tariff rate is somewhat small compared to rates of nominal protection in many developing countries, it does introduce an anti-export bias into the Turkish external regime. A piecemeal reduction in the 1985 tariff rates to the level of 1989 results in an increase in Turkish welfare of 7/100 of a percent of GDP, and the benefits of uniformity (of all distortions) are reduced from 99.9 percent to 94.1 percent of the benefits of the first-best liberalization. This also shows that the tariff reductions that Turkey undertook in the late 1980's were welfare enhancing.

If the external incentive regime were biased toward import substitution, as is common in developing economies, then piecemeal lowering of import protection would result in welfare improvement. The important lesson is that when a country has gone as far as Turkey with import liberalization, while at the same time maintaining significant export subsidies, further import liberalization must be balanced with further reductions in export subsidies.[28] Similarly, these results provide support for the view that *some* small export subsidies are efficient if a country starts from an import regime that is significantly protected.

To the extent that export or production subsidies in Turkey are effected by means of "duty drawback" on customs duties on imports or VAT, interaction effects such as we have examined will be built in to any liberalization of those subsidy schemes. In other words, anything that lowers tariffs would endogenously lower export subsidies, generating these beneficial interaction effects. This may well be an unplanned advantage of the use of such drawback schemes.

As Turkey turned away from import substitution in the early 1980's, it adopted strong export promotion measures, some of which, as mentioned in the introduction, have been the subject of controversy. We also address this issue by examining whether the Turkish policy of reducing export subsidies during the last half of the 1980's was welfare enhancing. In order to assess whether there were benefits of the export subsidy reduction, we counterfactually scale up all e..port subsidies to levels estimated to prevail in earlier years in Turkey, and simulate

[28] Similar results for the Polish economy are discussed by Tarr [1990]. It was shown that liberalization of foreign exchange surrender requirements would provide benefits for Poland for a very significant liberalization, but beyond a high level of liberalization Polish welfare would be reduced unless export subsidies were also reduced.

the effects of the Turkish policy of lowering export subsidies toward the level of 1989. This tilts the external incentives toward export promotion, but what is more important, greatly increases the dispersion in the export subsidies. We find that the the policy of export subsidy reduction yields very substantial welfare benefits.[29]

Finally we note that second-best effects with domestic taxes are apparent, but they are not so important as to offset the benefits of either liberalization or uniformity as reform packages providing they are applied to export subsidies (either jointly with tariffs, or by themselves).

The Effect of Alternative Tax Replacements

The use of the VAT as a replacement tax makes virtually no difference to our quantitative or qualitative conclusions. The VAT has a relatively small welfare cost for changes in the order of 10% or so, which is the upper bound on most of the policy exercises we consider. Figure 4 displays these welfare changes, using a lump-sum tax to replace foregone revenues. Thus we would not be surprised to see the use of the VAT having little effect relative to the lump-sum replacement tax for reasonably small changes. Unless specified otherwise, this is what we find in all of our policy simulations.[30]

3.3 Sectoral Liberalization

We have seen above that given uniformity, export subsidies tend to offset the anti-export bias of tariffs even in a multisector framework of the Turkish economy. Krueger [1984; p.528] has noted, however, that policy-makers in developing countries have often used export promotion measures as a device to induce import substitution

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[29] We perform simulations with three new export subsidy rates of 2.0, 2.62 and 3.4 times the export subsidies of our original benchmark equilibrium. As discussed in appendix B, this corresponds to export subsidies of 14.8, 19.4 and 25.2 percent, which were reported as the export subsidy rates prevailing in Turkey in the years 1988, 1985 and 1986, respectively. As a percent of GDP, the welfare benefits of reducing the export subsidies to the level of our original benchmark equilibrium are 3.6%, 6.5% and 12.1%, with the higher welfare benefits corresponding to reduction of the higher xport subsidies. The welfare benefits of export subsidy reduction increase more than proportionately to the scalar multiple of the export subsidy, because the quantity of resources distorted increases with the price distortion of the subsidy and acts multiplicatively on the price distortion in the calculation of the welfare costs. Interestingly, the welfare effects of subsidy reduction are only slightly affected by rebenchmarking with 1985 tariff rates, reflecting the fact that it is dispersion of the export subsidy that is of primary importance in these results.

[30] Although the welfare change from VAT reduction is small, the sign of the welfare change is the opposite of what is expected from first-best policies. This is because VAT rates are often high in those sectors that have high tariffs and export subsidies (we pursue this point below).

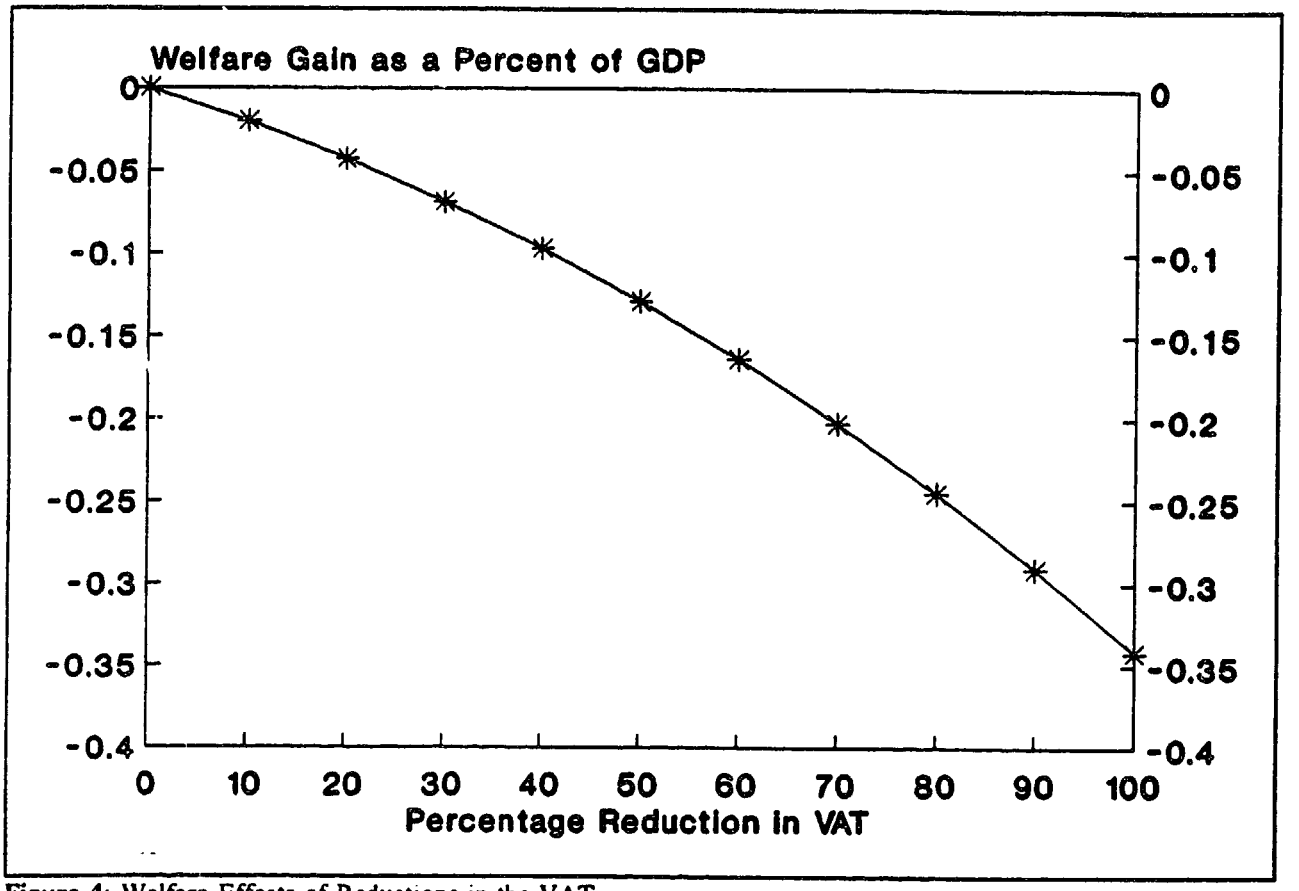

Figure 4: Welfare Effects of Reductions in the VAT

industries to export part of their output. Krueger notes that this policy is also justified as offsetting the anti-export bias in the regime. Presumably the argument is that the sector is not motivated to export without the export subsidy since it receives a relatively high price on the domestic market due to the import protection.

On the contrary, however, an export subsidy to the sector that is also favored by a high tariff will not be an offset. Rather it will exacerbate the resource misallocation problem of too many resources in the protected sector. We investigate the impact on the Turkish economy of removing or reducing tariffs or export subsidies, or both, from individual sectors. Given piecemeal policy change in a particular sector, the interaction with the VAT in the sector will become important. In particular, if a sector enjoys a high tariff and high export subsidy, excessive resource allocation to the sector will be reduced by a high VAT.

Table 2 presents a summary of welfare effects of piecemeal reform of individual sectors. In order to compare results across sectors which are significantly different in size, we express welfare gains here as a

percentage of benchmark value-added in the reformed sector. Table 3 presents the same results in unadjusted terms: it shows the percentage change in GDP as the result of the sectoral reform. The first three columns of these tables consider the consequences of removing existing export subsidies and import tariffs one sector at a time, leaving protection in all other sectors at benchmark levels. The column titled TSX simultaneously removes both tariffs and export subsidies.

Table 2: Welfare Effects of Piecemeal Sectoral Reform as a Percent of Sectoral Value-Added

	Complete Removal			Marginal Reform	
	SX	T	TSX	SX	T
AGR	0	-0.005	-0.005	0	0.005
ALC	-0.29	1.75	1.406	-0.039	2.564
ANI	0	-0.018	-0.018	0	-0.006
APP	-4.315	-0.233	-4.782	-0.716	0.583
CEM	0.166	-0.002	0.163	1.056	0.042
CHM	0.136	-1.168	-1.09	1.187	0.564
COL	0	-0.101	-0.101	0	-0.101
COM	-0.075	-0.051	-0.127	-0.069	-0.022
ELM	2.048	-0.948	1.119	8.459	-0.322
FAB	53.228	0.586	53.085	394.025	0.715
FIS	0	0.023	0.023	0.002	0.14
FOR	0	-0.047	-0.047	0	-0.027
FRT	0.394	-0.156	0.218	1.939	-0.135
GLS	0.048	0.075	0.101	1.83	0.343
IRN	8.427	-4.239	5.775	27.191	-3.941
MAC	-0.663	-0.414	-0.994	0.331	0.083
MEA	-0.194	-0.033	-0.228	0.036	-0.022
OFP	-1.414	0.157	-1.223	-0.729	0.415
OMP	0	-0.127	-0.127	0	0.657
REF	0	0.009	0.009	0	0.086
RUB	0.02	0.071	0.039	1.298	0.488
SUG	0.264	0.01	0.273	0.521	0.027
TEX	-2.174	-0.267	-2.441	0.206	0.304
TOB	0	1.382	1.382	0	2.51
VEG	-0.472	-0.144	-0.626	0.133	-0.092
VEH	-0.919	-1.238	-2.213	-0.544	1.106
WOO	-0.123	-0.277	-0.4	-0.119	-0.032

The last two columns represent the effect of *marginal* reform on a sector by sector basis. These columns report the results of scenarios in which sectoral tariffs and export subsidies are reduced by 10%. In order to provide a consistent basis for comparison with the infra-marginal experiments, we have multiplied the welfare effect of these 10% reductions by 10 in order to indicate the welfare consequences of complete reform which would be "predicted"

Table 3: Welfare Effects of Piecemeal Sectoral Reform as a Percent of GDP

	Complete Removal			Marginal Reform	
	SX	T	TSX	SX	T
AGR	0	-0.00084	-0.00084	0	0.000835
ALC	-0.00173	0.010399	0.008353	-0.00023	0.01524
ANI	0	-0.001	-0.001	0	-0.00031
APP	-0.07883	-0.00426	-0.08736	-0.01309	0.010655
CEM	0.00093	-9.5e-06	0.000907	0.005899	0.000237
CHM	0.003322	-0.0285	-0.0266	0.02897	0.013773
COL	0	-0.00284	-0.00284	0	-0.00284
COM	-0.00141	-0.00096	-0.00241	-0.00131	-0.00041
ELM	0.024585	-0.01138	0.013431	0.101528	-0.00387
FAB	0.769165	0.008477	0.7671	5.693816	0.010337
FIS	0	0.000166	0.000166	0.000014	0.000992
FOR	0	-0.00059	-0.00059	0	-0.00034
FRT	0.002663	-0.00105	0.001471	0.013099	-0.00091
GLS	0.00028	0.000427	0.000579	0.010503	0.00197
IRN	0.191486	-0.0963	0.131224	0.617817	-0.08955
MAC	-0.01028	-0.00642	-0.01541	0.005135	0.001286
MEA	-0.00196	-0.00034	-0.0023	0.00056	-0.00022
OFP	-0.01864	0.002069	-0.01613	-0.00962	0.005472
OMP	0	-0.00072	-0.00072	0	0.00374
REF	0	0.000403	0.000403	0	0.003821
RUB	0.000104	0.00038	0.000209	0.00692	0.002601
SUG	0.001557	0.000057	0.001614	0.00308	0.000157
TEX	-0.07048	-0.00866	-0.07915	0.006692	0.009843
TOB	0	0.029122	0.029122	0	0.052881
VEG	-0.00736	-0.00224	-0.00976	0.002079	-0.00144
VEH	-0.01273	-0.01715	-0.03066	-0.00754	0.015335
WOO	-0.00238	-0.00538	-0.00776	-0.00231	-0.00061

by a marginal analysis. We do not report the TSX column for the marginal changes since the results would be additive in the two components that are displayed.

Given the policy concern mentioned by Krueger, the first result on which we focus is the welfare effects of export subsidy and tariff reduction in those sectors for which both the export subsidies are greater than 15 percent *and* tariffs are above average. From Table 1, there are six sectors in this group: Chemicals (CHM), Electrical Machinery (ELM), Fabricated Metal Products (FAB), Glass (GLS), Rubber Products (RUB), and Motor Vehicles and Equipment (VEH). We see that for a marginal reduction in export subsidies in all sectors except Motor Vehicles there is a welfare gain. Similarly, for a marginal reduction in tariffs in all sectors except Electrical Machinery there

is also a welfare gain.[31] These results support the view that using high export subsidies in sectors with above average tariffs is counterproductive.[32]

Theory suggests that the distortion costs of a tariff or subsidy increase more than proportionally with the size of the tariff or subsidy, because the quantity of resources misallocated also increases and acts multiplicatively on the tariff or subsidy in calculating the value of the distortion costs. Thus the benefits of export subsidy reduction are greater at the margin the greater the export subsidy, and the concentration of high export subsidies in a few sectors in Turkey is likely to be a problem for this reason. Examining the three cases of export subsidies above 20 percent, Fabricated Metal Products (FAB), Iron and Steel (IRN), and Electrical Machinery (ELM), there are indeed substantial benefits from a reduction of the export subsidy at the margin, even though in the case of Iron and Steel the tariff rate is below average. Thus the evidence for Turkey supports the view that high export subsidies are counterproductive.

The same general policy conclusion also holds for those sectors with high tariffs. There are seven sectors with tariffs in excess of 30% (ALC, FIS, GLS, OFP, OMP, SUG and TOB), and inspection of Tables 2 and 3 verifies that the welfare gains from tariff reduction in these sectors are substantial at the margin.

There are many sectors for which there are welfare losses from reductions in tariffs, export subsidies, or both, either in terms of marginal or complete liberalization. In addition there are a number of sectors for which marginal liberalization can be beneficial in welfare terms and yet complete liberalization harmful. With respect to export subsidies, examples include Machinery except Electrical (MAC), Meat Processing (MEA), Textiles (TEX), and Vegetable and Animal Oils and Fats (VEG). With respect to tariffs we have MAC again, Other Non-metallic Mineral Production (OMP), TEX again, and VEH. These results are explained by the fact that after some point further reduction of tariffs or export subsidies results in a bias in incentives against the sector given that tariffs and exports subsidies remain in place in the rest of the economy.

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[31] Motor Vehicles experienced the highest VAT rate in the economy at 25.8%, so export subsidies are offseting the impact of too little resources in Motor Vehicles due to the VAT. In Electrical Machinery, there is also an above average VAT rate; moreover, the tariff rate, which is close to the average rate in the benchmark, is also playing an offseting role to the VAT at the margin.

[32] These results are based only on Harberger triangle-type distortion costs. Including considerations of rent-seeking, as mentioned above, would strengthen the argument against high export subsidies.

It is also interesting to note that the relationship between these sector-by-sector results and the earlier across-the-board results. Taking simple sums of the welfare gains in Table 3 indicates aggregate gains of 0.8% from removing export subsidies, *minus* 0.14% from removing tariffs, 0.7% from removing foreign distortions, 6.5% from marginally reducing export subsidies, and 0.05% from marginally reducing tariffs. The first three of these numbers compare with the actual welfare gains of across-the-board reform of 1.0%, *minus* 0.12%, and 1.2%, respectively. This indicates that there are significant interaction effects from liberalizing foreign distortions on a multi-sectoral basis rather than implied by the sum of the individual sectoral reforms: the welfare gain is roughly doubled.

3.4 Harmonization with the European Communities

Background

Turkey has long held aspirations of becoming a member of the EC. As part of negotiations with the EC on this matter Turkey has adopted a policy of harmonizing it's tariff structure with the Common External Tariff (CET) of the EC. There has been some dispute as to exactly what this means, however.

Turkey's "effective (nominal) tariff" consists of several components, as discussed in Appendix B. First there is a statutory customs duty. Then there are a series of import surcharges, such as stamp taxes and wharf charges. The customs duty varies across sectors, but the surcharges are generally uniform. We refer to the sum of customs duty and these surcharges as the "total duty" to be applied to dutiable imports.

However, Turkey exempts a significant portion of imports from duties through a number of mechanisms including "duty drawback" and the investment code. The immediate result of these exemptions for our purposes is that the share of imports that is dutiable varies greatly across sectors. Hence the effective (nominal) tariff is the product of the total duty and the share of imports that is dutiable in each sector. It is this effective duty which is the best measure of the nominal protection that the sector is receiving.

These distinctions become crucial when one attempts to implement a political commitment to "harmonize the tariff structure". Turkey initially interpreted harmonization to mean that it would levy a zero *customs duty* on imports from the EC but continue to levy certain of the import surcharges on those imports, albeit at a reduced rate.

According to this interpretation of harmonization the *customs duty* on non-EC imports would be set equal to the CET of the EC, and all import surcharges on non-EC imports would apply as before.

The net effect of this interpretation, as far as the EC was concerned, was that it would face positive tariffs on exports to Turkey when it might have expected "harmonization" to mean that it would be allowed to import duty-free into Turkey.

After negotiation with the EC, Turkey has considered revising the harmonization policy to accord better with the EC's initial expectations. According to this view all surcharges would be incorporated into the customs duty, and only this single total tariff would apply to imports. Then the *total tariff* on EC imports would be zero, and would be equal to the CET on non-EC imports.

Assuming the continued use in Turkey of exemptions from import duties, the *effective (nominal) tariff* on non-EC imports would be lower than the CET which the EC applies on those imports itself. That is, after harmonization Turkey would be applying lower average tariffs than the EC. One can imagine that negotiations on this matter are continuing.

Results

Given the political importance of this trade policy alternative we have considered the effects of each interpretation. With either interpretation of the CET, and VAT as the replacement tax, the change is welfare from CET harmonization is small. With Turkey's interpretation of the CET, Turkey's welfare would increase by 7/1000 of one percent of GDP. With the EC's interpretation of the CET, Turkey's welfare would be reduced by 24/1000 of one percent of GDP.

What explains these results? CET harmonization reduces Turkey's average tariff. For small reductions in the tariff, such as implied by the Turkish version of harmonization, there is a slight gain in welfare. As explained above, further uncoordinated reductions in the tariff level from the already low level eventually result in welfare losses. Thus, although the difference is slight, the EC version of harmonization results in a loss simply because the tariff reduction is larger.

On the other hand, by combining CET harmonization with removal of export subsidies Turkey can expect to obtain significant welfare gains from EC tariff harmonization. This result follows from our analysis of the joint effects of removing tariffs and export subsidies in Figure 2, along with our interpretation of CET harmonization as a *de facto* across-the-board reduction in tariffs.

Irrespective of the final policy package, our main policy lesson here is that the welfare effects of quibbling over the proper interpretation of CET harmonization are in the second-order of smalls. This conclusion is particularly true in relation to the foregone benefits of more substantial liberalization or uniformity packages.

5. SENSITIVITY ANALYSIS

How robust are our major policy conclusions to the many assumptions of our numerical model? We answer this question partially by considering a systematic sensitivity analysis of the main results with respect to all of the elasticities of the model.[33]

Our sensitivity analysis employs the procedures developed by Harrison and Vinod [1992]. Essentially these procedures amount to a Monte Carlo simulation exercise in which a wide range of elasticities are independently and simultaneously perturbed from their benchmark values. These perturbations follow prescribed distributions, such as a t distribution with a specified standard deviation and degrees of freedom, or a uniform distribution over a specified range.[34] For each Monte Carlo run we solve the counter-factual policy with the selected set of elasticities. This process is repeated until we arrive at the desired sample size, in our case 1000. The results are then tabulated as a distribution, with equal weight being given (by construction) to each Monte Carlo run. The upshot is a probability distribution defined over the endogenous variables of interest. In our case we focus solely on the welfare impacts of each policy.

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[33] We appreciate that there are many other assumptions that remain fixed as we just vary elasticities, but regard those extensions as beyond the scope of the present study. For example, an important question is how our results might change as we examine alternative market structure assumptions, or move from a static framework to a growth setting. We plan to examine these extensions using the SOE model, but do not believe that they can be appropriately treated briefly enough to include here.

[34] The exact distributional assumptions used are documented in Appendix C (available on request). The MPSS software used to implement the Monte Carlo simulations is documented in Harrison [1990].

UT ... set tariffs equal to a uniform value of 8.115% for all sectors.
USX ... set export subsidies equal to a uniform value of 7.399% for all sectors.
UFD ... set all foreign trade distortions (tariffs & export subsidies) equal to their average benchmark values.
U ... set all domestic and foreign distortions equal to their average benchmark value.

LTAR ... liberalize tariffs by setting them to zero across-the-board.
LSX ... liberalize export subsidies by setting them to zero across-the-board.
LSX20 ... liberalize export subsidies by 20% across-the-board.
LFD ... liberalize foreign trade distortions by setting them to zero across-the-board.
LALL ... liberalize all distortions by setting them to zero: the "first-best" policy.

ULT ... set tariffs and export subsidies to their uniform values, and then liberalize tariffs.
ULSX ... set tariffs and export subsidies to their uniform values, and then liberalize export subsidies.

LVAT ... liberalize the VAT by setting it to zero across-the-board.

Note: all simulations use a lump-sum replacement tax.

Figure 5: Description of the Policy Simulations Subject to Sensitivity Analysis

The policies that we examine are described in Figure 5, and the results of the sensitivity analysis are reported in Table 4. In the interests of reporting all of the pertinent data in a compact manner, some of the column and row headings are necessarily somewhat cryptic at first glance. The acronyms for each simulation are defined in Figure 5. The "Sample Size" column refers to the number of Monte Carlo runs that were actually completed. In each case we have at least 1000 runs, which should be enough to obtain a reliable picture of the distribution of results. The "Point Estimate" column shows the welfare effect of the policy when all elasticities are set equal to their benchmark, or point estimate (PE), values. These are the results reported and discussed earlier. We report the change in welfare due to the policy as a percent of GDP, just as before.

The remaining columns report the results of the sensitivity analysis proper. We list the mean, the median, and the standard deviation, so as to provide simple indicators of the location and dispersion of the distribution of welfare results. We do not report here the skewness and kurtosis statistics that are necessary to gain a more complete impression of the distribution. In all cases we find that there is indeed significant skewness in the distribution, but insignificant kurtosis. The skewness in these distributions manifests itself in there being a systematic difference between the mean and median reported. Thus by comparing these two statistics one can see the direction

Table 4: Results of the Sensitivity Analysis

Simulation	Sample Size	Point Estimate	Mean	Median	Standard Deviation	Prob. ≥ 0	Prob. ≥ PE	50% Lower Bound	50% Upper Bound	75% Lower Bound	75% Upper Bound
UT	1000	0.161	0.21	0.21	0.03	1.00	0.97	0.19	0.23	0.18	0.25
USX	1000	1.073	0.841	0.866	0.114	1.00	0.00	0.71	0.93	0.65	0.96
UFD	2662	1.173	1.005	1.034	0.118	1.00	0.03	0.87	1.09	0.80	1.12
U	1041	1.373	1.301	1.307	0.139	1.00	0.33	1.20	1.40	1.11	1.46
LTAR	1000	-0.125	-0.218	-0.211	0.108	0.01	0.22	-0.31	-0.14	-0.36	-0.10
LSX	1000	1.004	0.844	0.875	0.117	1.00	0.03	0.70	0.93	0.65	0.96
LSX30	1000	0.848	0.751	0.782	0.129	1.00	0.38	0.57	0.85	0.52	0.87
LFD	1000	1.174	1.003	1.030	0.122	1.00	0.04	0.86	1.09	0.80	1.12
LALL	1000	1.374	1.299	1.308	0.144	1.00	0.34	1.18	1.40	1.10	1.46
ULT	1000	-0.058	-0.167	-0.172	0.033	0.0	0.0	-0.19	-0.13	-0.20	-0.12
ULSX	2000	-0.088	-0.050	-0.050	0.020	0.001	0.980	-0.066	-0.034	-0.074	-0.025
LVAT	1000	-0.342	-0.097	-0.090	0.085	0.135	1.00	-0.17	-0.02	-0.21	0.000

of the skewness directly.[35]

In order to obtain an indication of the *qualitative* policy results we report the "Prob. ≥ 0" column, which shows the probability from the empirical distribution that welfare increased in the counter-factual policy. This gives us a measure of the confidence that we have the *sign* right when we look at the Point Estimate welfare effect or the Mean or Median. Similarly, we report a column showing the probability that a welfare effect greater than or equal

[35] Why do we get such significant skewness in the distributions? There are two general reasons why this might occur: induced skewness due to our explicit distributional assumptions, and intrinsic skewness in the (implicit) function linking the set of elasticities and welfare. Each can be evaluated.

The explicit assumptions made in our sensitivity analysis result in a large number of skewed distributions for production activities that have benchmark Leontief technologies. The class of activities that fall into this category are those activities combining intermediate inputs and value added. In this case we allow perturbations of 0.5 and 1.0, as well as the benchmark value of zero. To see if this is the source of the skewness we can just remove these perturbations for these activities and re-run the sensitivity analysis to see if the skewness disappears. We have done this for the USX policy simulation (making all export subsidies uniform), and find that it does not account for the skewness.

The other possible reason for skewed results is more subtle than there being skewed distributional assumptions, but could well be more important. This has to do with the "asymmetry" of the *implicit function* that takes a given set of elasticities and generates the welfare effect. It is perfectly possible that equi-sized perturbations of a given elasticity can have different absolute effects on welfare. For example, the elasticity of substitution between domestically produced and imported goods in our Armington aggregate is set at 2 in the benchmark. We allow equal increases and decreases in this elasticity in our sensitivity analysis. However, it is plausible that increasing this elasticity to 3 from 2 has very little impact on welfare, whereas reducing it from 2 to 1 has a large impact. The source of our priors on this is no more than visual and casual inspection of isoquants with the relevant elasticities of substitution: once the elasticity gets above 2 it stays "pretty flat", but dropping it down to 1 adds "significant curvature". We can evaluate this source of skewness with respect to blocks of elasticities of the same type by just setting those elasticities equal to their PE value. We do this for the USX policy simulation, and with respect to each elasticity block. No single block can account for the skewness.

We conclude that there is no single block of elasticities that is causing this skewness.

to the PE welfare effect was obtained. If the PE result is perfectly representative of the location of the distribution of results we should see this value around one-half; this would be the case if the PE result exactly equalled the reported Median result. A value lower (higher) than one-half indicates that the distribution generally lies below (above) the PE result.

Finally, to gain a better sense of the confidence to be attached to the PE or Mean result, we report lower and upper bounds from 50% and 75% symmetric confidence intervals around the Median result. These confidence intervals simply show the smallest and largest values that lie within 50% or 75% of the distribution centered on the Median. Thus a 50% confidence interval between 1.1 and 2.3 can be interpreted as saying that 50% of the Monte Carlo runs resulted in welfare results between these values.

What, then, do we learn from these sensitivity analyses regarding our policy conclusions. Six observations may be made.

First, the welfare gains from the first-best liberalization policy (LALL) are robust to uncertainty over elasticities. The median and PE estimates are each of the same order of magnitude, around 1.3%.

Second, the welfare gains from reform of export subsidies are not as large as they were with the PE elasticities. This applies to the policy of uniformity (USX) as well as liberalization (LSX). In each case the welfare gains drop to around 0.87% rather than the initial results of 1.0% or so when PE elasticities are used. It is noteworthy, however, that just reducing export subsidies by 20% (LSX20) continues to generate a relatively large fraction of the welfare gains from the complete liberalization of export subsidies. Given the decline in welfare gains due to the USX and LSX policies, this fraction is therefore even larger than before. This confirms the policy conclusion as to the importance of having the highest export subsidies reduced, at the very least.

Third, there continues to be a welfare loss from unilateral liberalization of tariffs (LTAR). This loss increases from 0.1% of GDP to around 0.2% when we allow for uncertainty over elasticities.

Fourth, the welfare gains from moving towards uniformity of foreign distortions (UFD) or all distortions (U) appear to very robust.

Fifth, the welfare losses obtained when tariffs or export subsidies were liberalized from a benchmark in which all foreign distortions were uniform (ULT and ULSX, respectively) are qualitatively robust. The welfare loss

in the case of tariff liberalization is somewhat larger than before, strengthening our earlier policy conclusion in this respect.

Finally, the welfare effects of removing the VAT with a lump-sum replacement (LVAT) are even "more neutral" then before. Rather than a welfare loss of 0.342%, we now find a median welfare loss of only 0.09% with a standard deviation of approximately the same value. This confirms the earlier finding that the existing VAT serves well as a practical alternative to the lump-sum tax as a distortion-free replacement tax.

6. CONCLUSIONS

The first important policy conclusion concerns the fragility of the rule-of-thumb that holds that small export subsidies may be welfare enhancing as an offset to existing import tariffs. We find that this rule-of-thumb applies when one assumes uniform tariffs and export subsidies across sectors, but that it is unreliable as a rule when applied across-the-board to sectorally dispersed trade distortions or for sector-specific reform. The rule is rehabilitated, then, when a country has managed to reduce the anti-export bias of the trade regime *and* has a relatively uniform set of trade distortions. This set of circumstances may characterize an increasing number of countries that have been following a path of trade liberalization in recent decades. In such cases one must be wary about advocating the reform of tariffs *or* export subsidies alone.

A further important conclusion from our examination is that tariff and export subsidy uniformity yields substantial benefits in welfare terms in Turkey. Although "Ramsey" optimal import taxation would call for non-uniform import taxation inversely proportional to the elasticity of import demand in each sector, the *observed* dispersion of the tariff structure in Turkey is inconsistent with optimal departures from uniform protection. In fact, in the case of Turkey uniformity achieves an extremely high proportion of the benefits of full trade liberalization. This result is explained primarily by the substantial trade liberalization Turkey has undertaken during the decade of the 1980's. Given its export subsidies and low level of protection, the trade regime no longer has an anti-export bias. Rather the principal distortion remaining in the trade regime derives from the dispersion of the tariff and export subsidy structure.

Another important policy conclusion that we draw is that the harmonization strategy is significantly inferior to any of the other strategies. This result follows simply from the fact that harmonization to EC tariffs will require a lowering of Turkish tariffs from already low levels, in the presence of export subsidies almost as large as the existing average effective tariff rate. Unilateral tariff elimination in the presence of export subsidies results in a second-best distortion. The export subsidies become the dominant distortion in the trade regime, and the economy becomes too export oriented. We argue, however, that harmonization to the EC tariff structure can be a welfare enhancing policy if accompanied by a policy of removing or reducing export subsidies. The important policy lesson for Turkey from this exercise is that if it intends to proceed with harmonization to the CET of the EC then it is important to accompany that policy with a reduction in export subsidies.

Summarizing, the most important policy conclusion from our analysis concerns the fragility of first-best rules-of-thumb as to the welfare benefits of piecemeal trade policy reforms. In other words, it is not the case that any *partial* movement towards the first-best trade policy for Turkey will result in some fraction of the welfare gains from that first-best package. Of course this is nothing but a restatement of well-known second-best results. What is new, however, is an attempt to assess the quantitative significance of these effects for a Turkey and we are able to gain some insights into which particular distortions have more or less severe second-best effects.

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APPENDIX A:

ALGEBRAIC FORMULATION OF THE MODEL

The model is formulated as a system of nonlinear equations corresponding to the three classes of equilibrium conditions associated with an Arrow-Debreu general equilibrium: price-cost relations for producers, supply-demand balance for commodity and factor markets (including balance of payments), and income-expenditure balance for domestic consumers and government. In SOE these models are generated using the GAMS programming language and solved using the modified Newton (SLCP) algorithm due to Mathiesen [1985]. In this framework a central set of variables (prices, activity levels and income levels) characterize the economic equilibrium.

The version of the SOE model described here includes allowance for non-constant returns to scale and non-competitive pricing. These features are not used in the present study, but are documented here for completeness.

All important notation is summarized in Figure A1.

Technology, Preferences and Market Clearance Conditions

Domestic production is an aggregate of domestic and exported varieties with a constant elasticity of transformation:

$$Y_i = \phi_i(D_i, X_i) = (\alpha_D D_i^{(\epsilon-1)/\epsilon} + \alpha_X X_i^{(\epsilon-1)/\epsilon})^{\epsilon/(\epsilon-1)} \qquad (1)$$

This relationship can be interpreted as implying differences in the technical processes associated with production for domestic and export markets. The elasticity of transformation defined by ϵ_i will be lower for goods which are highly differentiated and higher for goods which are relatively homogeneous. The specification of this elasticity may be influenced by the intended time frame of the analysis. In the short-run it is more difficult to transform plants between domestic and export oriented products.

Imports from different trading partners trade off with domestic varieties in intermediate demand, investment demand and final demand. For simplicity (and due to limitations of data) we assume that the import composition and import-

	Variables
X_i	Export of good i.
D_i	Domestic sales of good i.
M_i	Composite import of good i.
m_{ir}	Import of good i from region r.
S_i	Armington aggregate of domestic supply and imports.
C_i	Private consumer demand for good i.
W	Welfare index for the representative domestic consumer.
L_i	Labor inputs to sector i.
K_i	Capital inputs to sector i.
x_{kj}	Intermediate inputs of good k in sector i.
f_{kj}	Variable input of primary k in sector i.
f^F_{kj}	Fixed input of primary k in sector i.
Y_i	Domestic production of good i.
p_i	Price of domestic produced good i.
π_i	Price of domestic-import good i composite.
w_k	Factor prices k.
τ_T	Replacement tax multiplier on lump-sum transfers.
τ_v	Replacement tax multiplier for factor taxes.
τ_i	Replacement tax multipliers for tariffs.
p^X_i	Export price of good i (exogenous).
p^M_{ir}	Import price of good i from region r(exogenous).
	Parameters
G_i	Government demand for good i from region.
t_{ir}	Import tariff rate on commodity i from region r.
s^P_i	Rate of production subsidy for good i.
s^X_i	Export subsidy rate for good i.
v_i	Tax rate on factor inputs to sector i.
T	Lump-sum tax on consumers.
B	Current account balance (net capital inflows).
a_{ij}	Intermediate input requirements, good i in sector j.
F_k	Primary factor supplies.

Figure A1: Notation

domestic substitution possibilities in investment, intermediate and final demand are identical. Under these conditions we can represent inputs as though they were composed of a single import-domestic aggregate for each commodity. The aggregation of domestic and imported varieties is characterized by a nested constant-elasticity function of domestic and imported goods:

$$S_i \equiv \psi_i(D_i, M_i) = \left(\alpha_D^{1/\sigma} D_i^{(\sigma-1)/\sigma} + \alpha_M^{1/\sigma} M_i^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)} \qquad (2)$$

where M_i represents a composite import from two or more regions r:

$$M_i \equiv \left(\sum_r \beta_{ir} m_{ir}^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)}$$

The market clearance condition for domestic supply balances output from the Armington aggregation function with intermediate, investment and final demand. This condition is:

$$S_i = \sum_j a_{ij} Y_j + G_i + I_i + C_i \qquad (3)$$

in which Y_j is the activity level of sector j, a_{ij} is the input requirements of good i in sector j, and G_i, I_i and C_i are components of final demand associated with government, investment and final consumption.

Variable inputs to production include primary factors as well as intermediate inputs of commodities. These are combined in a linearly homogeneous nested Leontief-CES form:

$$Y_i = \min\left[\frac{x_{1i}}{a_{1i}}, \frac{x_{2i}}{a_{2i}}, \ldots, \frac{x_{ni}}{a_{ni}}, \frac{V_i(f_i) + \sum_k f_{ki}^F}{a_{VA}}\right] \qquad (4)$$

where

$$V_i(f_i) = \left(\sum_k \delta_{ki} f_{ki}^{(\sigma-1)/\sigma}\right)^{\sigma/\sigma-1}$$

In this equation x_{ki} represents intermediate inputs of good k in sector i, f_{ki} is the variable input of primary factor k in sector i, $V_i()$ represents the value-added function for variable factors, f_i represents primary factor inputs to variable cost in sector i, and f_{ki}^F represents the input of factor k to the formation of fixed costs in sector i.

Domestic welfare is defined by consumption levels of market goods:

$$W = U(C_1, \ldots, C_n) \qquad (5)$$

The current account is balanced at international prices (p_i^X and p_i^M), taking into account exogenous capital flows (B):

$$\sum_i p_i^X X_i + B = \sum_r p_{ir}^M m_{ir} \qquad (6)$$

The prices which appear in this equation are exogenous parameters, the international prices of imports and exports. This constraint has an associated variable which is the "real exchange rate". The model, however, contains no monetary instruments and determines only relative prices.

Factor markets always clear with flexible prices:

$$\sum_i f_{ki} + f_{ki}^F = E_k \qquad (7)$$

These only appear for sectors in which there are increasing returns to scale. The factor composition of fixed costs is identical to that of variable costs.

Income-Expenditure Balance

Consumer income includes primary factor earnings plus foreign capital inflows less transfers. Final demand is modelled by budget-constrained utility maximization by a representative agent. The budget constraint is written:

$$\sum_i \pi_i C_i = \sum_k w_k E_k + B - \tau_T T \qquad (8)$$

In this equation w_k represents the market price of primary factor k, B represents the foreign exchange balance and $\tau_T T$ represents the level of lumpsum transfer.

Unlike private households, government demands are held constant in all simulations. The government budget constraint is accommodated through endogenous scaling of one of the three government tax instruments so that revenue balances with expenditure. Government income consists of five components: (i) lumpsum transfers from households (T), (ii) import tariffs (t_{ij}), (iii) value-added taxes on factor inputs to production (ν_i), (iv) less production subsidies (s_i), (v) less export subsidies (s_i^X). The government budget is:

$$\sum_i \pi_i G_i = \tau_t T + \tau_t \sum_{ir} p_{ir}^M t_{ir} m_{ir} + \tau_v \sum_{ik} \nu_i w_k f_{ik} - \sum_i s_i^P \left(p_i D_i + p_i^X X_i \right) - \sum_i s_i^X p_i^X X_i \qquad (9)$$

In the government budget equation parameters which endogenously adjust to balance income and expenditure are: τ_T for lumpsum transfers, τ_t for tariffs, and τ_v for value-added taxes. In any given equilibrium only one of these parameters departs from the default value of unity.

Price-Cost Balance in Competitive Markets

When technology exhibits constant returns to scale producers price at marginal cost. In production the marginal cost of supply for sector i (c_i) is defined by:

$$c_i Y_i = \sum_j \pi_j x_{ji} + (1+\tau_v \nu_i) \sum_k w_k f_{ik} \qquad (10)$$

The competitive market structure with constant returns to scale technology and no barriers to entry drives excess profits to zero. Producers then equate marginal cost with market price gross of subsidy, providing the following zero profit condition:

$$\left(1+s_i^P\right)\left(p_i D_i + p_i^X X_i\right) + p_i^X X_i s_i^X = c_i Y_i \qquad (11)$$

In this equation the first term represents the value of output gross of production subsidy, and the second term captures the effect of the export subsidy.

The import aggregation always equates price with marginal cost. This means that the value of domestic supply equals the cost of domestic inputs plus imports gross of tariffs and rents:

$$\pi_i S_i = p_i D_i + \sum_r \left(1+\tau_i t_{ir}\right) p_{ij}^M m_{ir} \qquad (12)$$

Monopolistic Competition

The competitive equilibrium which follows from free entry and constant returns to scale is incompatible with increasing returns technology. When production involves both fixed and variable costs some alternative to the competitive paradigm must be considered. We consider two market structures, both of which are consistent with IRS: free-entry monopolistic competition, and average cost (Ramsey) pricing.

In free entry monopolistic competition domestic producers set output price sc that marginal revenue equals marginal cost, taking into account the effect of their output on the domestic price level. The number of firms in a given market is determined by the break-even condition, so that in equilibrium the total value of markup revenues exactly balances fixed costs of production. As the economic environment changes, increasing or decreasing markup revenue, the net (long-run) impact is not to change profit but rather to increase or decrease the number of active firms in the industry. The following features of the model structure are important determinants of the nature of competition in the domestic market:

- domestic and imported varieties are imperfect substitutes;
- domestic varieties may be differentiated; and

· demand for the import-domestic aggregate is price-responsive.

In this section we derive the pricing rules followed by domestic producers in this environment.

We begin by presuming that demand for the import-domestic aggregate is represented by the following function: [1]

$$A(p_A) = \bar{A}\, p_A^{-\mu} \tag{13}$$

The Armington aggregate is formed through a constant elasticity aggregation of domestic and imported inputs

$$A = \left(\alpha_D^{(1/\sigma)}\, D^{(\sigma-1)/\sigma} + \alpha_M^{(1/\sigma)}\, M^{(\sigma-1)/\sigma}\right)^{\sigma/(\sigma-1)} \equiv \psi\,(D, M)$$

in which D domestic aggregate represents a constant elasticity aggregate of varieties from each of N domestic firms

$$D = \left[\sum_{i=1}^{N} q_i^{\eta-1/\eta}\right]^{\eta/\eta-1} \equiv g(q) \tag{15}$$

and M is a similar aggregate of imported goods with price index p_M. Let p_A and p_D denote prices of the A and D aggregates, and let p_i denote the price of domestic variety i. A is formed through cost minimization:

$$\begin{aligned} p_A = \min\ & p_D\left(\frac{D}{A}\right) + p_M\left(\frac{M}{A}\right) \\ \text{s.t.}\quad & \\ & f\left(\frac{D}{A}, \frac{M}{A}\right) = 1 \end{aligned} \tag{16}$$

The price index of the domestic aggregate, p_D, is formed in an analogous fashion, $p_D = \min\left(\sum_i p_i q_i \mid g(q) = 1\right)$. The Armington and domestic cost functions have the following associated demand functions: $D(p_D, p_A, A) = \alpha_D \left(\frac{p_A}{p_D}\right)^{\sigma} A$ and $q_i(p_i, p_D, D) = \left(\frac{p_D}{p_i}\right)^{\eta} D$.

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[1] Demand for the domestic-import aggregate arises from four sources: intermediate inputs, government, investment and households. The resulting demand function therefore depends on a number of factors including factor prices to the extent that they affect income. In this section we derive pricing rules assuming a given demand elasticity equal to the benchmark value of μ, as though it were an exogenous parameter.

Both of these functions may be inverted to express price as a function of quantity.

The domestic producer chooses an output quantity q_i which maximizes profit:

$$\Pi(q_i) = p_i q_i - C(q_i) \tag{17}$$

where $C(q_i) = F + c\,q_i$ is the cost function representing both fixed and variable components. Marginal cost is constant at fixed factor prices. Due to general equilibrium effects, however, the cost function will be increasing with output.

The familiar first-order condition equates marginal cost with marginal revenue:

$$\frac{\partial p_i}{\partial q_i} q_i + p_i = c \tag{18}$$

This can be rewritten to derive an expression for the selling price as a markup marginal cost: $p_i = (1+m_i)\,c_i$ where the markup rate m depends on the perceived elasticity of demand. That is, $m_i = -(1 + e_i)^{-1}$ where $e_i = \frac{\partial q_i}{\partial p_i}\frac{p_i}{q_i}$.

The derivation of e_i depends on the producer's anticipation of other domestic producers as well as imports. To compute e_i we begin with the inverse demand function, $p_i(q_i, p_D, D)$, and apply the chain rule:

$$\frac{\partial p_i}{\partial q_i} = \frac{\partial}{\partial q_i}\left[\left[\frac{D}{q_i}\right]^{1/\eta} p_D\right] = -\frac{1}{\eta}\frac{p_i}{q_i} + \frac{1}{\eta}\frac{p_i}{D}\frac{\partial D}{\partial q_i} + \frac{p_i}{p_D}\frac{\partial p_D}{\partial q_i} \tag{19}$$

Under Cournot conjectures the term $\frac{\partial D}{\partial q_i}$ is computed holding q_j fixed for $j \neq i$:

$$\frac{\partial D}{\partial q_i} = \left[\frac{D}{q_i}\right]^{1/\eta} \tag{20}$$

and the term $\frac{\partial p_D}{\partial q_i}$ is computed by applying the chain rule a second time:

$$\frac{\partial p_D}{\partial q_i} = \frac{\partial p_D}{\partial D}\frac{\partial D}{\partial q_i} \tag{21}$$

Combining, we have:

$$\frac{\partial p_i}{\partial q_i}\frac{q_i}{p_i} = -\frac{1}{\eta} + \frac{1}{\eta}\frac{q_i}{D}\left[\frac{D}{q_i}\right]^{1/\eta} + \frac{q_i}{p_D}\left[\frac{D}{q_i}\right]^{1/\eta}\frac{\partial p_D}{\partial D} \qquad (22)$$

Making the substitution $\left(\frac{q_i}{D}\right)^{-1/\eta} = \frac{p_i}{p_D}$, we have:

$$\frac{1}{e_i} = -\frac{1}{\eta} + \frac{1}{\eta}\frac{p_i q_i}{p_D D} + \left[\frac{\partial p_D}{\partial D}\frac{D}{p_D}\right]\frac{p_i q_i}{p_D D} \qquad (23)$$

We assume Cournot behaviour by domestic producers while at the same time assuming that producers regard imports as infinitely elastic at the world price (as consistent with our small open economy assumption). In this case:

$$-\frac{\partial D}{\partial p_D}\frac{p_D}{D} = \sigma + \theta_D(\mu - \sigma) \qquad (24)$$

where $\theta_D = \frac{p_D D}{p_D D + p_M M}$ is the domestic value share in the Armington aggregate. As a check notice that as $\theta_D \rightarrow 1$, $-\frac{\partial D}{\partial p_D}\frac{p_D}{D} \rightarrow \mu$, the price elasticity of demand for A.

With symmetric domestic firms $\frac{p_i q_i}{p_D D} = \frac{1}{N}$, so the perceived elasticity can be written as:[2]

$$-\frac{1}{e_i} = -\frac{\partial p_i}{\partial q_i}\frac{q_i}{p_i} = \frac{1}{\eta} + \left[\frac{1}{\sigma + \theta_D(\mu - \sigma)} - \frac{1}{\eta}\right]\frac{1}{N} \qquad (25)$$

Average Cost Pricing Equilibria

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[2] If on the other hand import quantities are fixed, as might be the case with import quotas, we apply an alternative formulae:

$$\frac{\partial p_D}{\partial D}\frac{D}{p_D} = -\frac{1}{\sigma} + \left[\frac{1}{\sigma} - \frac{1}{\mu}\right]\theta_D$$

and:

$$-\frac{1}{e_i} = \frac{1}{\eta} + \left[\frac{1}{\sigma} - \frac{1}{\eta}\right]\frac{1}{N} + \left[\frac{1}{\mu} - \frac{1}{\sigma}\right]\frac{\theta_D}{N}$$

In order to identify the effect of monopolistic pricing on results we have formulated an alternative to Cournot pricing and monopolistic competition in IRS sectors. Our "contestable markets" model is formulated as though there is a single firm in the industry which prices at a markup on marginal cost which exactly covers fixed costs. Formally, the equilibria which arise here are equivalent to a regulated monopoly which sets price equal to average cost by edict.

The structure of technology is identical for the monopolistic competition and contestable sectors. What is different is the determination of the markup on marginal cost. Under average cost pricing we have:

$$m = \frac{F + c\,Y}{c\,Y} \qquad (26)$$

The fixed cost per firm (F) remains fixed in all simulations while the level of industry output (Y) adjusts so that at price equals average cost the level of supply equals the level of demand.

Pricing for Export Markets

We presume that exports are priced at marginal cost for each of the non-competitive pricing rules.

ADDITIONAL REFERENCES

Mathieson, Lars, "Computation of Economic Equilibria by a Sequence of Linear Complementarity Problems", *Mathematical Programming Study 23* (Amsterdam: North-Holland, 1985).

APPENDIX B:
THE TRADE REGIME IN TURKEY:
A QUANTITATIVE ASSESSMENT OF TARIFF, NONTARIFF BARRIERS AND EXPORT INCENTIVES

In this appendix we provide a quantitative assessment of the trade regime in Turkey as of early 1990.[3] This descriptive assessment is used as an input into our general equilibrium trade policy modelling. We decompose the assessment of the trade regime into three components: non-tariff barriers, tariff barriers (and their alignment with the EC) and export incentives. We conclude that as of early 1990 Turkey has generally eliminated its nontariff barriers. During the period of nontariff barrier reduction, Turkey was increasing its tariff barriers. Since 1988, however, Turkey has also been reducing its tariff barriers.

The magnitude and impact of export incentives in Turkey has been the focus of considerable interest and controversy (see Milanovic [1986], Celasum and Rodrik [1988], Rodrik [1988a], and Arslan and van Wijnbergen [1990]). Consequently, an update on the magnitude of the export incentive regime is also essential in evaluating the overall trade regime.

We note that although there were periods during the 1980s when the official exchange rate was overvalued, as of early 1990 the Turkish lira was convertible. This was reflected by the absence of a black market premium, despite a real appreciation of the lira between 20 and 25 percent in 1989.

1. Non-Tariff Barriers

During the decade of the 1980s, and commencing in earnest at the end of 1983, Turkey gradually and steadily dismantled its extensive system of non-tariff barriers (NTBs).[4] The last few remaining items that were subject to NTBs in 1989 (the "prior permission" list) were freed in 1990.[5] Turkey does retain an import certificate

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[3] We wish to thank Deborah Bateman, Marylou Uy, Michael Klein and Omar Karasapan for the provision of data and helpful comments on the material in this Appendix.

[4] See Baysan and Blitzer [1988] [1991], Rodrik [1988b] and Grais, de Melo and Urata [1986] for earlier discussions of the impact of trade liberalizations in Turkey.

[5] Of course, imports of such as weapons and narcotics are restricted.

and permit system; but neither restrains imports.[6] As of early 1990, Turkey is best thought of as a country without NTBs.

2. Tariff Barriers

Turkey's tariff regime is a complicated system of at least 6 types of duties and surcharges. Moreover, there is an extensive system of exemptions from import taxation. Tables B1 and B2 summarize the exemption structure by sector, and tariff collection by type of import duty. From table B1 one sees that over 97 percent of mining imports are exempt from import taxation. From table B2 one may note that as a result of exemptions total import taxes were 37.2 percent of the value of dutiable imports in 1988, but only 12.5 percent of the value of total imports. While NTBs were being dismantled during the 1984-1988 period, tariff collections as a percentage of dutiable imports steadily rose from 24.8 percent to 37.2 percent, but fell in 1989 to 33.8 percent. In fact, tariffs were progressively lowered through 1989 (see table B3) and into 1990, so that they are lower in early 1990 than the average for 1989.

3. Alignment with the European Communities

Beginning in 1973, Turkey initiated tariff harmonization with the European Communities (EC). This logically implies moving toward zero tariffs against EC imports and moving to the Common External Tariff (CET) against imports from non-EC countries.[7] Products were placed on either a 12 or 22 year list, implying alignment with the EC by either 1985 or 1995. Turkey began postponing its obligations in 1977 and the process remained stalled until 1988.

In 1988 Turkey announced a schedule of customs duty alignment with the EC through 1993. If continued at this same rate, it will bring about full alignment by 1995 (see table B4).[8] With respect to the EC, all tariffs will have to be reduced, but some tariffs against third country suppliers may have to be increased. By and large CET harmonization implies a reduction in the level of nominal tariffs in Turkey.

The principle problem for the alignment process is that the "alignment" just discussed applies only to the

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[6] The certificate, which is issued by the government, need only be requested at the 2 digit level, is granted routinely within two days and is valid for one year. The import permit is granted by an authorized bank.

[7] We discuss in a moment an alternative interpretation of CET harmonization which was adopted by the Turkish government in early discussions of this policy.

[8] The policy is scheduled for reassessment in 1993.

basic customs tariff. There are many import surcharges that are earmarked for special funds.[9] Only partial or no alignment is planned for the various surcharges. Thus, both the Support and Price Stabilization Fund (SPSF) surcharge and the stamp tax will be reduced against the EC from 10 to 6 percent each; as of early 1990, the announced alignment of these surcharges has not taken place on schedule. The Mass Housing Fund (MHF) and the Development and Support Fund (DSF) levies are scheduled to be phased out within a period of five to six years starting in 1993.[10]

On average the basic customs duty is less than one-third of the total import tax paid. Since Turkey has a longstanding relationship with the EC in which it enjoys duty free status on its exports to the EC, the lack of full import tax alignment against EC imports has been a source of annoyance to the EC. During the last year or so, Turkey has considered converting all customs duties and surcharges into a single import tax which will then be set at zero on EC imports and set at the CET on non-EC imports. This plan remains controversial within Turkey, with some government agencies opposing it because of revenue considerations. The concern here is that Turkey has so many exemptions from import taxation that imposing a single tariff rate at the CET may significantly lower overall tariff revenue, as compared to a system in which all imports pay significant surcharges. We illustrate the differences between these two versions of CET harmonization below and in the main text.

4. Export Incentives

Data on incentives to Turkish exports between 1985 and 1988 are summarized in table B5. We note that export subsidies as a percentage of total exports generally declined significantly, from 25 percent of exports in 1986 to 15 percent in 1988. Uy [1990] reports a further decline in export subsidies by 2 percent of the value of exports in 1989.[11]

We decompose incentives to exports into two overall categories: (1) incentives granted through the reduction in taxes that would otherwise be payable to the government; and (2) budgetary transfers from the government to the firm.

Category (1) includes the following:

(a) waiver of payments of customs duties (duty drawback). Exporters who hold encouragement certificates can import duty free provided these imports are less than 40 to 60 per cent of the value of the exports. Holders of these certificates may also obtain foreign exchange at the official exchange rate for their import needs. Given the absence of a foreign exchange premium above the official rate in 1990, the latter right of the export certificate has no value[12].

(b) reduction in the amount of corporate income tax payable. Exporters with more than $250,000 of industrial exports may reduce their taxable income by 18 percent of their export receipts (as of early 1990). Other industries that qualify include fresh fruits and vegetables, tourism revenues and international air services (see Uy [1990] for further details). In 1988 Turkey introduced a value added tax (VAT). Any VAT paid which is related to exports is rebated through the corporate income tax system.

(c) waiver of the payment of indirect taxes (rebates). Commodities were classified into various lists which ostensibly reflected their indirect tax content. These rebates were eliminated after 1988.

Category 2 of subsidies to firms is almost entirely the SPSF. There is a list of 107 commodities that are eligible for subsidies under the SPSF. The government obtains revenues for this fund from a combination of export taxes on major agricultural exports such as hazelnuts, raisins and lamb, and an import surcharge that was 10 percent in 1989 (up from 4 percent in 1986). The government plans to reduce the SPSF import

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[9] See table B2 for their quantitative importance.

[10] Reductions of the MHF and DSF subsidies commenced ahead of schedule in mid-1989.

[11] The calculation for 1989 excludes the customs duty exemptions, so it is not strictly comparable.

[12] In addition, holders of export encouragement certificates may obtain export credit at below market rates of interest. See Arslan and van Wijnbergen [1990].

surcharge by half a percentage point per six months until it reaches 6 percent in 1991.[13]

For the 1980-1984 period, Milanovic (1986) found great disparities in the export incentives depending on the sector; for example the metal products, electrical machinery and non-ferrous metals industries received extremely high subsidies (94, 62 and 49 percent respectively). The system in 1990 is primarily dependent on tax incentives available to any firm (86 percent of the incentives to exports in 1988 were through category 1 tax incentives) which should reduce the dispersion in the export subsidies. The export subsidy rates employed in the study are discussed in the next section.

5. Final Estimates Used in the Model

There are many detailed aspects of the trade regime in Turkey which it is not possible to capture without considerable reconstruction of existing data and/or extensions to the SOE framework. A good example is the way in which tax incentives are used to implement export subsidies. To the extent that these incentives have already been included in the Input-Output table, we would have to reconstruct the affected transactions. Rebates on VAT are one such incentive, and appear implicitly as differences in the VAT rates we observe in the 1985 IO table. Even if we could determine the sectoral values of these incentives, we would need to make the VAT policy instrument in our model a function of the export subsidy policy instrument. At present they are each specified exogenously as data.

Neither of these data or modelling extensions are infeasible. However, we have been obliged to trade-off simplicity of formulation with "reality" in such instances, given the limited resources at our disposal.

Table B6 lists the final estimates for each of the policy instruments that are used in our model. We appreciate that there may be some biases in some of these numbers, and would encourage any reader with "better numbers" to please share them with us! For the present, we simply point out several key features of these estimates in relation to the previous discussion.

First, the VAT rates that we use show a great deal of variation across sectors. One reason for such variation, of course, are the exemptions from the VAT due to the export subsidy scheme just mentioned. Another reason is that the statutory VAT rates are not indeed uniform. However, one further reason for the disparity we observe is that our rates are derived from observed collections data in 1985. The VAT had barely been introduced in Turkey in 1985, and it is known that there were a great many administrative problems with collection procedures. We propose replacing these 1985 imputed rates with more recent data if we can obtain the latter.

Second, the export subsidy rates seem to be a bit "low". Their weighted average, using 1985 exports as weights, is just over 7%. The averages we found from the data reported in Table 5 are much higher than this, specifically 19.4% and 14.8% in 1985 and 1988, respectively. One reason for the discrepancy is that our data do not reflect the tax incentives, which accounted for 94.3% and 86% of all export incentives in 1985 and 1988. These appear elsewhere in our data, as discussed above. Hence one might argue that we should scale up the export subsidy data we do have to reflect the greater impact of export subsidies.

On the other hand, if the data that we do have only reflects budget-related subsidies (using the terminology of table B5) then our average

[13] Statement of Dr. Tigrel, Undersecretary of SPO, Ad Hoc Committee Meeting, Brussels, Dec. 20 and 21, 1988. There are unconfirmed reports that Turkey intends to continue with the progressive lowering of the SPSF import surcharge until it reaches 4 percent. Planned reductions, however, were behind schedule as of early 1990.

level of subsidy is too high, and should be scaled down to around 1 or 2%. Faced with these alternatives, we elected to maintain the values we have since there is a plausible case for scaling them up or down.

Third, the tariff rates seem at face value to be much more dispersed than might be expected from our earlier discussion of the importance of uniform import surcharges. The explanation for this appearance is that Turkey does have considerable dispersion in it's customs duty and in the proportion of imports in each sector that is exempt from any import taxation.

Table B7 decomposes each of these components of the final tariff rate. The second column shows the percentage of imports of this sector that was dutiable (i.e., non-exempt). The third column shows the statutory customs duty. The next four columns report the values of various import surcharges. "Total Duty" is then defined as the sum of each of these surcharges and the customs duty. The "Effective Duty" is then computed as the product of the total duty and the share of the sector's imports that are dutiable. It is this last column which we use as our estimate of the benchmark tariff in our model.

An important operational implication of table B7 is that one should be careful to understand that calling for a "uniform tariff" in our setting requires not only that the customs duty be made uniform but that the share of imports that is dutiable also be made uniform. The latter undoubtedly involves a much more significant change in current practice.

Table B8 lists our estimates of the various interpretations of the policy of harmonization to the CET of the EC. The second column repeats the benchmark tariffs just discussed. The third column lists the nominal CET for 1985 reported in Cawley and Davenport (1988; tables B6 & B7).

The two rival interpretations of harmonization are called CET1 and CET2. CET1 assumes that imports from the EC receive a zero customs duty and that certain surcharges are reduced on them as discussed earlier; the tariff rates shown as CET1-EC are the result. Tariffs on Rest of World (ROW) imports under CET1 are computed by just replacing the customs duty of table B7 with the CET; the tariff rates shown as CET1-ROW then result. Finally, the CET2 interpretation is that the effective duty on EC imports is set to zero but that the effective duty on ROW imports is set equal to the CET.[14]

Table B8 demonstrates that there is a very significant difference in the nominal tariff regime in Turkey depending on which interpretation of CET harmonization is adopted.

ADDITIONAL REFERENCES

Cawley, Richard, and Davenport, Michael, "Partial Equilibrium Calculations of the Impact of Internal market Barriers in the European Community", in European Commission, Studies on the Economics of Integration (Brussels: EC, Series CB-52-88-493-EC-C, 1988).

Celasun, M. and Dani Rodrik, Debt, Adjustment and Growth: Turkey, 1988.

[14] Note that we do not just apply the CET on ROW imports, since the percentage of imports that are dutiable in each sector must be taken into account. For example, the CET on imports of AGM from the ROW is 5.0%, but the share that is dutiable is only 22.3%. Hence the effective duty is 5.0(.223) = 1.1% as shown in the CET2-ROW column.

TABLE B1: Turkey: Analysis of 1988 Imports and Import Exemptions
(Values in Million US$)

	TOTAL IMPORTS		IMPORTS SUBJECT TO DUTIES		DUTY EXEMPT IMPORTS		EXEMPTIONS FROM INCENTIVES	
	Value	% of Total	Value	% of Total	Value	% of Total	Value	% of Exemptions
The Whole Economy	14,339.7	100.0%	4,470.8	31.2%	9,868.8	68.8%	7,347.0	74%
Exc. Crude Petroleum	11,805.4	83.0%	4,447.8	37.4%	7,457.8	62.6%	4,959.1	66%
Agriculture	464.8	3.2%	176.9	38.7%	278.9	61.3%	44.5	16%
Mining	2,597.0	18.1%	73.8	2.8%	2,523.1	97.2%	2,476.8	98%
Manufacturing	11,287.9	78.7%	4,221.1	37.4%	7,066.8	62.6%	4,825.7	68%
		% of MFG						
Consumer Goods (MFG)	1,513.3	13.4%	662.3	43.8%	850.9	56.2%	582.2	68%
Intermed Goods (MFG)	5,760.8	51.0%	2,176.4	37.8%	3,584.4	62.2%	1,713.8	48%
Capital Goods (MFG)	4,013.8	35.6%	1,382.4	34.4%	2,631.4	65.6%	2,529.7	96%
2-Digit ISIC Sectors								
31 Food,Beverages,Tobacco	593.6	5.3%	253.7	42.7%	339.9	57.3%		16%
32 Textiles & Leather	328.6	2.9%	144.4	43.9%	184.2	56.1%		79%
33 Wood, Cork, & Products	35.6	0.3%	16.1	45.3%	19.5	54.7%		100%
34 Paper & Printing	290.9	2.6%	77.4	26.6%	213.5	73.4%		38%
35 Chemicals, Petr, Coal	3,166.8	28.1%	1,422.0	44.9%	1,744.8	55.1%		62%
36 Nonmetallic Minerals	192.5	1.7%	98.0	50.9%	94.5	49.1%		33%
37 Basic Metal Industries	1,885.6	16.7%	497.1	26.4%	1,388.6	73.6%		34%
38 Metal Prods, Machinery	4,752.4	42.1%	1,682.7	35.4%	3,069.7	64.6%		95%
39 Other Manufacturing	41.9	0.4%	29.7	70.9%	12.2	29.1%		78%
3-Digit ISIC Sectors								
311 Food Manufacturing	404.6	3.6%	65.6	16.2%	339.0	83.8%		16%
313 Beverages	19.3	0.2%	18.8	97.1%	0.6	2.9%		55%
314 Tobacco	169.7	1.5%	169.3	99.8%	0.4	0.2%		100%
321 Textiles	271.9	2.4%	131.6	48.4%	140.4	51.6%		100%
322 Wearing Apparel	2.1	0.0%	1.8	84.0%	0.3	16.0%		100%
323 Leather Products	51.1	0.5%	7.7	15.1%	43.4	84.9%		9%
324 Foot Wear	3.5	0.0%	3.4	96.0%	0.1	4.0%		100%
331 Wood, Cork, & Products	26.6	0.2%	14.9	56.1%	11.7	43.9%		100%
332 Wooden Furn & Fixtrs	9.0	0.1%	1.2	13.2%	7.8	86.8%		100%
341 Paper Products	269.0	2.4%	71.6	26.6%	197.4	73.4%		33%
342 Printing & Publishing	21.8	0.2%	5.8	26.7%	16.0	73.3%		100%
351 Industrial Chemicals	2,129.4	18.9%	937.8	44.0%	1,191.7	56.0%		68%
352 Other Chemical Prods	500.5	4.4%	277.1	55.4%	223.5	44.6%		93%
353 Petroleum Refineries	161.8	1.4%	119.1	73.6%	42.7	26.4%		57%
354 Petroleum & Coal Prods	278.4	2.5%	26.7	9.6%	251.7	90.4%		6%
355 Rubber Products	64.8	0.6%	44.4	68.6%	20.4	31.4%		98%
356 Plastic Products Nec	31.9	0.3%	16.9	53.1%	15.0	46.9%		100%
361 Ceramic Products	13.4	0.1%	6.6	49.5%	6.8	50.5%		100%
362 Glass & Glass Products	29.3	0.3%	19.9	68.1%	9.3	31.9%		100%
369 Other Nonmet Min Prods	149.8	1.3%	71.4	47.7%	78.4	52.3%		20%
371 Iron & Steel B-Met Ind	1,487.7	13.2%	378.1	25.4%	1,109.5	74.6%		33%
372 Nonferrous B-Met Ind	398.0	3.5%	119.0	29.9%	279.0	70.1%		36%
381 Metal Products Nec	387.3	3.4%	111.4	28.8%	275.9	71.2%		100%
382 Nonelectric Machinery	2,293.6	20.3%	766.8	33.4%	1,527.0	66.6%		95%
383 Electrical Machinery	1,124.6	10.0%	386.1	34.3%	738.5	65.7%		96%
384 Transport Equipment	676.5	6.0%	262.4	38.8%	414.1	61.2%		98%
385 Scientific Equipment	270.4	2.4%	156.2	57.8%	114.2	42.2%		67%
390 Other Manufacturing	41.9	0.4%	29.7	70.9%	12.2	29.1%		78%

TABLE B2: Summary of Imports and Import Taxes: 1984-1988
(Values in billion Turkish Lira)

	1984	1985	1986	1987	1988	1989 (Prelim.)
GDP AT CURRENT FACTOR COSTS	17,349.1	25,526.1	35,627.8	52,928.6	91,385.2	151,823.8
CIF TOTAL IMPORT VALUE	3,924.7	5,879.8	7,433.4	12,539.4	20,312.0	33,000
% imports subject to duties	29.8%	35.8%	36.9%	34.2%	31.1%	30.0%
IMPORTS SUBJECT TO DUTIES	1,169.5	2,105.0	2,742.9	4,288.5	6,317.0	9,400
REVENUE COLLECTIONS						
TAXES						
Gross Customs Duties (1)	167.1	226.1	345.6	505.7	704.6	727.7
Stamp Duty	18.1	74.2	135.2	300.0	507.1	968.8
Wharf Duty	41.4	62.1	60.6	92.1	129.1	252.4
TOTAL TAXES	226.6	362.4	541.4	897.8	1340.8	1948.9
LEVIES						
SPSF Import Surcharge	29.1	76.6	113.0	203.3	565.3	793.2
MHF/DSF Import Levies	33.9	79.2	174.8	291.0	446.4	607.3
Duties to Invest/FX Revenue Fund	2.1	8.2	53.4	88.4	185.6	0.5
TOTAL LEVIES	65.1	164.0	341.2	582.7	1197.3	1401.0
TOTAL IMPORT TAX REVENUES	291.7	526.4	882.6	1480.5	2538.1	3346.4
Import Revenues/GDP	1.7%	2.1%	2.5%	2.8%	2.8%	2.2%
REVENUES AS % OF TOTAL IMPORTS TAXES						
Gross Customs Duties (1)	4.3%	3.8%	4.6%	4.0%	3.5%	2.2%
Stamp Duty	0.5%	1.3%	1.8%	2.4%	2.5%	2.9%
Wharf Duty	1.1%	1.1%	0.8%	0.7%	0.6%	0.8%
TOTAL TAXES	5.8%	6.2%	7.3%	7.2%	6.6%	5.9%
LEVIES						
SPSF Import Surchargeq	0.7%	1.3%	1.5%	1.6%	2.8%	2.4%
MHF/DSF Import Levies	0.9%	1.3%	2.4%	2.3%	2.2%	1.8%
Duties to Invest/FX Revenue Fund	0.1%	0.1%	0.7%	0.7%	0.9%	—
TOTAL LEVIES	1.7%	2.8%	4.6%	4.6%	5.9%	4.2%
TOTAL IMPORT TAX REVENUES	7.4%	9.0%	11.9%	11.8%	12.5%	10.1%
REVENUES AS % OF IMPORTS PAYING DUTIES TAXES						
Gross Customs Duties (1)	14.3%	10.7%	12.6%	11.8%	11.2%	7.3%
Stamp Duty	1.5%	3.5%	4.9%	7.0%	8.0%	9.8%
Wharf Duty	3.5%	3.0%	2.2%	2.1%	2.0%	2.5%
TOTAL TAXES	19.4%	17.2%	19.7%	20.9%	21.2%	19.7%
LEVIES						
SPSF Import Surcharge	2.5%	3.6%	4.1%	4.7%	8.9%	8.0%
MHF/DSF Import Levies	2.9%	3.8%	6.4%	6.8%	7.1%	6.1%
Duties to Invest/FX Revenue Fund (2)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
TOTAL LEVIES	5.4%	7.4%	10.5%	11.5%	16.0%	14.2%
TOTAL IMPORT TAX REVENUES	24.8%	24.6%	30.2%	32.5%	37.2%	33.8%

Note: (1) Includes revenues collected from municipality tax.
(2) N.A. since imports paying this levy are not included as imports subject to duties.

TABLE B3
Evolution of Turkish Import Tariffs: 1988 to November 3, 1989

	AVERAGE TARIFFS					AVERAGE TARIFF CHANGES				
	1988	1/89	5/89	8/89	11/89	1988-Jan 89	Jan 89-May 89	May 89-Aug 89	Aug 89-Nov 89	1988-Nov 89
The Whole Economy	23.9	25.4	22.5	17.7	10.9	6%	-12%	-21%	-38%	-54%
Agriculture	18.1	16.9	13.4	13.1	10.9	-7%	-21%	-2%	-17%	-40%
Mining	17.4	14.1	14.1	13.0	6.7	-19%	0%	-8%	-48%	-61%
Manufacturing	24.6	26.2	23.3	18.0	11.0	7%	-11%	-23%	-39%	-55%
Consumer Goods (MFG)	34.5	35.3	30.8	21.4	17.4	2%	-13%	-31%	-19%	-50%
Intermed Goods (MFG)	16.6	17.2	16.1	13.4	5.7	4%	-6%	-17%	-57%	-65%
Capital Goods (MFG)	29.8	28.3	24.4	21.7	10.1	-5%	-14%	-11%	-53%	-66%
31 Food,Beverages,Tobacco	29.1	31.7	23.8	22.9	20.2	9%	-25%	-4%	-12%	-31%
32 Textiles & Leather	33.6	34.9	32.8	15.4	13.8	4%	-6%	-53%	-10%	-59%
33 Wood, Cork, & Products	29.1	32.8	31.1	23.4	10.8	13%	-5%	-25%	-54%	-63%
34 Paper & Printing	15.5	18.7	18.3	17.3	4.5	21%	-2%	-5%	-74%	-71%
35 Chemicals, Petr, Coal	15.5	15.5	14.8	13.7	4.8	0%	-5%	-7%	-65%	-69%
36 Nonmetallic Minerals	33.1	33.8	28.2	23.0	16.3	2%	-17%	-18%	-29%	-51%
37 Basic Metal Industries	13.2	11.5	11.5	10.8	4.8	-13%	0%	-6%	-56%	-64%
38 Metal Prods, Machinery	31.0	29.3	25.5	22.0	11.5	-5%	-13%	-14%	-48%	-63%
39 Other Manufacturing	33.8	35.8	28.3	28.0	16.0	6%	-21%	-1%	-43%	-53%
311 Food Manufacturing	28.7	31.3	23.1	22.2	19.4	9%	-26%	-4%	-13%	-32%
Beverages	37.1	39.6	37.4	37.0	36.0	7%	-6%	-1%	-3%	-3%
314 Tobacco	25.0	25.0	25.0	25.0	25.0	0%	0%	0%	0%	0%
321 Textiles	33.1	34.2	32.6	11.8	11.5	3%	-5%	-64%	-3%	-65%
322 Wearing Apparel	41.4	40.6	39.4	25.9	24.4	-2%	-3%	-34%	-6%	-41%
323 Leather Products	18.2	28.9	28.9	28.6	15.4	59%	0%	-1%	-46%	-15%
324 Foot Wear	31.7	37.6	20.0	20.0	15.0	19%	-47%	0%	-25%	-53%
331 Wood, Cork, & Products	26.3	30.2	30.2	23.7	9.5	15%	0%	-22%	-60%	-64%
332 Wooden Furn & Fixtrs	50.0	48.3	36.6	21.7	18.3	-3%	-24%	-41%	-16%	-63%
341 Paper Products	15.4	18.7	18.6	17.3	3.3	21%	-1%	-7%	-81%	-79%
342 Printing & Publishing	16.0	18.7	17.3	17.4	8.3	17%	-7%	1%	-52%	-48%
351 Industrial Chemicals	12.3	12.4	12.4	11.4	2.0	1%	0%	-8%	-82%	-84%
352 Other Chemical Prods	22.9	18.1	17.7	15.7	7.9	-21%	-2%	-11%	-50%	-66%
353 Petroleum Refineries	15.1	13.9	13.9	13.9	9.5	-8%	0%	0%	-32%	-37%
354 Petroleum & Coal Prods	10.9	16.9	16.9	16.9	6.5	55%	0%	0%	-62%	-40%
355 Rubber Products	36.0	33.9	33.9	32.5	13.0	-6%	0%	-4%	-60%	-64%
356 Plastic Products Nec	40.0	21.8	15.7	15.3	11.2	-45%	-28%	-3%	-27%	-72%
361 Ceramic Products	35.7	37.2	33.4	23.6	16.0	4%	-10%	-29%	-32%	-55%
362 Glass & Glass Products	36.0	37.6	29.2	22.3	16.8	4%	-22%	-24%	-25%	-53%
369 Other Nonmet Min Prods	30.1	28.9	25.9	23.6	16.0	-4%	-10%	-9%	-32%	-47%
371 Iron & Steel B-Met Ind	11.9	10.5	10.5	10.4	2.7	-12%	0%	-1%	-74%	-78%
372 Nonferrous B-Met Ind	14.3	13.5	13.4	11.8	8.6	-6%	-1%	-12%	-28%	-40%
381 Metal Products Nec	39.3	35.8	31.8	26.2	16.4	-9%	-11%	-18%	-37%	-58%
382 Nonelectric Machinery	32.2	31.7	25.8	23.9	12.1	-2%	-19%	-7%	-49%	-62%
383 Electrical Machinery	26.5	23.6	21.9	19.4	9.2	-11%	-7%	-11%	-53%	-65%
384 Transport Equipment	31.4	32.8	30.5	25.3	15.1	4%	-7%	-17%	-40%	-52%
Scientific Equipment	23.2	20.9	18.2	13.0	4.5	-10%	-13%	-29%	-65%	-80%
Other Manufacturing	33.8	35.8	28.3	28.0	16.0	6%	-21%	-1%	-43%	-53%

TABLE B4
TURKEY - ANNOUNCED TARIFF REDUCTIONS

(a) Schedule towards zero tariff rates with EEC Countries

	12-Year List Reductions		22-Year List Reductions	
Year	Annual	Total	Annual	Total
1989	10%	40%		10% 30%
1990	10%	50%		10% 40%
1991	10%	60%		10% 50%
1992	10%	70%		10% 60%
1993**	10%	80%		10% 70%
1994**	10%	90%		10% 80%
1995**	10%	100%	10%	100%

(b) Schedule towards harmonization with the CET

	12-Year List Adjustments		22-Year List Adjustments	
Year	Annual	Total	Annual	Total
1989	20%	20%	20%	20%
1990	0%	20%	0%	20%
1991	20%	40%	0%	20%
1992	0%	40%	20%	40%
1993**	40%	80%	0%	40%
1994**	0%	80%	40%	80%
1995**	20%	100%	20%	100%

** The schedules for 1993-1995 have not been announced. These estimate are good guesses based on discussions with SPO.

TABLE 63
Export Incentives

		1985	1986	1987	1988
Total Exports	($000)	7,958,100	7,456,600	10,190,100	11,662,071
Tax Incentives:					
Rebates (VAT)	(TL mns)	287,378	281,601	437,207	674,902
	($000)	554,420	420,677	510,947	476,391
		(35.9)	(22.4)	(21.6)	(27.6)
Corporate Tax Reduction	(TL mns)	76,600	129,700	357,600	677,859
	($000)	147,779	193,756	418,147	478,549
		(9.6)	(10.3)	(17.7)	27.7)
Custom Duty Exemption	(TL mns)	391,818	693,588	1,001,193	748,747
	($000)	755,909	1,036,104	1,170,056	528,593
		(48.9)	(55.1)	(49.6)	(30.6)
Total Tax Related	($000)	1,458,108	1,650,537	2,099,150	1,483,533
		(94.3)	(87.7)	(88.9)	(86.0)
Budget Related Subsidies:					
SPSF	(TL mns)	0	8,102	145,500	330,347
	($000)	0	12,103	170,040	233,215
			(0.6)	(7.2)	(13.5)
RUSP	(TL mns)				
	($000)				
Total Subsidies from EBFs	($000)	87,838	230,522	261,453	241,366
		(5.7)	(12.3)	(11.1)	(14.0)
Total Incentives	($000)	1,545,946	1,881,058	2,360,603	1,724,899
		(100)	(100)	(100)	(100)
Incentives/Exports		19.4	25.2	23.2	14.8
Exchange Rate	(TL/$US)	518.3	669.4	855.7	1416.5

Figures in parenthesis are shares in total incentives.

TABLE B6

Final Estimates of Policy Instruments

(expressed in percentages)

ID	Sector	1985 Tariffs	1989 Tariffs	Export Subsidies	VAT	Production Subsidies
AGR	Agriculture	4.1	6.0		0.9	4.2
AIR	Air Transport				2.3	
ALC	Alcoholic Beverages	22.0	72.3	8.2	4.7	
ANI	Animal Husbandry	15.6	6.0		0.9	
APP	Wearing Apparel	8.3	22.8	13.5	12.8	
BLD	Building Construction				16.5	
CEM	Cement	3.9	2.6	18.0	7.5	
CHM	Other Chemical Products	19.8	15.7	15.7	11.4	2.4
COL	Coal Mining	0.7	0.7		7.8	3.4
COM	Communication	2.5	6.3	2.8	2.0	
CON	Other Construction				4.5	
ELE	Electricity				3.6	2.0
ELM	Electrical Machinery	35.3	11.0	29.7	9.4	
FAB	Fabricated Metal Products	46.4	10.0	69.7	12.8	
FIN	Financial Institutions & Insurance				9.7	
FIS	Fisheries	23.5	34.9		0.3	
FOR	Forestry	20.5	3.9		1.1	
FRT	Fertilizers	1.3	2.5	15.7	2.5	0.9
GAS	Gas Manufacture & Waterworks				3.4	
GLS	Glass & Glass products	63.0	31.8	16.9	5.2	
IRN	Iron & Steel	16.3	4.6	21.4	20.1	
LND	Other Land Transport				3.6	0.8
MAC	Machinery except Electrical	20.2	10.5	9.6	6.0	0.6
MEA	Meat Processing	13.7	4.2	8.2	1.8	
OFP	Manufacture of Other Food Products	38.7	30.1	8.2	15.0	
OMP	Other Non-metallic Mineral Production	27.1	32.5		9.5	
OWN	Ownership of Dwellings				2.0	
PPS	Personal & Professional Services	0.6			18.9	
PUB	Public Services					
REF	Petroleum Refineries	150.7	16.2		15.7	
RES	Restaurants & Hotels				9.2	
RUB	Rubber Products	49.8	25.3	20.0	7.7	
SUG	Sugar	16.9	32.3	8.2	8.4	9.0
TEX	Textiles	26.2	19.4	13.5	14.1	
TOB	Tobacco	52.1	57.3		2.4	
TRD	Wholesale & Retail Trade				10.5	
VEG	Vegetable & Animal Oils & Fats	2.9	3.9	8.2	12.1	0.6
VEH	Land Transport Vehicles & Equipment	24.6	20.1	15.1	25.8	
WAT	Water Transport				2.3	2.8
WOO	Wood & Cork Products	23.0	13.7	1.6	13.6	

TABLE 67

Components of the Effective Tariff Rate in Turkey

	Percent Dutiable	Customs Duty	Surcharges			Total MHF-DSF	Effective Duty	Duty
			Stamp	SPSF	Wharf			
AGM	22.3	2.5	10.0	10.0	4.0	8.3	34.8	7.8
AGR	17.8	1.2	10.0	10.0	4.0	8.3	33.5	6.0
ALC	100.0	40.0	10.0	10.0	4.0	8.3	72.3	72.3
ANI	17.8	1.2	10.0	10.0	4.0	8.3	33.5	6.0
APP	72.2	17.3	10.0	10.0	4.0	8.3	49.6	35.8
BEV	78.6	30.4	10.0	10.0	4.0	8.3	62.7	49.3
CEM	8.1	0.1	10.0	10.0	4.0	8.3	32.4	2.6
CHM	49.3	0.8	10.0	10.0	4.0	8.3	33.2	16.4
COL	5.0		10.0	10.0	4.0	8.3	32.3	1.6
CRU	0.8		10.0	10.0	4.0	8.3	32.3	0.2
DRG	8.2	0.9	10.0	10.0	4.0	8.3	33.2	2.7
ELM	31.8	2.4	10.0	10.0	4.0	8.3	34.7	11.0
FAB	27.5	4.1	10.0	10.0	4.0	8.3	36.4	10.0
FIB	82.5	10.0	10.0	10.0	4.0	8.3	42.3	34.9
FOO	53.5	8.0	10.0	10.0	4.0	8.3	40.3	21.6
FOR	12.0	0.4	10.0	10.0	4.0	8.3	32.7	3.9
FRN	27.3	5.4	10.0	10.0	4.0	8.3	37.7	10.3
FRT	7.7	0.4	10.0	10.0	4.0	8.3	32.7	2.5
FRU	96.7	16.7	10.0	10.0	4.0	8.3	49.0	47.3
FUR	6.4	0.7	10.0	10.0	4.0	8.3	33.0	2.1
GIN	34.2	0.7	10.0	10.0	4.0	8.3	33.0	11.3
GLS	74.2	10.5	10.0	10.0	4.0	8.3	42.6	31.6
GRN	7.4	0.1	10.0	10.0	4.0	8.3	32.4	2.4
IRN	13.3	0.1	10.0	10.0	4.0	8.3	32.4	4.3
IRO	17.5	0.1	10.0	10.0	4.0	8.3	32.4	5.7
MAC	27.5	2.5	10.0	10.0	4.0	8.3	34.8	9.6
MEA	12.8	0.2	10.0	10.0	4.0	8.3	32.5	4.2
NFM	18.4	0.6	10.0	10.0	4.0	8.3	32.9	6.0
NFO	7.9	0.1	10.0	10.0	4.0	8.3	32.4	2.6
NMM	16.5	0.2	10.0	10.0	4.0	8.3	32.5	5.4
OFP	68.7	10.3	10.0	10.0	4.0	8.3	42.6	29.3
OMI	51.9	3.6	10.0	10.0	4.0	8.3	35.9	18.6
OMP	79.7	8.5	10.0	10.0	4.0	8.3	40.8	32.5
OTE	7.1	0.1	10.0	10.0	4.0	8.3	32.4	2.3
PAP	38.8	0.9	10.0	10.0	4.0	8.3	33.2	12.9
PET	27.2	1.5	10.0	10.0	4.0	8.3	33.8	9.2
PLS	57.6	7.2	10.0	10.0	4.0	8.3	39.5	22.8
PRI	34.9	4.3	10.0	10.0	4.0	8.3	36.6	12.8
REF	49.8	0.3	10.0	10.0	4.0	8.3	32.6	16.2
RRE	12.1	1.7	10.0	10.0	4.0	8.3	34.0	4.1
RUB	64.5	7.0	10.0	10.0	4.0	8.3	39.3	25.3
SHP	7.3	1.2	10.0	10.0	4.0	8.3	33.5	2.4
STO	64.8	4.7	10.0	10.0	4.0	8.3	37.0	24.0
SUG	100.0		10.0	10.0	4.0	8.3	32.3	32.3
TEX	51.7	5.4	10.0	10.0	4.0	8.3	37.7	19.5
TOB	100.0	25.0	10.0	10.0	4.0	8.3	57.3	57.3
VEG	5.8	0.1	10.0	10.0	4.0	8.3	32.4	1.8
VEH	68.4	9.8	10.0	10.0	4.0	8.3	42.1	28.8
WOO	54.6	3.8	10.0	10.0	4.0	8.3	35.9	19.6

TABLE B8
Effective Tariff Under Alternative CET Harmonization Policies

	Benchmark	CET	CET1-EC	CET1-ROW	CET2-ROW
AGM	7.8	5.0	5.4	8.3	1.1
AGR	6.0			4.3	5.7
ALC	72.3	15.0	24.3	47.3	15.0
ANI	6.0			4.3	5.7
APP	35.8	12.5	17.5	32.3	9.0
BEV	49.3	10.0	19.1	33.2	7.9
CEM	2.6			2.0	2.6
CHM	16.4	6.5	12.0	19.1	3.2
COL	1.6			1.2	1.6
CRU	0.3			0.2	0.3
DRG	2.7	6.5	2.0	3.2	0.5
ELM	11.0	5.5	7.7	12.0	1.7
FAB	10.0	5.6	6.7	10.4	1.5
FIS	34.9		20.0	26.6	
FOO	21.6	10.0	13.0	22.6	5.3
FOR	3.9			2.9	3.9
FRN	10.3	4.8	6.6	10.1	1.3
FRT	2.5			1.9	2.5
FRU	47.4	7.0	23.5	38.0	6.8
FUR	2.1	7.5	1.6	2.5	0.5
GIN	11.3	10.0	8.3	14.5	3.4
GLS	31.8	4.0	18.0	26.9	3.0
GRN	2.4			1.8	2.4
IRN	4.3	3.0	3.2	4.7	0.4
IRO	5.7	3.0	4.3	6.2	0.5
MAC	9.6	5.0	6.7	10.3	1.4
MEA	4.2	20.0	3.1	6.7	2.6
NFM	6.1	3.0	4.5	6.5	0.6
NFO	2.6	3.0	1.9	2.8	0.2
NMM	5.4	5.0	4.0	6.2	0.8
OFP	29.3	16.5	16.7	33.5	11.3
OMI	18.6	5.3	12.6	19.5	2.8
OMP	32.5		19.4	25.7	
OTE	2.3	6.5	1.7	2.8	0.5
PAP	12.9	5.5	9.4	14.7	2.1
PET	9.2			6.6	8.8
PLS	22.8	8.0	14.0	23.2	4.6
PRI	12.8	2.7	8.5	12.2	0.9
REF	16.2		12.1	16.1	
RRE	4.1	6.5	2.9	4.7	0.8
RUB	25.3	6.3	15.7	24.9	4.1
SHP	2.4	6.5	1.8	2.8	0.5
STO	24.0	5.0	15.7	24.2	3.2
SUG	32.3	80.0	24.3	112.3	80.0
TEX	19.5	10.0	12.6	21.9	5.2
TOB	57.3	30.0	24.3	62.3	30.0
VEG	1.8	15.0	1.4	2.6	0.8
VEH	28.8	6.5	16.6	26.5	4.4
WOO	19.6	5.2	13.3	20.5	2.8

APPENDIX C:

CALIBRATION OF THE MODEL

1. Data Sources

The most important dataset for our purposes is the 1985 Input-Output table for Turkey obtained from the State Planning Organization of Turkey. This IO table identifies the following 64 sectors, listed below with their three-letter acronym:

AGM	Agricultural machinery & equipment
AGR	Agriculture
AIR	Air transport
ALC	Alcoholic beverages
ANI	Animal Husbandry
APP	Wearing apparel
BEV	Soft drinks & carbonated water
BLD	Building construction
CEM	Cement
CHM	Other chemical products
COL	Coal mining
COM	Communication
CON	Other construction
CRU	Crude Petroleum & natural gas
DRG	Drugs & medicine
ELE	Electricity
ELM	Electrical machinery
FAB	Fabricated metal products
FIN	Financial institutions & insurance
FIS	Fisheries
FOO	Footwear
FOR	Forestry
FRN	Wood furniture & fixtures
FRT	Fertilizers
FRU	Fruits & vegetables processing
FUR	Leather & fur products
GAS	Gas manufacture & waterworks
GIN	Ginning
GLS	Glass & glass products
GRN	Grain mill products
IRN	Iron & steel
IRO	Iron ore mining
LND	Other land transport
MAC	Machinery except electrical
MEA	Meat processing
NFM	Non-ferrous metal
NFO	Non-ferrous ore mining
NMM	Non-metallic mineral mining
OFP	Manufacture of other food production
OMI	Other manufacturing industries
OMP	Other non-metallic mineral production
OTE	Other transport equipment
OWN	Ownership of dwellings
PAP	Paper & paper products
PET	Petroleum & coal products
PLS	Plastic products
PPS	Personal & professional services
PRI	Printing & publishing
PUB	Public services
REF	Petroleum refineries
RES	Restaurants & hotels
RLW	Railway transport
RRE	Railroad equipment

RUB	Rubber products
SHP	Shipbuilding & repairing
STO	Stone quarrying
SUG	Sugar
TEX	Textiles (excl. ginning)
TOB	Tobacco
TRD	Wholesale & retail trade
VEG	Vegetable & animal oils & fats
VEH	Land transport vehicles & equipment
WAT	Water transport
WOO	Wood & cork products

There are a large number of sectors identified here that are minuscule in terms of their contribution to total value added. We elected to aggregate 24 of these sectors with other sectors, using our own priors as to which sectors they would be best aggregated with. The resulting mapping, indicating aggregated sector and sector aggregated to, is as follows:

CRU --> COL Crude Petroleum & natural gas
IRO --> COL Iron ore mining
NFO --> COL Non-ferrous ore mining
NMM --> COL Non-metallic mineral mining
STO --> COL Stone quarrying
FRU --> VEG Fruits & vegetables processing
GRN --> VEG Grain mill products
BEV --> OFP Soft drinks & carbonated water
GIN --> TEX Ginning
FUR --> APP Leather & fur products
FOO --> APP Footwear
FRN --> WOO Wood furniture & fixtures
PAP --> WOO Paper & paper products
PRI --> COM Printing & publishing
DRG --> CHM Drugs & medicine
PET --> CHM Petroleum & coal products
PLS --> CHM Plastic products
NFM --> IRN Non-ferrous metal
AGM --> MAC Agricultural machinery & equipme
SHP --> MAC Shipbuilding & repairing
RRE --> VEH Railroad equipment
OTE --> VEH Other transport equipment
OMI --> MAC Other manufacturing industries
RLW --> LND Railway transport.

Thus we see, for example, that the CRU, IRO, NFO and NMM sectors are all added to the COL sector in the 40-sector aggregation used throughout. Our final aggregation consists of the following sectors:

AGR	Agriculture
AIR	Air transport
ALC	Alcoholic beverages
ANI	Animal Husbandry
APP	Wearing apparel
BLD	Building construction
CEM	Cement
CHM	Other chemical products
COL	Coal mining
COM	Communication
CON	Other construction
ELE	Electricity

ELM	Electrical machinery
FAB	Fabricated metal products
FIN	Financial institutions & insurance
FIS	Fisheries
FOR	Forestry
FRT	Fertilizers
GAS	Gas manufacture & waterworks
GLS	Glass & glass products
IRN	Iron & steel
LND	Other land transport
MAC	Machinery except electrical
MEA	Meat processing
OFP	Manufacture of other food production
OMP	Other non-metallic mineral production
OWN	Ownership of dwellings
PPS	Personal & professional services
PUB	Public services
REF	Petroleum refineries
RES	Restaurants & hotels
RUB	Rubber products
SUG	Sugar
TEX	Textiles (excl. ginning)
TOB	Tobacco
TRD	Wholesale & retail trade
VEG	Vegetable & animal oils & fats
VEH	Land transport vehicles & equipment
WAT	Water transport
WOO	Wood & cork products

2. Elasticities

The text explained the sources for each of the elasticities in the model. The specific values emplotyed are listed below. ETRN is the elasticity of transformation between domestic & exports. ESUBKL is the factor substitution elasticity. ESUBDD is the product differentiation substitution elasticity. ESUBDM is the domestic-imports substitution elasticity. ESUBMM is the imports-by-source substitution elasticity. MU is the price elasticity of the Armington aggregate.

Sector	ETRN	ESUBKL	ESUBDD	ESUBDM	ESUBMM	MU
AGR	2.900	0.945	10.000	2.000	5.000	2.000
AIR	2.900	1.884	10.000	2.000	5.000	2.000
ALC	2.900	0.945	10.000	2.100	5.000	2.000
ANI	2.900	0.945	10.000	2.000	5.000	2.000
APP	2.900	0.927	10.000	3.400	5.000	2.000
BLD	2.900	1.988	10.000	2.000	5.000	2.000
CEM	2.900	0.958	10.000	0.800	5.000	2.000
CHM	2.900	1.009	10.000	1.800	5.000	2.000
COL	2.900	0.426	10.000	0.500	5.000	2.000
COM	2.900	1.988	10.000	2.000	5.000	2.000
CON	2.900	1.988	10.000	2.000	5.000	2.000
ELE	2.900	1.884	10.000	2.000	5.000	2.000
ELM	2.900	0.931	10.000	1.300	5.000	2.000
FAB	2.900	0.911	10.000	1.500	5.000	2.000
FIN	2.900	2.055	10.000	2.000	5.000	2.000
FIS	2.900	0.945	10.000	2.000	5.000	2.000
FOR	2.900	0.945	10.000	2.000	5.000	2.000
FRT	2.900	1.009	10.000	1.400	5.000	2.000
GAS	2.900	1.884	10.000	2.000	5.000	2.000
GLS	2.900	0.958	10.000	1.400	5.000	2.000
IRN	2.900	0.911	10.000	0.500	5.000	2.000
LND	2.900	1.884	10.000	2.000	5.000	2.000

MAC	2.900	1.202	10.000	0.500	5.000	2.000
MEA	2.900	0.945	10.000	0.500	5.000	2.000
OFP	2.900	0.945	10.000	0.500	5.000	2.000
OMP	2.900	0.958	10.000	0.800	5.000	2.000
OWN	2.900	1.988	10.000	2.000	5.000	2.000
PPS	2.900	2.055	10.000	2.000	5.000	2.000
PUB	2.900	1.988	10.000	2.000	5.000	2.000
REF	2.900	0.293	10.000	0.340	5.000	2.000
RES	2.900	3.125	10.000	2.000	5.000	2.000
RUB	2.900	0.972	10.000	1.300	5.000	2.000
SUG	2.900	0.945	10.000	2.000	5.000	2.000
TEX	2.900	0.927	10.000	2.000	5.000	2.000
TOB	2.900	0.839	10.000	2.000	5.000	2.000
TRD	2.900	1.283	10.000	2.000	5.000	2.000
VEG	2.900	0.945	10.000	1.700	5.000	2.000
VEH	2.900	1.884	10.000	2.000	5.000	2.000
WAT	2.900	1.884	10.000	2.000	5.000	2.000
WOO	2.900	0.745	10.000	2.000	5.000	2.000

APPENDIX D:

SENSITIVITY ANALYSIS OF RESULTS

In this appendix we document the systematic sensitivity analysis of our simulation results. The statistical procedures employed are those developed by Harrison and Vinod [1992] and implemented in the MPSS software developed by Harrison [1990]. Essentially these procedures amount to a Monte Carlo simulation exercise in which a wide range of elasticities are independently and simultaneously perturbed from their benchmark values. These perturbations follow prescribed distributions, such as a t distribution with a specified standard deviation and degrees of freedom, or a uniform distribution over a specified range. The exact distributional assumptions used are documented below in a file which is used by the MPSS software to set up the Monte Carlo simulations. For each Monte Carlo run we solve the counter-factual policy with the selected set of elasticities. This process is repeated until we arrive at the desired sample size, in our case 1000. The results are then tabulated as a distribution, with equal weight being given (by construction) to each Monte Carlo run. The upshot is a probability distribution defined over the endogenous variables of interest. In our case we focus solely on the welfare impacts of each policy.

The exact distributional assumptions we used have been described in the main text. Exact documentation is provided by the following "SSA" file, to use the jargon of the software MPSS described in Harrison [1990]. In the interests of space we will not explain how to interpret this file. To a large degree it is reasonably self-explanatory, and to the extent that it is not the reader can consult Harrison [1990] and Harrison and Vinod [1992]. The file is as follows:

```
$SAMPLE: 1000
$MPS: upold mps600
$MAPMEM: NUL
$SAVE:
$INTEGRATE: 0 1.073
$HISTOGRAM: 15
$CINTERVALS: 50 55 60 65 70 75 80 85 90 95 100
$PERCENT: FALSE
$SCRATCH: D:
COMMODITY ... u
COMMODITY ... f.L
COMMODITY ... f.K
COMMODITY ... va.AGR
COMMODITY ... va.AIR
COMMODITY ... va.ALC
COMMODITY ... va.ANI
COMMODITY ... va.APP
COMMODITY ... va.BLD
COMMODITY ... va.CEM
COMMODITY ... va.CHM
COMMODITY ... va.COL
COMMODITY ... va.COM
COMMODITY ... va.CON
COMMODITY ... va.ELE
COMMODITY ... va.ELM
COMMODITY ... va.FAB
COMMODITY ... va.FIN
COMMODITY ... va.FIS
COMMODITY ... va.FOR
COMMODITY ... va.FRT
COMMODITY ... va.GAS
COMMODITY ... va.GLS
COMMODITY ... va.IRN
COMMODITY ... va.LND
```

```
COMMODITY  ... va.MAC
COMMODITY  ... va.MEA
COMMODITY  ... va.OFP
COMMODITY  ... va.OMP
COMMODITY  ... va.OWN
COMMODITY  ... va.PPS
COMMODITY  ... va.PUB
COMMODITY  ... va.REF
COMMODITY  ... va.RES
COMMODITY  ... va.RUB
COMMODITY  ... va.SUG
COMMODITY  ... va.TEX
COMMODITY  ... va.TOB
COMMODITY  ... va.TRD
COMMODITY  ... va.VEG
COMMODITY  ... va.VEH
COMMODITY  ... va.WAT
COMMODITY  ... va.WOO
COMMODITY  ... gc
COMMODITY  ... fx
COMMODITY  ... nvk
COMMODITY  ... a.AGR
COMMODITY  ... a.AIR
COMMODITY  ... a.ALC
COMMODITY  ... a.ANI
COMMODITY  ... a.APP
COMMODITY  ... a.BLD
COMMODITY  ... a.CEM
COMMODITY  ... a.CHM
COMMODITY  ... a.COL
COMMODITY  ... a.COM
COMMODITY  ... a.CON
COMMODITY  ... a.ELE
COMMODITY  ... a.ELM
COMMODITY  ... a.FAB
COMMODITY  ... a.FIN
COMMODITY  ... a.FIS
COMMODITY  ... a.FOR
COMMODITY  ... a.FRT
COMMODITY  ... a.GAS
COMMODITY  ... a.GLS
COMMODITY  ... a.IRN
COMMODITY  ... a.LND
COMMODITY  ... a.MAC
COMMODITY  ... a.MEA
COMMODITY  ... a.OFP
COMMODITY  ... a.OMP
COMMODITY  ... a.OWN
COMMODITY  ... a.PPS
COMMODITY  ... a.PUB
COMMODITY  ... a.REF
COMMODITY  ... a.RES
COMMODITY  ... a.RUB
COMMODITY  ... a.SUG
COMMODITY  ... a.TEX
COMMODITY  ... a.TOB
COMMODITY  ... a.TRD
COMMODITY  ... a.VEG
COMMODITY  ... a.VEH
COMMODITY  ... a.WAT
COMMODITY  ... a.WOO
COMMODITY  ... c.AGR
COMMODITY  ... c.AIR
COMMODITY  ... c.ALC
COMMODITY  ... c.ANI
COMMODITY  ... c.APP
COMMODITY  ... c.BLD
COMMODITY  ... c.CEM
COMMODITY  ... c.CHM
COMMODITY  ... c.COL
COMMODITY  ... c.COM
COMMODITY  ... c.ELE
COMMODITY  ... c.ELM
COMMODITY  ... c.FAB
COMMODITY  ... c.FIN
COMMODITY  ... c.FIS
COMMODITY  ... c.FOR
COMMODITY  ... c.FRT
COMMODITY  ... c.GAS
COMMODITY  ... c.GLS
COMMODITY  ... c.IRN
COMMODITY  ... c.LND
COMMODITY  ... c.MAC
COMMODITY  ... c.MEA
COMMODITY  ... c.OFP
COMMODITY  ... c.OMP
COMMODITY  ... c.PPS
COMMODITY  ... c.REF
COMMODITY  ... c.RES
COMMODITY  ... c.RUB
COMMODITY  ... c.SUG
COMMODITY  ... c.TEX
COMMODITY  ... c.TOB
COMMODITY  ... c.TRD
COMMODITY  ... c.VEG
COMMODITY  ... c.VEH
COMMODITY  ... c.WAT
COMMODITY  ... c.WOO
PRODUCTION ... I        s: 0.000
PRODUCTION ... I        a: 0.000
PRODUCTION ... I        b: 0.000
PRODUCTION ... I        c: 0.000
PRODUCTION ... I        d: 0.000
PRODUCTION ... I        t: 0.000
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PRODUCTION ... Y.AGR    a: 0.000
PRODUCTION ... Y.AGR    b: 0.000
PRODUCTION ... Y.AGR    c: 0.000
PRODUCTION ... Y.AGR    d: 0.000
PRODUCTION ... Y.AGR    t: 2.900  n 1.3 5
PRODUCTION ... Y.AIR    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.AIR    a: 0.000
PRODUCTION ... Y.AIR    b: 0.000
PRODUCTION ... Y.AIR    c: 0.000
PRODUCTION ... Y.AIR    d: 0.000
PRODUCTION ... Y.AIR    t: 2.900  n 1.3 5
PRODUCTION ... Y.ALC    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.ALC    a: 0.000
PRODUCTION ... Y.ALC    b: 0.000
PRODUCTION ... Y.ALC    c: 0.000
PRODUCTION ... Y.ALC    d: 0.000
PRODUCTION ... Y.ALC    t: 2.900  n 1.3 5
PRODUCTION ... Y.ANI    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.ANI    a: 0.000
PRODUCTION ... Y.ANI    b: 0.000
PRODUCTION ... Y.ANI    c: 0.000
PRODUCTION ... Y.ANI    d: 0.000
PRODUCTION ... Y.ANI    t: 2.900  n 1.3 5
PRODUCTION ... Y.APP    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.APP    a: 0.000
PRODUCTION ... Y.APP    b: 0.000
PRODUCTION ... Y.APP    c: 0.000
PRODUCTION ... Y.APP    d: 0.000
PRODUCTION ... Y.APP    t: 2.900  n 1.3 5
PRODUCTION ... Y.BLD    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.BLD    a: 0.000
PRODUCTION ... Y.BLD    b: 0.000
PRODUCTION ... Y.BLD    c: 0.000
PRODUCTION ... Y.BLD    d: 0.000
PRODUCTION ... Y.BLD    t: 2.900  n 1.3 5
PRODUCTION ... Y.CEM    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.CEM    a: 0.000
PRODUCTION ... Y.CEM    b: 0.000
PRODUCTION ... Y.CEM    c: 0.000
PRODUCTION ... Y.CEM    d: 0.000
PRODUCTION ... Y.CEM    t: 2.900  n 1.3 5
PRODUCTION ... Y.CHM    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.CHM    a: 0.000
PRODUCTION ... Y.CHM    b: 0.000
PRODUCTION ... Y.CHM    c: 0.000
PRODUCTION ... Y.CHM    d: 0.000
PRODUCTION ... Y.CHM    t: 2.900  n 1.3 5
PRODUCTION ... Y.COL    s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.COL    a: 0.000
```

```
PRODUCTION ... Y.COL    b: 0.000
PRODUCTION ... Y.COL    c: 0.000
PRODUCTION ... Y.COL    d: 0.000
PRODUCTION ... Y.COL    t: 2.900  n 1.3  5
PRODUCTION ... Y.COM    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.COM    a: 0.000
PRODUCTION ... Y.COM    b: 0.000
PRODUCTION ... Y.COM    c: 0.000
PRODUCTION ... Y.COM    d: 0.000
PRODUCTION ... Y.COM    t: 2.900  n 1.3  5
PRODUCTION ... Y.CON    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.CON    a: 0.000
PRODUCTION ... Y.CON    b: 0.000
PRODUCTION ... Y.CON    c: 0.000
PRODUCTION ... Y.CON    d: 0.000
PRODUCTION ... Y.CON    t: 2.900  n 1.3  5
PRODUCTION ... Y.ELE    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.ELE    b: 0.000
PRODUCTION ... Y.ELE    c: 0.000
PRODUCTION ... Y.ELE    d: 0.000
PRODUCTION ... Y.ELE    t: 2.900  n 1.3  5
PRODUCTION ... Y.ELM    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.ELM    c: 0.000
PRODUCTION ... Y.ELM    d: 0.000
PRODUCTION ... Y.ELM    t: 2.900  n 1.3  5
PRODUCTION ... Y.FAB    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.FAB    a: 0.000
PRODUCTION ... Y.FAB    b: 0.000
PRODUCTION ... Y.FAB    c: 0.000
PRODUCTION ... Y.FAB    d: 0.000
PRODUCTION ... Y.FAB    t: 2.900  n 1.3  5
PRODUCTION ... Y.FIN    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.FIN    b: 0.000
PRODUCTION ... Y.FIN    c: 0.000
PRODUCTION ... Y.FIN    d: 0.000
PRODUCTION ... Y.FIN    t: 2.900  n 1.3  5
PRODUCTION ... Y.FIS    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.FIS    a: 0.000
PRODUCTION ... Y.FIS    b: 0.000
PRODUCTION ... Y.FIS    c: 0.000
PRODUCTION ... Y.FIS    d: 0.000
PRODUCTION ... Y.FIS    t: 2.900  n 1.3  5
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PRODUCTION ... Y.FOR    b: 0.000
PRODUCTION ... Y.FOR    c: 0.000
PRODUCTION ... Y.FOR    d: 0.000
PRODUCTION ... Y.FOR    t: 2.900  n 1.3  5
PRODUCTION ... Y.FRT    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.FRT    a: 0.000
PRODUCTION ... Y.FRT    b: 0.000
PRODUCTION ... Y.FRT    c: 0.000
PRODUCTION ... Y.FRT    d: 0.000
PRODUCTION ... Y.FRT    t: 2.900  n 1.3  5
PRODUCTION ... Y.GAS    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.GAS    a: 0.000
PRODUCTION ... Y.GAS    b: 0.000
PRODUCTION ... Y.GAS    c: 0.000
PRODUCTION ... Y.GAS    d: 0.000
PRODUCTION ... Y.GAS    t: 2.900  n 1.3  5
PRODUCTION ... Y.GLS    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.GLS    a: 0.000
PRODUCTION ... Y.GLS    b: 0.000
PRODUCTION ... Y.GLS    c: 0.000
PRODUCTION ... Y.GLS    d: 0.000
PRODUCTION ... Y.GLS    t: 2.900  n 1.3  5
PRODUCTION ... Y.IRN    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.IRN    b: 0.000
PRODUCTION ... Y.IRN    c: 0.000
PRODUCTION ... Y.IRN    d: 0.000
PRODUCTION ... Y.IRN    t: 2.900  n 1.3  5
PRODUCTION ... Y.LND    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.LND    b: 0.000
PRODUCTION ... Y.LND    c: 0.000
PRODUCTION ... Y.LND    d: 0.000
PRODUCTION ... Y.LND    t: 2.900  n 1.3  5
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PRODUCTION ... Y.MAC    t: 2.900  n 1.3  5
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PRODUCTION ... Y.MEA    d: 0.000
PRODUCTION ... Y.MEA    t: 2.900  n 1.3  5
PRODUCTION ... Y.OFP    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.OFP    b: 0.000
PRODUCTION ... Y.OFP    c: 0.000
PRODUCTION ... Y.OFP    d: 0.000
PRODUCTION ... Y.OFP    t: 2.900  n 1.3  5
PRODUCTION ... Y.OMP    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.OMP    a: 0.000
PRODUCTION ... Y.OMP    b: 0.000
PRODUCTION ... Y.OMP    c: 0.000
PRODUCTION ... Y.OMP    d: 0.000
PRODUCTION ... Y.OMP    t: 2.900  n 1.3  5
PRODUCTION ... Y.OWN    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.OWN    a: 0.000
PRODUCTION ... Y.OWN    b: 0.000
PRODUCTION ... Y.OWN    c: 0.000
PRODUCTION ... Y.OWN    d: 0.000
PRODUCTION ... Y.OWN    t: 2.900  n 1.3  5
PRODUCTION ... Y.PPS    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.PPS    d: 0.000
PRODUCTION ... Y.PPS    t: 2.900  n 1.3  5
PRODUCTION ... Y.PUB    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.REF    c: 0.000
PRODUCTION ... Y.REF    d: 0.000
PRODUCTION ... Y.REF    t: 2.900  n 1.3  5
PRODUCTION ... Y.RES    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.RES    c: 0.000
PRODUCTION ... Y.RES    d: 0.000
PRODUCTION ... Y.RES    t: 2.900  n 1.3  5
PRODUCTION ... Y.RUB    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.RUB    c: 0.000
PRODUCTION ... Y.RUB    d: 0.000
PRODUCTION ... Y.RUB    t: 2.900  n 1.3  5
PRODUCTION ... Y.SUG    s: 0.000  s 0.0  0.5  1.0
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PRODUCTION ... Y.SUG    b: 0.000
PRODUCTION ... Y.SUG    c: 0.000
PRODUCTION ... Y.SUG    d: 0.000
PRODUCTION ... Y.SUG    t: 2.900  n 1.3  5
PRODUCTION ... Y.TEX    s: 0.000  s 0.0  0.5  1.0
PRODUCTION ... Y.TEX    a: 0.000
PRODUCTION ... Y.TEX    b: 0.000
PRODUCTION ... Y.TEX    c: 0.000
PRODUCTION ... Y.TEX    d: 0.000
PRODUCTION ... Y.TEX    t: 2.900  n 1.3  5
```

PRODUCTION ... Y.TOB s: 0.000 s 0.0 0.5 1.0
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PRODUCTION ... Y.TOB b: 0.000
PRODUCTION ... Y.TOB c: 0.000
PRODUCTION ... Y.TOB d: 0.000
PRODUCTION ... Y.TOB t: 2.900 n 1.3 5
PRODUCTION ... Y.TRD s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.TRD a: 0.000
PRODUCTION ... Y.TRD b: 0.000
PRODUCTION ... Y.TRD c: 0.000
PRODUCTION ... Y.TRD d: 0.000
PRODUCTION ... Y.TRD t: 2.900 n 1.3 5
PRODUCTION ... Y.VEG s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.VEG a: 0.000
PRODUCTION ... Y.VEG b: 0.000
PRODUCTION ... Y.VEG c: 0.000
PRODUCTION ... Y.VEG d: 0.000
PRODUCTION ... Y.VEG t: 2.900 n 1.3 5
PRODUCTION ... Y.VEH s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.VEH a: 0.000
PRODUCTION ... Y.VEH b: 0.000
PRODUCTION ... Y.VEH c: 0.000
PRODUCTION ... Y.VEH d: 0.000
PRODUCTION ... Y.VEH t: 2.900 n 1.3 5
PRODUCTION ... Y.WAT s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.WAT a: 0.000
PRODUCTION ... Y.WAT b: 0.000
PRODUCTION ... Y.WAT c: 0.000
PRODUCTION ... Y.WAT d: 0.000
PRODUCTION ... Y.WAT t: 2.900 n 1.3 5
PRODUCTION ... Y.WOO s: 0.000 s 0.0 0.5 1.0
PRODUCTION ... Y.WOO a: 0.000
PRODUCTION ... Y.WOO b: 0.000
PRODUCTION ... Y.WOO c: 0.000
PRODUCTION ... Y.WOO d: 0.000
PRODUCTION ... Y.WOO t: 2.900 n 1.3 5
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PRODUCTION ... V.AGR a: 0.000
PRODUCTION ... V.AGR b: 0.000
PRODUCTION ... V.AGR c: 0.000
PRODUCTION ... V.AGR d: 0.000
PRODUCTION ... V.AGR t: 0.000
PRODUCTION ... V.AIR s: 1.880 n .2489 5
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PRODUCTION ... V.AIR d: 0.000
PRODUCTION ... V.AIR t: 0.000
PRODUCTION ... V.ALC s: 0.940 n .041 5
PRODUCTION ... V.ALC a: 0.000
PRODUCTION ... V.ALC b: 0.000
PRODUCTION ... V.ALC c: 0.000
PRODUCTION ... V.ALC d: 0.000
PRODUCTION ... V.ALC t: 0.000
PRODUCTION ... V.ANI s: 0.940 n .041 5
PRODUCTION ... V.ANI a: 0.000
PRODUCTION ... V.ANI b: 0.000
PRODUCTION ... V.ANI c: 0.000
PRODUCTION ... V.ANI d: 0.000
PRODUCTION ... V.ANI t: 0.000
PRODUCTION ... V.APP s: 0.930 n .0766 5
PRODUCTION ... V.APP a: 0.000
PRODUCTION ... V.APP b: 0.000
PRODUCTION ... V.APP c: 0.000
PRODUCTION ... V.APP d: 0.000
PRODUCTION ... V.APP t: 0.000
PRODUCTION ... V.BLD s: 1.990 n .477 5
PRODUCTION ... V.BLD a: 0.000
PRODUCTION ... V.BLD b: 0.000
PRODUCTION ... V.BLD c: 0.000
PRODUCTION ... V.BLD d: 0.000
PRODUCTION ... V.BLD t: 0.000
PRODUCTION ... V.CEM s: 0.960 n .1317 5
PRODUCTION ... V.CEM a: 0.000
PRODUCTION ... V.CEM b: 0.000
PRODUCTION ... V.CEM c: 0.000
PRODUCTION ... V.CEM d: 0.000
PRODUCTION ... V.CEM t: 0.000
PRODUCTION ... V.CHM s: 1.010 n .0268 5
PRODUCTION ... V.CHM a: 0.000
PRODUCTION ... V.CHM b: 0.000
PRODUCTION ... V.CHM c: 0.000
PRODUCTION ... V.CHM d: 0.000
PRODUCTION ... V.CHM t: 0.000
PRODUCTION ... V.COL s: 0.430 n .105 5
PRODUCTION ... V.COL a: 0.000
PRODUCTION ... V.COL b: 0.000
PRODUCTION ... V.COL c: 0.000
PRODUCTION ... V.COL d: 0.000
PRODUCTION ... V.COL t: 0.000
PRODUCTION ... V.COM s: 1.990 n .477 5
PRODUCTION ... V.COM a: 0.000
PRODUCTION ... V.COM b: 0.000
PRODUCTION ... V.COM c: 0.000
PRODUCTION ... V.COM d: 0.000
PRODUCTION ... V.COM t: 0.000
PRODUCTION ... V.CON s: 1.990 n .477 5
PRODUCTION ... V.CON a: 0.000
PRODUCTION ... V.CON b: 0.000
PRODUCTION ... V.CON c: 0.000
PRODUCTION ... V.CON d: 0.000
PRODUCTION ... V.CON t: 0.000
PRODUCTION ... V.ELE s: 1.880 n .249 5
PRODUCTION ... V.ELE a: 0.000
PRODUCTION ... V.ELE b: 0.000
PRODUCTION ... V.ELE c: 0.000
PRODUCTION ... V.ELE d: 0.000
PRODUCTION ... V.ELE t: 0.000
PRODUCTION ... V.ELM s: 0.980 n .0267 5
PRODUCTION ... V.ELM a: 0.000
PRODUCTION ... V.ELM b: 0.000
PRODUCTION ... V.ELM c: 0.000
PRODUCTION ... V.ELM d: 0.000
PRODUCTION ... V.ELM t: 0.000
PRODUCTION ... V.FAB s: 0.910 n .2411 5
PRODUCTION ... V.FAB a: 0.000
PRODUCTION ... V.FAB b: 0.000
PRODUCTION ... V.FAB c: 0.000
PRODUCTION ... V.FAB d: 0.000
PRODUCTION ... V.FAB t: 0.000
PRODUCTION ... V.FIN s: 2.050 n .255 5
PRODUCTION ... V.FIN a: 0.000
PRODUCTION ... V.FIN b: 0.000
PRODUCTION ... V.FIN c: 0.000
PRODUCTION ... V.FIN d: 0.000
PRODUCTION ... V.FIN t: 0.000
PRODUCTION ... V.FIS s: 0.940 n .0407 5
PRODUCTION ... V.FIS a: 0.000
PRODUCTION ... V.FIS b: 0.000
PRODUCTION ... V.FIS c: 0.000
PRODUCTION ... V.FIS d: 0.000
PRODUCTION ... V.FIS t: 0.000
PRODUCTION ... V.FOR s: 0.940 n .0407 5
PRODUCTION ... V.FOR a: 0.000
PRODUCTION ... V.FOR b: 0.000
PRODUCTION ... V.FOR c: 0.000
PRODUCTION ... V.FOR d: 0.000
PRODUCTION ... V.FOR t: 0.000
PRODUCTION ... V.FRT s: 1.010 n .0268 5
PRODUCTION ... V.FRT a: 0.000
PRODUCTION ... V.FRT b: 0.000
PRODUCTION ... V.FRT c: 0.000
PRODUCTION ... V.FRT d: 0.000
PRODUCTION ... V.FRT t: 0.000
PRODUCTION ... V.GAS s: 1.880 n .2489 5
PRODUCTION ... V.GAS a: 0.000
PRODUCTION ... V.GAS b: 0.000
PRODUCTION ... V.GAS c: 0.000
PRODUCTION ... V.GAS d: 0.000
PRODUCTION ... V.GAS t: 0.000
PRODUCTION ... V.GLS s: 0.960 n .1317 5
PRODUCTION ... V.GLS a: 0.000
PRODUCTION ... V.GLS b: 0.000
PRODUCTION ... V.GLS c: 0.000

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PRODUCTION ... V.GLS    d: 0.000
PRODUCTION ... V.GLS    f: 0.000
PRODUCTION ... V.IRN    s: 0.910  n .2411  5
PRODUCTION ... V.IRN    a: 0.000
PRODUCTION ... V.IRN    b: 0.000
PRODUCTION ... V.IRN    c: 0.000
PRODUCTION ... V.IRN    d: 0.000
PRODUCTION ... V.IRN    t: 0.000
PRODUCTION ... V.LND    s: 1.880  n .2489  5
PRODUCTION ... V.LND    a: 0.000
PRODUCTION ... V.LND    b: 0.000
PRODUCTION ... V.LND    c: 0.000
PRODUCTION ... V.LND    d: 0.000
PRODUCTION ... V.LND    t: 0.000
PRODUCTION ... V.MAC    s: 1.200  n .0897  5
PRODUCTION ... V.MAC    a: 0.000
PRODUCTION ... V.MAC    b: 0.000
PRODUCTION ... V.MAC    c: 0.000
PRODUCTION ... V.MAC    d: 0.000
PRODUCTION ... V.MAC    t: 0.000
PRODUCTION ... V.MEA    s: 0.940  n .0407  5
PRODUCTION ... V.MEA    a: 0.000
PRODUCTION ... V.MEA    b: 0.000
PRODUCTION ... V.MEA    c: 0.000
PRODUCTION ... V.MEA    d: 0.000
PRODUCTION ... V.MEA    t: 0.000
PRODUCTION ... V.OFP    s: 0.940  n .0407  5
PRODUCTION ... V.OFP    a: 0.000
PRODUCTION ... V.OFP    b: 0.000
PRODUCTION ... V.OFP    c: 0.000
PRODUCTION ... V.OFP    d: 0.000
PRODUCTION ... V.OFP    t: 0.000
PRODUCTION ... V.OMP    s: 0.960  n .1317  5
PRODUCTION ... V.OMP    a: 0.000
PRODUCTION ... V.OMP    b: 0.000
PRODUCTION ... V.OMP    c: 0.000
PRODUCTION ... V.OMP    d: 0.000
PRODUCTION ... V.OMP    t: 0.000
PRODUCTION ... V.OWN    s: 1.990  n .477 5
PRODUCTION ... V.OWN    a: 0.000
PRODUCTION ... V.OWN    b: 0.000
PRODUCTION ... V.OWN    c: 0.000
PRODUCTION ... V.OWN    d: 0.000
PRODUCTION ... V.OWN    t: 0.000
PRODUCTION ... V.PPS    s: 2.050  n .255  5
PRODUCTION ... V.PPS    a: 0.000
PRODUCTION ... V.PPS    b: 0.000
PRODUCTION ... V.PPS    c: 0.000
PRODUCTION ... V.PPS    d: 0.000
PRODUCTION ... V.PPS    t: 0.000
PRODUCTION ... V.PUB    s: 1.990  n .477  5
PRODUCTION ... V.PUB    a: 0.000
PRODUCTION ... V.PUB    b: 0.000
PRODUCTION ... V.PUB    c: 0.000
PRODUCTION ... V.PUB    d: 0.000
PRODUCTION ... V.PUB    t: 0.000
PRODUCTION ... V.REF    s: 0.290  n .1016  5
PRODUCTION ... V.REF    a: 0.000
PRODUCTION ... V.REF    b: 0.000
PRODUCTION ... V.REF    c: 0.000
PRODUCTION ... V.REF    d: 0.000
PRODUCTION ... V.REF    t: 0.000
PRODUCTION ... V.RES    s: 3.120  n .817  5
PRODUCTION ... V.RES    a: 0.000
PRODUCTION ... V.RES    b: 0.000
PRODUCTION ... V.RES    c: 0.000
PRODUCTION ... V.RES    d: 0.000
PRODUCTION ... V.RES    t: 0.000
PRODUCTION ... V.RUB    s: 0.970  n .082  5
PRODUCTION ... V.RUB    a: 0.000
PRODUCTION ... V.RUB    b: 0.000
PRODUCTION ... V.RUB    c: 0.000
PRODUCTION ... V.RUB    d: 0.000
PRODUCTION ... V.RUB    t: 0.000
PRODUCTION ... V.SUG    s: 0.940  n .0407  5
PRODUCTION ... V.SUG    a: 0.000
PRODUCTION ... V.SUG    b: 0.000
PRODUCTION ... V.SUG    c: 0.000
PRODUCTION ... V.SUG    d: 0.000
PRODUCTION ... V.SUG    t: 0.000
PRODUCTION ... V.TEX    s: 0.930  n .0766  5
PRODUCTION ... V.TEX    a: 0.000
PRODUCTION ... V.TEX    b: 0.000
PRODUCTION ... V.TEX    c: 0.000
PRODUCTION ... V.TEX    d: 0.000
PRODUCTION ... V.TEX    t: 0.000
PRODUCTION ... V.TOB    s: 0.840  n .0893  5
PRODUCTION ... V.TOB    a: 0.000
PRODUCTION ... V.TOB    b: 0.000
PRODUCTION ... V.TOB    c: 0.000
PRODUCTION ... V.TOB    d: 0.000
PRODUCTION ... V.TOB    t: 0.000
PRODUCTION ... V.TRD    s: 1.280  n .525  5
PRODUCTION ... V.TRD    a: 0.000
PRODUCTION ... V.TRD    b: 0.000
PRODUCTION ... V.TRD    c: 0.000
PRODUCTION ... V.TRD    d: 0.000
PRODUCTION ... V.TRD    t: 0.000
PRODUCTION ... V.VEG    s: 0.940  n .0407  5
PRODUCTION ... V.VEG    a: 0.000
PRODUCTION ... V.VEG    b: 0.000
PRODUCTION ... V.VEG    c: 0.000
PRODUCTION ... V.VEG    d: 0.000
PRODUCTION ... V.VEG    t: 0.000
PRODUCTION ... V.VEH    s: 1.880  n .2489  5
PRODUCTION ... V.VEH    a: 0.000
PRODUCTION ... V.VEH    b: 0.000
PRODUCTION ... V.VEH    c: 0.000
PRODUCTION ... V.VEH    d: 0.000
PRODUCTION ... V.VEH    t: 0.000
PRODUCTION ... V.WAT    s: 1.880  n .2489  5
PRODUCTION ... V.WAT    a: 0.000
PRODUCTION ... V.WAT    b: 0.000
PRODUCTION ... V.WAT    c: 0.000
PRODUCTION ... V.WAT    d: 0.000
PRODUCTION ... V.WAT    t: 0.000
PRODUCTION ... V.WOO    s: 0.740  n .1136  5
PRODUCTION ... V.WOO    a: 0.000
PRODUCTION ... V.WOO    b: 0.000
PRODUCTION ... V.WOO    c: 0.000
PRODUCTION ... V.WOO    d: 0.000
PRODUCTION ... V.WOO    t: 0.000
PRODUCTION ... A.AGR    s: 2.000  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.AGR    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.AGR    b: 0.000
PRODUCTION ... A.AGR    c: 0.000
PRODUCTION ... A.AGR    d: 0.000
PRODUCTION ... A.AGR    t: 0.000
PRODUCTION ... A.AIR    s: 2.000  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.AIR    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.AIR    b: 0.000
PRODUCTION ... A.AIR    c: 0.000
PRODUCTION ... A.AIR    d: 0.000
PRODUCTION ... A.AIR    t: 0.000
PRODUCTION ... A.ALC    s: 2.100  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.ALC    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.ALC    b: 0.000
PRODUCTION ... A.ALC    c: 0.000
PRODUCTION ... A.ALC    d: 0.000
PRODUCTION ... A.ALC    t: 0.000
PRODUCTION ... A.ANI    s: 2.000  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.ANI    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.ANI    b: 0.000
PRODUCTION ... A.ANI    c: 0.000
PRODUCTION ... A.ANI    d: 0.000
PRODUCTION ... A.ANI    t: 0.000
PRODUCTION ... A.APP    s: 3.400  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.APP    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.APP    b: 0.000
PRODUCTION ... A.APP    c: 0.000
PRODUCTION ... A.APP    d: 0.000
PRODUCTION ... A.APP    t: 0.000
PRODUCTION ... A.BLD    s: 2.000  m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.BLD    a: 5.000  s  3.0 4.0 5.0 6.0 7.0
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PRODUCTION ... A.BLD    b: 0.000
PRODUCTION ... A.BLD    c: 0.000
PRODUCTION ... A.BLD    d: 0.000
PRODUCTION ... A.BLD    t: 0.000
PRODUCTION ... A.CEM    s: 0.800   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.CEM    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.CEM    b: 0.000
PRODUCTION ... A.CEM    c: 0.000
PRODUCTION ... A.CEM    d: 0.000
PRODUCTION ... A.CEM    t: 0.000
PRODUCTION ... A.CHM    s: 1.800   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.CHM    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.CHM    b: 0.000
PRODUCTION ... A.CHM    c: 0.000
PRODUCTION ... A.CHM    d: 0.000
PRODUCTION ... A.CHM    t: 0.000
PRODUCTION ... A.COL    s: 0.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.COL    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.COL    b: 0.000
PRODUCTION ... A.COL    c: 0.000
PRODUCTION ... A.COL    d: 0.000
PRODUCTION ... A.COL    t: 0.000
PRODUCTION ... A.COM    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.COM    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.COM    b: 0.000
PRODUCTION ... A.COM    c: 0.000
PRODUCTION ... A.COM    d: 0.000
PRODUCTION ... A.COM    t: 0.000
PRODUCTION ... A.ELE    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.ELE    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.ELE    b: 0.000
PRODUCTION ... A.ELE    c: 0.000
PRODUCTION ... A.ELE    d: 0.000
PRODUCTION ... A.ELE    t: 0.000
PRODUCTION ... A.ELM    s: 1.300   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.ELM    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.ELM    b: 0.000
PRODUCTION ... A.ELM    c: 0.000
PRODUCTION ... A.ELM    d: 0.000
PRODUCTION ... A.ELM    t: 0.000
PRODUCTION ... A.FAB    s: 1.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.FAB    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.FAB    b: 0.000
PRODUCTION ... A.FAB    c: 0.000
PRODUCTION ... A.FAB    d: 0.000
PRODUCTION ... A.FAB    t: 0.000
PRODUCTION ... A.FIN    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.FIN    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.FIN    b: 0.000
PRODUCTION ... A.FIN    c: 0.000
PRODUCTION ... A.FIN    d: 0.000
PRODUCTION ... A.FIN    t: 0.000
PRODUCTION ... A.FIS    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.FIS    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.FIS    b: 0.000
PRODUCTION ... A.FIS    c: 0.000
PRODUCTION ... A.FIS    d: 0.000
PRODUCTION ... A.FIS    t: 0.000
PRODUCTION ... A.FOR    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.FOR    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.FOR    b: 0.000
PRODUCTION ... A.FOR    c: 0.000
PRODUCTION ... A.FOR    d: 0.000
PRODUCTION ... A.FOR    t: 0.000
PRODUCTION ... A.FRT    s: 1.400   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.FRT    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.FRT    b: 0.000
PRODUCTION ... A.FRT    c: 0.000
PRODUCTION ... A.FRT    d: 0.000
PRODUCTION ... A.FRT    t: 0.000
PRODUCTION ... A.GAS    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.GAS    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.GAS    b: 0.000
PRODUCTION ... A.GAS    c: 0.000
PRODUCTION ... A.GAS    d: 0.000
PRODUCTION ... A.GAS    t: 0.000
PRODUCTION ... A.GLS    s: 1.400   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.GLS    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.GLS    b: 0.000
PRODUCTION ... A.GLS    c: 0.000
PRODUCTION ... A.GLS    d: 0.000
PRODUCTION ... A.GLS    t: 0.000
PRODUCTION ... A.IRN    s: 0.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.IRN    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.IRN    b: 0.000
PRODUCTION ... A.IRN    c: 0.000
PRODUCTION ... A.IRN    d: 0.000
PRODUCTION ... A.IRN    t: 0.000
PRODUCTION ... A.LND    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.LND    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.LND    b: 0.000
PRODUCTION ... A.LND    c: 0.000
PRODUCTION ... A.LND    d: 0.000
PRODUCTION ... A.LND    t: 0.000
PRODUCTION ... A.MAC    s: 0.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.MAC    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.MAC    b: 0.000
PRODUCTION ... A.MAC    c: 0.000
PRODUCTION ... A.MAC    d: 0.000
PRODUCTION ... A.MAC    t: 0.000
PRODUCTION ... A.MEA    s: 0.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.MEA    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.MEA    b: 0.000
PRODUCTION ... A.MEA    c: 0.000
PRODUCTION ... A.MEA    d: 0.000
PRODUCTION ... A.MEA    t: 0.000
PRODUCTION ... A.OFP    s: 0.500   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.OFP    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.OFP    b: 0.000
PRODUCTION ... A.OFP    c: 0.000
PRODUCTION ... A.OFP    d: 0.000
PRODUCTION ... A.OFP    t: 0.000
PRODUCTION ... A.OMP    s: 0.800   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.OMP    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.OMP    b: 0.000
PRODUCTION ... A.OMP    c: 0.000
PRODUCTION ... A.OMP    d: 0.000
PRODUCTION ... A.OMP    t: 0.000
PRODUCTION ... A.PPS    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.PPS    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.PPS    b: 0.000
PRODUCTION ... A.PPS    c: 0.000
PRODUCTION ... A.PPS    d: 0.000
PRODUCTION ... A.PPS    t: 0.000
PRODUCTION ... A.REF    s: 0.340   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.REF    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.REF    b: 0.000
PRODUCTION ... A.REF    c: 0.000
PRODUCTION ... A.REF    d: 0.000
PRODUCTION ... A.REF    t: 0.000
PRODUCTION ... A.RES    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.RES    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.RES    b: 0.000
PRODUCTION ... A.RES    c: 0.000
PRODUCTION ... A.RES    d: 0.000
PRODUCTION ... A.RES    t: 0.000
PRODUCTION ... A.RUB    s: 1.300   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.RUB    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.RUB    b: 0.000
PRODUCTION ... A.RUB    c: 0.000
PRODUCTION ... A.RUB    d: 0.000
PRODUCTION ... A.RUB    t: 0.000
PRODUCTION ... A.SUG    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.SUG    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.SUG    b: 0.000
PRODUCTION ... A.SUG    c: 0.000
PRODUCTION ... A.SUG    d: 0.000
PRODUCTION ... A.SUG    t: 0.000
PRODUCTION ... A.TEX    s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.TEX    a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.TEX    b: 0.000
PRODUCTION ... A.TEX    c: 0.000
PRODUCTION ... A.TEX    d: 0.000
PRODUCTION ... A.TEX    t: 0.000
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PRODUCTION ... A.TOB     s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.TOB     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.TOB     b: 0.000
PRODUCTION ... A.TOB     c: 0.000
PRODUCTION ... A.TOB     d: 0.000
PRODUCTION ... A.TOB     t: 0.000
PRODUCTION ... A.TRD     s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.TRD     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.TRD     b: 0.000
PRODUCTION ... A.TRD     c: 0.000
PRODUCTION ... A.TRD     d: 0.000
PRODUCTION ... A.TRD     t: 0.000
PRODUCTION ... A.VEG     s: 1.700   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.VEG     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.VEG     b: 0.000
PRODUCTION ... A.VEG     c: 0.000
PRODUCTION ... A.VEG     d: 0.000
PRODUCTION ... A.VEG     t: 0.000
PRODUCTION ... A.VEH     s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.VEH     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.VEH     b: 0.000
PRODUCTION ... A.VEH     c: 0.000
PRODUCTION ... A.VEH     d: 0.000
PRODUCTION ... A.VEH     t: 0.000
PRODUCTION ... A.WAT     s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.WAT     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.WAT     b: 0.000
PRODUCTION ... A.WAT     c: 0.000
PRODUCTION ... A.WAT     d: 0.000
PRODUCTION ... A.WAT     t: 0.000
PRODUCTION ... A.WOO     s: 2.000   m .5 .75 1.0 1.25 1.5
PRODUCTION ... A.WOO     a: 5.000   s  3.0 4.0 5.0 6.0 7.0
PRODUCTION ... A.WOO     b: 0.000
PRODUCTION ... A.WOO     c: 0.000
PRODUCTION ... A.WOO     d: 0.000
PRODUCTION ... A.WOO     t: 0.000
PRODUCTION *** U         s: 1.000   s  0.0  0.5  1.0  1.5  2.0
PRODUCTION ... U         a: 0.000
PRODUCTION ... U         b: 0.000
PRODUCTION ... U         c: 0.000
PRODUCTION ... U         d: 0.000
PRODUCTION ... U         t: 0.000
PRODUCTION ... G         s: 0.000
PRODUCTION ... G         a: 0.000
PRODUCTION ... G         b: 0.000
PRODUCTION ... G         c: 0.000
PRODUCTION ... G         d: 0.000
PRODUCTION ... G         t: 0.000
DEMAND     ... REPAGT    s: 0.000
DEMAND     ... REPAGT    a: 0.000
DEMAND     ... REPAGT    b: 0.000
DEMAND     ... REPAGT    c: 0.000
DEMAND     ... REPAGT    d: 0.000
DEMAND     ... GOVT      s: 0.000
DEMAND     ... GOVT      a: 0.000
DEMAND     ... GOVT      b: 0.000
DEMAND     ... GOVT      c: 0.000
DEMAND     ... GOVT      d: 0.000
AUXILIARY  ... taulo
AUXILIARY  ... taurp
```

There is one specific assumption built into this sensitivity analysis that is not obvious from the cited documentation and this file. Government demands a good called G, which is produced using a number of inputs (which are final goods and services produced by other activities). The point estimate elasticity of substitution for this activity is zero, implying a Leontief production technology. This is shown above, near the end of the SSA file, by the line "PRODUCTION ... G s: 0.000". We would

normally perturb such an elasticity by allowing it to also take on values of 0.5, 1.0, 1.5 and 2.0, as well as zero. Unfortunately we cannot do this here, since some of the input coefficients are negative. This is due to government expenditure including current consumption and investment together; the latter can be negative if, for example, the government runs down it's inventories in a good sufficiently in the base year. In any event, these negative coefficients imply that we are constrained to use a non-price-responsive production technology for this activity, since the derived input demands are not well-defined in such a case *if they are price-sensitive*. In other words, we are constrained by the economics of this set of benchmark expenditure data to not perturb this elasticity away from zero. Thus there are no distributional assumptions made for this line in the SSA file.

The results of the sensitivity analysis are reported in Section 5 of the main text.

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