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Modeling Bilateral Trade Flows with the Static World Policy Simulation (SWOPSIM) Modeling Framework

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ABSTRACT

This report documents the method for constructing a bilateral trade flow model of the Armington type within the SWOPSIM (Static World Policy Simulation) framework. The logic of the Armington bilateral trade flow model is presented and its paramaterization in SWOPSIM is illustrated. Appendices document recent improvements made in SWOPSIM computer programs and procedures including the capacity to generate bilateral trade flow models.

Keywords: Armington, bilateral trade, free trade area, trade, trade modeling.

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INTRODUCTION

The static world policy simulation (SWOPSIM) modeling framework developed by Roningen (8) follows the logic of a nonspatial price equilibrium model that assumes that domestic and traded goods are perfect substitutes in consumption. 1/ While such nonspatial models are used extensively in the literature for trade policy analysis, their usefulness is often limited by their inability to address issues concerning bilateral trade. For such purposes, it is common to resort to either spatial price equilibrium models or trade flows and market share models. 2/

Both spatial price equilibrium and trade flow models endogenize trade flows and market shares, and provide a means to introduce discriminatory tariff and nontariff barriers, which are particularly important in agricultural trade. Spatial price equilibrium models explain trade flows for homogeneous commodities based on the differences in transportation costs. These models, however, have not historically explained trade flows adequately (11). A majority of empirical spatial price equilibrium models suggest considerably more specialization in trade than actually exists in the real world. One hypothesis for this poor performance is that an agricultural commodity like beef which is produced in many countries is not a perfectly homogeneous product as assumed in spatial price equilibrium models. Therefore, the law of one price does not hold.

This lack of support for the law of one price and the failure of the spatial price equilibrium models to replicate trade flows adequately provided the motivation for developing bilateral trade flow models of agricultural trade. One subclass of such models is the Armington-type model (2) which explains bilateral trade flows by assuming that commodities exported by different countries are not homogeneous. Importers, in this framework, discriminate among products on the basis of their geographic origin.

Armington-type models are gaining greater acceptance in the agricultural economics literature as a means of explaining agricultural trade flows. Recent examples of this approach include studies by Abbott and Paarlberg (1),

1/ Underscored numbers in parentheses cite sources listed in the Reference section.

2/ The terminology describing the various types of models are explained in Thompson (11).

Honma and Heady (7), Figueroa (5), and Suryana (10). Despite this broader acceptance, the Armington approach has shortcomings. Limitations of the approach are well chronicled in Thompson (11), and Grennes, Johnson, and Thursby (6).

This report explains how to create an Armington-type trade flow model from the nonspatial price equilibrium framework embedded in SWOPSIM. The SWOPSIM framework has been modified to allow the generation of an Armington-type bilateral trade flow model. This modification will allow the framework to endogenously generate bilateral trade flows, and address issues relating to bilateral trade such as the establishment of a free trade area.

The report begins with a brief description of SWOPSIM models followed by an explanation of the logic of Armington-type models. The modifications required to impose an Armington structure in SWOPSIM are then outlined. This is followed by an illustration of the parameterization necessary for an Armington model. The report concludes with an example illustrating the creation and use of an Armington-type model in SWOPSIM. The example gives an interpretation of results from a demonstration Armington-type model analyzing the impact of the establishment of a free trade area between two countries.

Appendices document improvements in SWOPSIM computer programs, including the capacity to generate bilateral trade flow models and to omit products and/or country/regions from a world trade model.

THE STRUCTURE OF SWOPSIM MODELS

SWOPSIM (8) is a framework that can be used to create static world policy simulation models. The models created by the framework reside in spreadsheets and are modified and solved as spreadsheets. SWOPSIM models are designed to simulate the effect of changes in policies on production, consumption, and trade. The framework allows the construction of single commodity or multi-commodity world trade models. 3/

The models generated by SWOPSIM are characterized by an economic structure that includes constant elasticity supply and demand equations and summary policy measures. Trade is the difference between supply and demand as is the case in standard neoclassical net trade models.

SWOPSIM models are static; they do not model the timepaths of endogenous variables. Supply quantities are functions of input and/or product prices, and if desired, other endogenous demand quantities (joint products). Demand quantities, on the other hand, are largely functions of own- and cross-product prices, and under certain circumstances, supply quantities of endogenous

3/ Appendix B documents a new general feature of SWOPSIM when generating single or multi-commodity models. Given a set of products in a master file, models can be generated omitting selected products. This means, for example, that if a master spreadsheet has 10 products, a world model may be generated holding the data for 4 of them constant. Similarly, it is possible to generate a single product or a multi-product world holding the data for selected country/regions constant. This new feature of SWOPSIM makes it possible to generate a wide variety of models from the same basic data. Appendix B also documents some new convenient model and data aggregation procedures and table generating routines.

variables in the model. Linkages across products can occur via cross-price relationships and technological parameters that describe input-output types of specifications, while linkages across countries and regions take place through domestic-international price equations and world trade.

The policy structure of SWOPSIM models is embedded in equations linking domestic and world prices. The standard policy structure is designed to allow flexibility in characterizing policies that might affect production, consumption, and trade. Policies are inserted as subsidy equivalents at the producer, consumer, export, or import level. Alternatively, price transmission elasticities can be used to characterize the degree of connection of domestic and world prices. Exchange rates translate world prices to trade prices denominated in a country's domestic currency to link up with consumer and producer prices also denominated in the domestic currency.

As an example, suppose a model includes beef (BF), pork (PK), and coarse grains (CG). Let P denote a price, QS the quantity supplied, QD the quantity demanded, QT the quantity traded, S a supply related variable, D a demand related variable, and Z a constant. A world trade model for beef with three regions (C1, C2, and RW) might appear as follows (* means multiplication and ^ means exponentiation):

Region C1: 4/

```
QSC1BF = Z11 * (PBF ^ .3) * (PCN ^ -.2)                    (1)
QDC1BF = Z12 * (PBF ^ -.2) * (PPK ^ .05)                   (2)
QTC1BF = QSC1BF - QDC1BF                                   (3)
```

Region C2:

```
QSC2BF = Z21 * (PBF ^ .3) * (PCN ^ -.2)                    (4)
QDC2BF = Z22 * (PBF ^ -.2) * (PPK ^ .05)                   (5)
QTC2BF = QSC2BF - QDC2BF                                   (6)
```

Region RW:

```
QSRWBF = Z31 * (PBF ^ .3) * (PCN ^ -.2)                    (7)
QDRWBF = Z32 * (PBF ^ -.2) * (PPK ^ .05)                   (8)
QTRWBF = QSRWBF - QDRWBF                                   (9)
```

Market Clearing Condition:

```
QTC1BF + QTC2BF + QTRWBF = 0                               (10)
```

Each region in this SWOPSIM model example is characterized by three equations. The world beef market model consists of 10 equations, 9 of which represent regional supply, demand, and trade equations, and 1 that determines the world price through the market clearing condition.

In the example, for the sake of simplicity, the world price of beef is assumed to drive the supply, demand, and trade equations. SWOPSIM models, however,

4/ The notation for equations in SWOPSIM follows that of the spreadsheet in which the equations are embedded. However, spreadsheets may have cell locations as variables instead of mnemonic names. See Roningen (8) for examples.

allow the flexibility of introducing separate producer, consumer, and trade prices. Under such circumstances, each domestic market model would have two additional equations that link domestic and world prices--a production price equation and a consumption price equation:

$$PP = MA + CT * (ER \wedge TR) * (PW \wedge TW) \quad (11)$$

$$PC = MD + PP \quad (12)$$

where, PP is production price, ER the exchange rate, TR the exchange rate transmission elasticity, PW the world price, TW the world price transmission elasticity, PC the consumption price, and CT a constant. MA and MD are the margins between the trade (export or import) price and production and consumption prices, respectively. CT would capture much of the price differences attributable to trade measures such as tariffs and quotas, while MA and MD would reflect domestic margins. Each region in this more detailed framework would be characterized by 5 equations, while the world beef market would be represented by 16 equations. The SWOPSIM framework makes the model useful from a policy analysis viewpoint by introducing price wedges such as producer, consumer, or trade subsidies/taxes as shift variables in equations (11) and (12).

THE LOGIC OF ARMINGTON BILATERAL TRADE FLOW MODELS

Armington (2,3) has developed the theory for a class of trade models in which consumers discriminate among commodities on the basis of their geographic origin. His hypothesis is that a commodity like wheat or beef is not perfectly homogeneous, and therefore the law of one price does not hold exactly; instead, varietal and quality differences exist. Consumers differentiate by place of production of otherwise physically similar commodities. For instance, U.S. consumers may distinguish between high quality beef produced in Canada and lower quality beef produced in Argentina. Beef, in this illustration would be defined as a good, while beef produced by a particular country would be called a product.

Armington's approach assumes that utility is weakly separable so that the consumer's decision process may be viewed as occurring in two stages. The total quantity of a commodity to be imported is first determined, and then this quantity is allocated among competing suppliers. U.S. consumers, in our example, would determine, in the first stage, how much total beef to consume, and in the second stage allocate this total among domestic, Canadian, Argentine, or other beef suppliers.

Expressed algebraically, in the first stage an importer k who has a weakly separable utility function determines expenditures on goods by maximizing:

$$U_k = U(Q_{1k}, \ldots\ldots\ldots, Q_{mk}) \quad (13)$$

subject to

$$E_k = \sum_{i=1}^{m} Q_{ik} P_{ik} \quad (14)$$

where, U_k is total utility, E_k is total expenditure, Q_{ik} is a quantity index for good i, and P_{ik} is a price index for good i. Given the assumption of weak separabilty of utility, the quantity index for a given good is represented by

a function of quantities of products of the same kind:

$$Q_{ik} = \Xi(Q_{i1k}, Q_{i2k}, \ldots\ldots, Q_{ink}) \qquad (15)$$

where, $Q_{i1k}.....Q_{ink}$ are quantities of product of good i for importer k. Equation (15) implies that the importer's preference for different products of any kind is independent of his purchases of products of any other kind. The necessary and sufficient condition for such a weakly separable utility function is that the marginal rate of substitution between any two products of the same kind is independent of the consumption of products of all other kinds.

The quantity index of demand for good i, Q_{ik}, is derived as a function of m good price indices and total expenditures:

$$^{*}Q_{ik} = {}^{*}Q_{ik}(P_{1k}, P_{2k}, \ldots\ldots, P_{mk}, E_k) \qquad (16)$$

In the second stage, the demand for any product, Q_{ijk}, is obtained by minimizing the cost of purchasing the volume of $^{*}Q_{ik}$ determined in the first stage. A product demand function in this framework would be represented by:

$$Q_{ijk} = f(E_k, P_{i1k}, \ldots\ldots, P_{ink}) \qquad (17)$$

where, i is 1,....,m; j,k is 1,....n; E_k is country k's total expenditure; Q_{ijk} is quantity demanded in country k of good i produced by country j; and P_{ijk} is the price in country k of good from country j.

To simplify the model and reduce the number of parameters to be estimated, Armington assumes that the total quantity of product consumed, Q_{ik} (equation 15), is a constant elasticity of substitution (CES) index of the quantity consumed from the countries of origin ($Q_{i1k}, \ldots, Q_{ink}$). This specification implies that the elasticity of substitution between any two products (kinds of beef) in a given market is constant, and the elasticity of substitution between any two products in a given market equals the elasticity of substitution between any other kinds of products in the same market. Hence, beef from Canada substitutes for beef from Argentina at the same rate that beef from Australia substitutes for beef from Argentina, and so on for beef from any pair of origins.

The quantity index implied for equation (16) using the CES function for equation (15) is:

$$^{*}Q_{ik} = \left(\sum_{j=1}^{n} b_i \, Q_{ijk}^{-p_k}\right)^{-1/p_k} \qquad (18)$$

where, $^{*}Q_{ik}$ is the quantity index of import i in region k, Q_{ijk} is the import of commodity i in region k from supplier j, and the elasticity of substitution between the imports in region k from any two exporters is represented by $\sigma_k = 1/(1+p_k)$.

Given equation (18), the product demand equation implied in the second stage by the Armington assumptions is given by:

$$^{*}Q_{ijk} = b_{ij}P_{ik}^{\sigma_k}\,{}^{*}Q_{ik}\left(\frac{P_{ijk}}{P_i}\right)^{-\sigma_k} \qquad (19)$$

where, P_{ijk} is the price in country k for good i from country j, and P_{ik} is the price index for good i in country k.

Armington has shown that the demand for a product implied by equation (19), given his assumptions, can alternatively be expressed in percentage terms as:

$$D_{ijk} = e_{ki}E_k + n_{ijjk}P_{ijk} + \sum_{h\neq j} n_{ijhk}P_{ihk} + \sum_{g=1}^{m} n_{ighk}P_{gk} \qquad (20)$$

where, e_{ki} is the expenditure elasticity for good i in country k, n_{ijhk} is price elasticity of demand in country k for good i produced by country j with respect to the price of good i produced by h, and n_{igk} is the price elasticity of demand in country k for good i with respect to the price of good g in country k. The Armington assumptions therefore allow one to express the percentage change in the quantity demanded of a product as an additive function of the percentage change in expenditure on the good and the percentage change in relative prices.

Estimation of the demand structure for an Armington model with m goods and n countries implied by equation (20) would require the estimation of mn expenditure elasticities, mn^2 direct-price elasticities, $mn^2(n-1)$ cross-price elasticities for products of the same kind, and $mn(n-1)$ cross-price elasticities with respect to other good's prices. The total number of demand elasticities for the Armington approach in a two-commodity, three-country model would be 66. This is far fewer than the 126 demand elasticities that would be required for a similar two-commodity, two-country differentiated product model without the Armington restrictions. Moreover, the mn^3 elasticities with respect to product prices of the same kind ($m^2n + mn^2(mn-1)$) can be calculated from 2mn elasticity estimates and market share data as:

$$n_{ijjk} = (-1)[(1-S_{ijk})\sigma_{ki} + S_{ijk}n_{iik}]) \quad \text{and} \qquad (21)$$

$$n_{ijhk} = S_{ihk}(\sigma_{ki} - n_{iik}) \qquad (22)$$

where, $S_{ijk}=P_{ijk}Q_{ijk}/P_{ik}Q_{ik}$, n_{iik} is the basic demand elasticity for commodity i in country k, σ_{ki}, n_{ijjk}, and n_{ijhk} are as defined earlier, and all elasticities are given positive signs for convenience. The total number of elasticity estimates with these restrictions would be 24, compared with 126 without any restrictions. 5/

Equations (20) and (21) establish the own- and cross-price relationships, respectively, for products of a given kind. In our example, if the United States imported beef from Canada, then n_{ijjk} is the own-price elasticity of demand for Canadian beef in the United States. Similarly, n_{ijhk} is the price elasticity of demand in the United States for Canadian beef with respect to the price of Argentine beef in the United States. Intuitively, all that equations (21) and (22) do is disaggregate the traditional own-price effects of a good into own- and cross-price effects of products of a kind using the elasticity of substitution among the products and shares of the products in

5/ Derivations of equations (21) and (22) are found in Armington (2) and Grennes, Johnson, and Thursby (6).

"good" consumption. These two equations turn out to be the key to a simple implementation of an Armington-type model in the SWOPSIM framework.

The creation of an Armington type of model in the SWOPSIM framework involves two procedures. First, Armington's two-stage approach is modified into a one-stage process in which the quantity of good as well as products of the same kind are determined simultaneously. This is done by forcing Armington's two equations (total good demand and total product demand) into a single product equation that allows for substitution among various imported products as well as with the product produced domestically. Second, equations (21) and (22) are used to calculate elasticities with respect to product prices of the same kind. These elasticities along with the cross-price elasticities between the different goods will be used to create the various product demand equations. The next section shows how the Armington approach can be used with SWOPSIM.

AN ARMINGTON TYPE OF MODEL IN THE SWOPSIM FRAMEWORK

The standard structure for a SWOPSIM model, as illustrated above, follows the logic of a net trade model that provides information on the total quantity of a commodity traded by a country/region. Such a model, as explained earlier, does not provide bilateral trade flows between regions. To derive this information from the net trade logic of the SWOPSIM framework, a variant of the Armington-type model is used which assumes that domestic and traded goods are imperfect substitutes in consumption.

This approach, following Armington, is to distinguish products by country of production. Beef, for instance, is no longer considered one commodity. Instead, consumers in any given country consider beef produced in other countries as separate products. In terms of the SWOPSIM modeling framework, three separate beef products are defined--beef originating from C1, beef originating from C2, and beef originating from RW--with a world market clearing price for each. The law of one-world price for beef no longer holds. This differs from a spatial price equilibrium model that would be characterized by one-world price for beef differentiated among importers solely on the basis of transportation costs.

Expanding upon the standard SWOPSIM model presented earlier, an Armington version of the world beef market with three regions--C1, C2, and RW--might appear as follows:

Region C1

```
QSC1BF    = Z11 * (PBFC1 ^ .3) * (PCNC1 ^ -.2)                          (23)
QDC1BF    = Z12 * (PBFC1 ^ -.7) * (PBFC2 ^ .02) * (PBFRW ^ .1)
              * (PPKC1 ^ .05)                                            (24)
QDC2BFC1  = Z13 * (PBFC1 ^ 1.8) * (PBFC2 ^ -2.5) * (PBFRW ^ .1)
              * (PPKC1 ^ .05)                                            (25)
QDRWBFC1  = Z14 * (PBFC1 ^ 1.8) * (PBFC2 ^ .02) * (PBFRW ^ -2)
              * (PPKC1^.05)                                              (26)
QTC1BF    = QSC1BF - QDC1BF                                            (27)
```

Region C2

```
QSC2BF    = Z21 * (PBFC2 ^ .3) * (PCNC2 ^ -.2)                          (28)
```

```
QDC1BFC2 = Z22 * (PBFC1 ^ -.7) * (PBFC2 ^ .02) * (PBFRW^.1)
               * (PPKC2 ^ .05)                                    (29)
QDC2BF   = Z23 * (PBFC1 ^ 1.8) * (PBFC2 ^ -2.5) * (PBFRW ^.1)
               * (PPKC2 ^ .05)                                    (30)
QDRWBFC2 = Z24 * (PBFC1 ^ 1.8) * (PBFC2 ^ .02) * (PBFRW ^ -2)
               * (PPKC2 ^ .05)                                    (31)
QTC2BF   = QSC2BF - QDC2BF                                        (32)
```

Region RW

```
QSRWBF   = Z31 * (PBFRW ^ .3) * (PCNRW ^ -.2)                     (33)
QDC1BFRW = Z32 * (PBFC1 ^ -.7) * (PBFC2 ^ .02) * (PBFRW ^ .1)
               * (PPKRW ^ .05)                                    (34)
QDC2BFRW = Z33 * (PBFC1 ^ 1.8) * (PBFC2 ^ -2.5) * (PBFRW ^ .1)
               * (PPKRW ^ .05)                                    (35)
QDRWBF   = Z34 * (PBFC1 ^ 1.8) * (PBFC2 ^ .02) * (PBFRW ^ -2)
               * (PPKRW ^ .05)                                    (36)
QTRWBF   = QSRWBF - QDRWBF                                        (37)
```

Market Clearing Condition

```
QTC1BF + QTC1BFC2 + QTC1BFRW = 0                                  (38)
QTC2BF + QTC2BFC1 + QTC2BFRW = 0                                  (39)
QTRWBF + QTRWBFC1 + QTRWBFC2 = 0                                  (40)
```

where all eight-lettered nomenclatures refer to the demand for a third-country product. QDC2BFC1, for instance, is the demand by C1 for beef produced in C2, while QDC1BFC2 is the demand by C2 for beef produced in C1. All other variables are as defined earlier.

The supply functions for this Armington example have not been altered from the original SWOPSIM framework. The model has only three supply functions, one each for the three regions of production.

Bilateral trade flows between countries are generated through the demand functions for the various types of beef. In the C1 model, for instance, there is no longer a demand only for domestically produced C1 beef. In addition, there are two more demand functions: one a demand for beef produced in C2 (QDC2BFC1) and the other a demand for beef produced in RW (QDRWBFC1). These two demand functions represent the import demand equations faced by C1 from C2 and RW, respectively. Similarly, C2 and RW both face three separate demands for beef: one for domestically produced beef and two for beef produced in the other two regions. C2's demand for C1 beef would represent C2's exports to C1, while C1's demand for C2's beef represents C2's import from C1. In this manner, bilateral trade flows between the countries are identified.

The world model has expanded from a 10-equation model (excluding producer and consumer price linkages) to an 18-equation model, with each region being characterized by 5 equations. The three world market clearing conditions ensure a world price for beef from each country of origin.

Economic linkages across products (demand) occur via cross-price relationships. In the C1 model, the demand for C1 beef is now dependent not only on its own-price elasticity of demand, and cross-price elasticities with respect to other goods such as pork, but also on the cross-price elasticity of demand for products C2 beef and RW beef. The own- and cross-price

elasticities for the three products are based, as explained earlier in Armington's methodology, on the own-price elasticity of demand for "good" beef, an assumed constant elasticity of substitution for products, and market shares. The cross-price relationships between products of a kind and any other good are assumed the same within each country model. Hence, the cross-price relationship between domestically produced beef and pork in C1 is the same as the cross-price relationship between C2 beef demanded in C1 and pork demanded in C1.

The product price relationship for the supply functions remain exactly the same. A slight modification, however, may be required in the input price relationship for an importer if inputs are also differentiated by origin of production. In this situation, given that there are three inputs compatible with one technology, the elasticities with respect to the three inputs are the share-weighted elasticities of the elasticity used in a situation without product differentiation.

The modification of the SWOPSIM framework to account for bilateral trade flows also implies that the model needs to be parameterized and interpreted differently. The next section illustrates the parameterization and explains how the model results need to be interpreted to handle bilateral trade flow information.

PARAMETERIZATION OF AN ARMINGTON BILATERAL TRADE FLOW MODEL IN SWOPSIM

There are four basic steps to the creation and parameterization of an Armington-type model in the SWOPSIM framework. The first is to create a master model file (spreadsheet) that defines the country and commodity coverage to be modeled. This is followed by a CREATE procedure that builds a country spreadsheet for products as defined in the master file. Elasticities and base data are then entered into this spreadsheet manually. The EQUATION procedure subsequently takes the elasticities and base data entered into the country/region spreadsheet and installs constant elasticity equations into the same spreadsheet. Then, the WORLDMOD procedure is used to create a multi-product world model with a full world market clearing mechanism. Each of these steps is explained in greater detail below, accompanied by a comparison of a standard SWOPSIM model with the Armington-type version of the model. The reader may also want to refer to the original SWOPSIM document (8) for further details on steps needed to create a standard model.

The Master Model File

The master model file (DEMN) for a standard two-commodity (BF and CG) three-region (C1, C2, and RW) world trade model is illustrated in figure 1. 6/ A '1' in the spreadsheet indicates that supply and demand equations are created for the particular region and product. A 'D' indicates that supply and demand equations are created for this region and the supply of the product can be included as a variable in any regional demand equation. In our example, the D's in row 6 imply that beef supply can be included as a variable in the coarse grains demand equations for regions C1 and C2. BF and CG equations exist for all regions, and base world prices are given in column AR. The base price for each commodity clears its own world market, and in this example, is the FOB price of the largest exporter denominated in U.S. dollars.

6/ All country and commodity codes must be defined with two letters.

Figure 1--Master Model File for the Standard SWOPSIM Model

```
    | A||B||C||D||E||F||G||H||I||J||K||L||M||N||O||P||Q||R||S||T||U||V||W||X||Y||Z|
1   DEMN   DEMoNstration model in the SWOPSIM framework (without the Armington specification)     Master Model File
2
3       C1 C2 RW - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
4
5     BF  D  D  1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
6     CG  1  1  1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
7      ^  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

11  DEFINITION OF MATRIX CELL CODES
12
13      .   No equation created for this country/region & product
14          (however, note that RW region MUST have equations for all
15          products to close world model).
16
17      1   Supply and demand equations created for this country/region
18          & product.
19
20      S   Supply and demand equations created AND demand quantity for this
21          country/region & product can be included in any SUPPLY equation.
22
23      D   Supply and demand equations created AND supply quantity for this
24          country/region & product can be included in any DEMAND equation.
25
26     SD   Supply and demand equations created AND demand quantity for this
27     or   country/region & product can be included in any SUPPLY equation
28     DS   AND supply quantity for this country/region & product can be
29          included in any DEMAND equation.

33   CODE  PRODUCT GROUP (Capital letters show the source of the CODE)
34
35     BF   BeeF and veal
36     CG   Coarse Grains
37
38      ^   other possible products
39
40
41  ^CODE  COUNTRY/REGION ------------------------------------------
42
43     C1   Country 1
44     C2   Country 2
45     RW   Rest of World
46
47      -   other possible countries/regions

    |AQ||   AR  |
1
2
3         WDPRICE
4        (US$/MT)
5     BF     2318
6     CG      133
7      ^
```

Figure 2 depicts the master model file for an Armington-type model. Given the assumption of product differentiation by origin of production, this new master model file defines a world model with six products, compared with just two in the standard SWOPSIM framework. Moreover, a product nomenclature in this Armington framework has to have four letters: a commodity notation followed by a country notation. C1BF defines beef produced in C1 as a product, while C2BF and RWBF similarly define beef produced in C2 and RW as two separate products, respectively. A similar logic holds for CG. As before, the world base price, denominated in a given currency (U.S. dollar) is in column AR. The Armington version requires that we provide a world market clearing price for each product. In the example illustrated, the base world price used is the FOB export price of the particular country that produces the product.

Figure 2--Master Model File for an Armington Bilateral Trade Flow Model

```
A||B||C||D||E||F||G||H||I||J||K||L||M||N||O||P||Q||R||S||T||U||V||W||X||Y||Z|
1   DARM   Demonstration ARMington type of model in the SWOPSIM framework                    Master
2
3       C1 C2 RW - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
4
5   C1BF  D  1  1  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
6   C2BF  1  D  1  .
7   RWBF  1  1  1  .
8   C1CG  1  1  1  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
9   C2CG  1  1  1  .
10  RWCG  1  1  1  .
11    ^   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12
```

```
                        |AQ||   AR  |
1    Model File
2
3    - - - - - - - -      WDPRICE
4                         (US$/MT)
5    . . . . . . . .C1BF     4281
6                   C2BF     1851
7                   RWBF     2318
8    . . . . . . . .C1CG      125
9                   C2CG      130
10                  RWCG      133
11   . . . . . . . .  ^
12
```

Country/Region Spreadsheets

A CREATE procedure is run to create individual country/region spreadsheets as specified in the master model file. A region spreadsheet contains a matrix for supply and demand elasticities, a series of rows for each product, and one cell each for specifying the exchange rate and its transmission elasticity. Figure 3 shows the spreadsheet created from the master model file DEMN for region C1 in the standard SWOPSIM framework. The sheet would, upon creation,

have zeros in the elasticity matrices but elasticities and base data were entered by hand into the sheet. Own- and cross-price elasticities are given in the supply (SUPPLY EL) and demand (DEMAND EL) elasticity matrices.

The world price is automatically input by the program from the master model file DEMN. All other prices (producer, consumer, and trade) are entered by hand. Supply and demand can be defined as deemed appropriate. In this example, supply is production plus beginning stocks, while demand is domestic demand plus ending stocks. One could alternatively define supply as production and demand as total demand exclusive of ending stocks if the model were to represent a longrun scenario. Net trade is the difference between the supply and demand. A positive number indicates total exports by C1, while a negative number represents imports of the commodity into the country. Note that trade for a product is gross, not net trade.

While entering the base quantity data into a SWOPSIM Armington model, one needs to be careful about the accounting procedure used. The quantity data entered needs to be such that the world market for the particular commodity clears. This means that the net trade for the three regions for any given product sums to zero. Note, however, that net trade information for each commodity is entered into three separate country spreadsheets, implying that one has to add across spreadsheets to ensure that the world market for each commodity clears in the base solution.

Figure 3 shows a country (C1) spreadsheet in the standard SWOPSIM model while figure 4 shows the country spreadsheet for country C1 for an Armington-type model created from the master model file DARM (shown in fig. 2). The supply block matrix (SUPPLY EL) is similar to that in figure 3 except for its size which increases from 2 by 2 in the standard two-commodity, three-country framework to 6 by 6 in the Armington model. Note that cross-price elasticities between products of the same kind (e.g. C1BF and C2BF) as well as own-price elasticities for products from other origins (e.g. C2BF, RWBF) are zero. This is done to ensure that products from one region are not produced in other regions. Similarly, cross-price relationships have been specified for only a product produced in the country and the same product consumed in the country. In figure 4, for instance, a cross-price term exists between C1BF and C1CG, but not between C1BF and C2CG and/or RWCG. This approach is adopted for computational ease. Alternatively, one could use weighted cross-price elasticities among products of a kind with the weights representing the proportion of each product used as input.

The primary change in the demand block matrix (DEMAND EL) concerns the own- and cross-price relationships for products of a kind. These relationships are derived using the two Armington equations described earlier. The equations that establish these relationships are embedded in those cells that depict the own- and cross-price relationship for products of a kind (in fig. 4, these cells for beef products would cover B12 through D14). The Armington equations require information on market shares (proportion imported from each exporters), the own-price elasticity of demand, and the elasticity of substitution. These three bits of information are entered into columns K, L, and M of the demand block, respectively, in figure 4.

Figure 3--Country Spreadsheet for C1 in the Standard SWOPSIM Model

	A	B	C	D	E	F	G	H	I	J	K
1	DEMN-C1		XRATE (LC/US$) =		1			XRATE ELASTICITY =		1	
2											
3	SUPPLY EL	BF	CG	SUPSUM	S-D SUM						
4	BF	.70	-.10	.60	1.20						
5	CG	.00	.50	.50	.90						
6											
7	DEMAND EL	BF	CG	SBF	DEMSUM						
8	BF	-.60	.00		-.6						
9	CG	.00	-.40	.2	-.4						
12	DEMN-C1	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
13	BF	2318	3086	5291	4281	1	11080	11766	-686	1	1
14	CG	133	104	108	125	1	269445	214264	55181	1	1

Figure 4--Country Spreadsheet for C1 in the Armington Model

	A	B	C	D	E	F	G	H	I	J	K
1	DARM-C1		XRATE (LC/US$) =		1			XRATE ELASTICITY =		1	
2											
3	SUPPLY EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	SUPSUM	S-D SUM		
4	C1BF	.70	.00	.00	-.10	.00	.00	.60	1.20		
5	C2BF	.00	.00	.00	.00	.00	.00	.00	.60		
6	RWBF	.00	.00	.00	.00	.00	.00	.00	.60		
7	C1CG	.00	.00	.00	.50	.00	.00	.50	1.30		
8	C2CG	.00	.00	.00	.00	.00	.00	.00	.80		
9	RWCG	.00	.00	.00	.00	.00	.00	.00	.80		
10											
11	DEMAND EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	SC1BF	DEMSUM	DSUM	DSHARE
12	C1BF	-.71	.02	.10	.00	.00	.00		-.60	11766	.94
13	C2BF	1.79	-2.48	.10	.00	.00	.00		-.60		.00
14	RWBF	1.79	.02	-2.40	.00	.00	.00		-.60		.05
15	C1CG	.00	.00	.00	-.80	.00	.00	.2	-.80	214264	1.00
16	C2CG	.00	.00	.00	3.00	-3.80	.00	.2	-.80		.00
17	RWCG	.00	.00	.00	3.00	.00	-3.80	.2	-.80		.00
20	DARM-C1	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
21	C1BF	4281	3086	5291	4281	1	11080	11066	14	1	1
22	C2BF	1851	3086	5291	1851	1	0	105	-105	1	1
23	RWBF	2318	3086	5291	2318	1	0	595	-595	1	1
24	C1CG	125	104	108	125	1	269445	214095	55350	1	1
25	C2CG	130	104	108	130	1	0	169	-169	1	1
26	RWCG	133	104	108	133	1	0	0	0	1	1

	L	M
10		
11	OWN PR.	ELASUBS
12	-.6	2.5
13		
14		
15	-.8	3.8

The underlined numbers in the demand elasticity matrix in figure 4 are generated by Armington type formulas from the own-price and substitution elasticities appearing in columns L and M (these numbers are also underlined in fig. 4). To illustrate, cell B12 in figure 4 establishes the own-price relationship for C1BF. This relationship is obtained using information in cells K12, L12, and M12. Similarly, cell C13 explains the relationship between beef produced in C1 and consumed in C1 (C1BF) and the price of C2BF. This cross-price elasticity for products of the same kind is obtained from information in cells L12, M12, and K13.

The country spreadsheets also require information on the various prices and base quantities to be entered. The world price, as earlier, is inserted by the program into the appropriate column. In figure 4, the world price for C1 denominated in C1's currency is 4281. Similarly, the world price for C2BF and C3BF are 1851 and 2318, respectively. The trade prices in figure 4 are entered in cells E21 through E26. In this example, these prices are import or export unit values for the product under consideration. The trade price for C1BF is its global export unit value. Alternatively, the trade prices for C2BF and RWBF are the import unit values for BF purchased by C1 from C2 and RW, respectively. The producer price levels for all three kinds of beef are established at the same level. This same is true for consumer prices for the various products of a kind in our example problem. This assumes that at the retail levels, consumers pay an equivalent price for all beef products. This equivalence in price is largely the result of domestic and trade policies pursued by the respective governments. Hence, even though importers distinguish by origin of production, the final consumer is charged similar prices through governmental policy decisions.

The base quantities must be entered a bit differently than in the standard SWOPSIM framework. In figure 4, row 21 depicts the supply and demand condition for commodity BF in C1 (C1BF). The base supply quantities to be entered are the total domestic supply in C1. This is the same quantity as in the standard version of figure 3. The base demand quantity, however, is total domestic demand for C1 compared with total demand inclusive of imports from C2 and RW in the standard version. In rows 22 and 23, the supply quantities are zero, indicating that C2 and RW beef are not produced in C1. The demand quantities in these two rows, 105 in row 22 and 595 in row 23, represent imports by C1 of C2 and RW beef, respectively.

As with the standard SWOPSIM version, it is important to ensure that the world market for each product clears for the base solution. If the world market is not cleared in the base data, the world model will solve to clear the markets before any policy changes are entered and will destroy the base period data against which comparisons are to be made. This, as earlier, has to be examined across the various country spreadsheets. In figure 4, for instance, exports by C1 of C1BF is 14. This has to add up to imports of C1BF by C2 (14 in fig. 5) and RW (0 in fig. 6), respectively. Similarly, exports of BF by RW (696) is the sum of imports by C1 (595) and C2 (101). Note again that while references to exports and imports in the standard SWOPSIM framework mean net trade [(exports (+) or imports (-1)] of a region, in the Armington framework, exports and imports refer to gross exports or imports from and/or to a region, given that products are differentiated by place of origin.

Figure 5--Country Spreadsheet for C2 in the Armington Type Model

	A	B	C	D	E	F	G	H	I	J	K
1	DARM-C2		XRATE (LC/US$) =		1.359			XRATE ELASTICITY =		1	
2											
3	SUPPLY EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	SUPSUM	S-D SUM		
4	C1BF	.00	.00	.00	.00	.00	.00	.00	.80		
5	C2BF	.00	.70	.00	.00	-.10	.00	.60	1.40		
6	RWBF	.00	.00	.00	.00	.00	.00	.00	.80		
7	C1CG	.00	.00	.00	.00	.00	.00	.00	.50		
8	C2CG	.00	.00	.00	.00	.50	.00	.50	1.00		
9	RWCG	.00	.00	.00	.00	.00	.00	.00	.50		
11	DEMAND EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	SC2BF	DEMSUM	DSUM	DSHARE
12	C1BF	-3.07	2.04	.23	.00	.00	.00		-.80	1026	.01
13	C2BF	.03	-1.06	.23	.00	.00	.00		-.80		.89
14	RWBF	.03	2.04	-2.87	.00	.00	.00		-.80		.10
15	C1CG	.00	.00	.00	-3.73	3.23	.00	.2	-.50	23556	.02
16	C2CG	.00	.00	.00	.07	-.57	.00	.2	-.50		.98
17	RWCG	.00	.00	.00	.07	3.23	-3.80	.2	-.50		.00
20	DARM-C2	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
21	C1BF	4281	3663	7091	4926	1.359	0	14	-14	1	1
22	C2BF	1851	3663	7091	2516	1.359	1016	911	105	1	1
23	RWBF	2318	3663	7091	3654	1.359	0	101	-101	1	1
24	C1CG	125	131	120	144	1.359	0	500	-500	1	1
25	C2CG	130	131	120	193	1.359	26091	23056	3035	1	1
26	RWCG	133	131	120	181	1.359	0	0	0	1	1

	L	M
10		
11	OWN PR.	ELASUBS
12	-.8	3.1
13		
14		
15	-.5	3.8
16		
17		

Figure 6--Country Spreadsheet for RW in the Armington Type of Model

	A	B	C	D	E	F	G	H	I	J	K
1	DARM-RW		XRATE (LC/US$) =		1			XRATE ELASTICITY =		1	
2											
3	SUPPLY EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	SUPSUM	S-D SUM		
4	C1BF	.00	.00	.00	.00	.00	.00	.00	.70		
5	C2BF	.00	.00	.00	.00	.00	.00	.00	.70		
6	RWBF	.00	.00	.50	.00	.00	.00	.50	1.20		
7	C1CG	.00	.00	.00	.00	.00	.00	.00	.50		
8	C2CG	.00	.00	.00	.00	.00	.00	.00	.50		
9	RWCG	.00	.00	.00	.00	.00	.50	.50	1.00		

Figure 6--Concluded

11	DEMAND EL	C1BF	C2BF	RWBF	C1CG	C2CG	RWCG	DEMSUM	DSUM	DSHARE	OWN PR.
12	C1BF	-2.50	.00	1.80	.00	.00	.00	-.70	30843	.00	-.7
13	C2BF	.00	-2.50	1.80	.00	.00	.00	-.70		.00	
14	RWBF	.00	.00	-.70	.00	.00	.00	-.70		1.00	
15	C1CG	.00	.00	.00	-3.24	.01	2.73	-.50	636771	.09	-.5
16	C2CG	.00	.00	.00	.26	-3.49	2.73	-.50		.00	
17	RWCG	.00	.00	.00	.26	.01	-.77	-.50		.91	

20	DARM-RW	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
21	C1BF	4281	4281	4281	4281	1	0	0	0	1	1
22	C2BF	1851	1851	1851	1851	1	0	0	0	1	1
23	RWBF	2318	2318	2318	2318	1	31539	30843	696	1	1
24	C1CG	125	125	125	125	1	0	54850	-54850	1	1
25	C2CG	130	130	130	130	1	0	2866	-2866	1	1
26	RWCG	133	133	133	133	1	579055	579055	0	1	1

	|	L	||	M |
10				
11	ELASUBS			
12	2.5			
13				
14				
15	3.5			

The Creation of Equations

The formulation of a world model requires the creation of supply, demand, trade, and price linkage equations. The procedure to accomplish this in the Armington version is no different than in the standard SWOPSIM framework. The term EQUATION should be typed followed by the four letters of the master model file to be used. EQUATION is a batch procedure that takes the elasticities entered into the country spreadsheet and writes standard equations in the appropriate columns of the spreadsheet. The programs also calculate the constants (intercepts) for the base data. If the elasticities or base data are changed, equations and constants must be recreated via the EQUATION procedure.

The Creation of a World Multi-Product Model

A full simultaneous multi-region, multi-product model from the country/region spreadsheets can be created using the WORLDMOD procedure. 7/ This procedure for an Armington version is no different than in the standard SWOPSIM framework. Figure 7 shows DARM-WD, the sample world model created from the master file DARM and the three-country spreadsheet. In this model, all cross-price terms are active in model equations and the full world market clearing mechanism for each product is in use.

7/ See Appendix B for added options for WORLDMOD. It is now possible to omit selected products and country/regions from a world model.

Figure 7--World Model Using the Armington Type of Specification

	A	B	C	D	E	F	G	H	I	J	K
1	DARM-C1		XRATE (LC/US$) =		1			XRATE ELASTICITY =		1	
2											
3	DARM-C1	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
4	C1BF	4281.00	3086	5291	4281	1	11080	11066	14	1	1
5	C2BF	1851.00	3086	5291	1851	1	0	105	-105	1	1
6	RWBF	2318.00	3086	5291	2318	1	0	595	-595	1	1
7	C1CG	125.00	104	108	125	1	269445	214095	55350	1	1
8	C2CG	130.00	104	108	130	1	0	169	-169	1	1
9	RWCG	133.00	104	108	133	1	0	0	0	1	1
10											
11											
12	DARM-C2		XRATE (LC/US$) =		1.359			XRATE ELASTICITY =		1	
13											
14	DARM-C2	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
15	C1BF	4281.00	3663	7091	4926	1.359	0	14	-14	1	1
16	C2BF	1851.00	3663	7091	2516	1.359	1016	911	105	1	1
17	RWBF	2318.00	3663	7091	3654	1.359	0	101	-101	1	1
18	C1CG	125.00	131	120	144	1.359	0	500	-500	1	1
19	C2CG	130.00	131	120	193	1.359	26091	23056	3035	1	1
20	RWCG	133.00	131	120	181	1.359	0	0	0	1	1
21											
22											
23	DARM-RW		XRATE (LC/US$) =		1			XRATE ELASTICITY =		1	
24											
25	DARM-RW	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
26	C1BF	4281.00	4281	4281	4281	1	0	0	0	1	1
27	C2BF	1851.00	1851	1851	1851	1	0	0	0	1	1
28	RWBF	2318.00	2318	2318	2318	1	31539	30843	696	1	1
29	C1CG	125.00	125	125	125	1	0	54850	-54850	1	1
30	C2CG	130.00	130	130	130	1	0	2866	-2866	1	1
31	RWCG	133.00	133	133	133	1	579055	579055	0	1	1
32											
33											
34	DARM-WD	WDPRICE			SUPDWD1	SUPDWD2	SUPDEMWD		ABWDTRD1	ABWDTRD2	ABWDTRD3
35	C1BF	4281			11080	0	11080		28	0	0
36	C2BF	1851			1016	0	1016		210	0	0
37	RWBF	2318			31539	0	31539		1392	0	0
38	C1CG	125			269445	0	269445		110700	0	0
39	C2CG	130			26091	0	26091		6070	0	0
40	RWCG	133			579055	0	579055		0	0	0

	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3	SSHIFT	DSHIFT	PRSUBEQ	CNSUBEQ	IMSUBEQ	EXSUBEQ	IMQUOTA	EXQUOTA	TDCONST	PRCONST	CNCONST
4	.00	.00							1	-1195	2205
5	.00	.00							1	1235	2205
6	.00	.00							1	768	2205
7	.00	.00							1	-21	4
8	.00	.00							1	-26	4
9	.00	.00							1	-29	4

Figure 7--Continued

14	SSHIFT	DSHIFT	PRSUBEQ	CNSUBEQ	IMSUBEQ	EXSUBEQ	IMQUOTA	EXQUOTA	TDCONST	PRCONST	CNCONST
15	.00	.00							.8467003	-1263	3428
16	.00	.00							1.000195	1147	3428
17	.00	.00							1.159940	9	3428
18	.00	.00							.8476821	-13	-11
19	.00	.00							1.092432	-62	-11
20	.00	.00							1.001400	-50	-11

25	SSHIFT	DSHIFT	PRSUBEQ	CNSUBEQ	IMSUBEQ	EXSUBEQ	IMQUOTA	EXQUOTA	TDCONST	PRCONST	CNCONST
26	.00	.00							1	0	0
27	.00	.00							1	0	0
28	.00	.00							1	0	0
29	.00	.00							1	0	0
30	.00	.00							1	0	0
31	.00	.00							1	0	0

34	ABWDTRD4	ABWDTRD							SUPDEQ1	SUPDEQ2	WDTRD1
35	0	14							11080	0	0
36	0	105							1016	0	0
37	0	696							31539	0	-4.0e-12
38	0	55350							269445	0	0
39	0	3035							26091	0	1.00e-11
40	0	0							579055	0	0

	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
2											
3	LPRPRICE	LCNPRICE	SCROSS	DCROSS	SCONST	DCONST	SUPPLYEQ	DEMANDEQ	NTRADEEQ	SUPPLYD	DEMANDD
4	3086	5291	.6284875	2.797851	63.63059	1741317.	11080	11066	14	0	0
5	3086	5291	1	10901503	0	16522.53	0	105	-105	0	0
6	3086	5291	1	5490392.	0	93627.68	0	595	-595	0	0
7	104	108	1	6.440327	26421.26	1407465.	269445	214095	55350	0	0
8	104	108	1	8112958.	0	1111.009	0	169	-169	0	0
9	104	108	1	8112958.	0	0	0	0	0	0	0

14	LPRPRICE	LCNPRICE	SCROSS	DCROSS	SCONST	DCONST	SUPPLYEQ	DEMANDEQ	NTRADEEQ	SUPPLYD	DEMANDD
15	3663	7091	1	5.5094e8	0	16853.65	0	14	-14	0	0
16	3663	7091	.6141478	10.02730	5.295842	1096691.	1016	911	105	0	0
17	3663	7091	1	93532920	0	121587.1	0	101	-101	0	0
18	131	120	1	20755546	0	1371.456	0	500	-500	0	0
19	131	120	1	5.583692	2279.581	63240.58	26091	23056	3035	0	0
20	131	120	1	29018627	0	0	0	0	0	0	0

25	LPRPRICE	LCNPRICE	SCROSS	DCROSS	SCONST	DCONST	SUPPLYEQ	DEMANDEQ	NTRADEEQ	SUPPLYD	DEMANDD
26	4281	4281	1	1140786.	0	0	0	0	0	0	0
27	1851	1851	1	1140786.	0	0	0	0	0	0	0
28	2318	2318	1	1	655.0753	6994167.	31539	30843	696	0	0
29	125	125	1	659560.2	0	517500.4	0	54850	-54850	0	0
30	130	130	1	2204508.	0	31018.94	0	2866	-2866	0	0
31	133	133	1	3.684139	50210.44	6788120.	579055	579055	0	0	0

Figure 7--Concluded

	WDTRD2	ABSWDTD1	ABSWDTD2	ABSWDTD3	ABSWDTD4	DARM-WD	SUPDEMEQ	WDPRICE	WDTRADE	ABSWDTRD	WEIGHT
34											
35	Ø	28	Ø	Ø	Ø	C1BF	11Ø8Ø	4281.ØØ	Ø	14	1
36	Ø	21Ø	Ø	Ø	Ø	C2BF	1Ø16	1851.ØØ	Ø	1Ø5	1
37	Ø	1392	Ø	Ø	Ø	RWBF	31539	2318.ØØ	-4.Ø6-12	696	1
38	Ø	11Ø7ØØ	Ø	Ø	Ø	C1CG	269445	125.ØØ	Ø	5535Ø	1
39	Ø	6Ø7Ø	Ø	Ø	Ø	C2CG	26Ø91	13Ø.ØØ	1.ØØe-11	3Ø35	1
4Ø	Ø	Ø	Ø	Ø	Ø	RWCG	579Ø55	133.ØØ	Ø	Ø	1

	AH	AI	AJ	AK	AL	AM	AN	AO	AP
2									
3	NTRADED	PRPRICED	CNPRICED	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
4	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ
5	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
6	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
7	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ
8	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
9	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	ERROR	.ØØ	ERROR
14	NTRADED	PRPRICED	CNPRICED	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
15	Ø	9.Ø9e-13	9.Ø9e-13	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
16	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ
17	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
18	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
19	Ø	2.84e-14	2.84e-14	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ
2Ø	Ø	2.84e-14	2.84e-14	.ØØ	ERROR	.ØØ	ERROR	.ØØ	ERROR
25	NTRADED	PRPRICED	CNPRICED	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
26	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	ERROR	.ØØ	ERROR
27	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	ERROR	.ØØ	ERROR
28	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ
29	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
3Ø	Ø	Ø	Ø	.ØØ	ERROR	.ØØ	.ØØ	.ØØ	.ØØ
31	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	ERROR

	LWDPRICE	SUPDEM%	WDPRICED	WDPRICE%	WDTRADE%	
34						
35	4281.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	(ERROR terms appear because the
36	1851.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	base quantity is zero in the
37	2318.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	spreadsheet--this causes a
38	125.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	division error in the percentage
39	13Ø.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	change calculation.)
4Ø	133.ØØ	.ØØ	.ØØ	.ØØ	ERROR	

AN EXAMPLE OF BILATERAL TRADE FLOW ANALYSIS: A FREE TRADE AREA

One of the primary benefits of creating an Armington-type model is its usefulness in addressing issues concerning bilateral trade. The formation of a free trade area (FTA) is an example of a problem that requires bilateral trade information. The next two sections illustrate how an Armington-type model can be used to analyze issues concerning a FTA. This first section summarizes the economics of a free trade area and the second section uses the Armington example of this paper to illustrate the impact of the establishment of a free trade area between countries C1 and C2.

The Economics of a Free Trade Area

A free trade area is created when two or more countries abolish all trade barriers--import duties and quantitative restrictions--on their mutual trade, but retain their original trade regime for trade with nonmembers. An example of a free trade area is the European Free Trade Area (EFTA) which consists of the "Outer Five" European countries: Austria, Finland, Norway, Sweden, and Switzerland.

A free trade area differs from a customs union in that under a customs union, each member in the union must maintain the same protection regime against imports from nonunion members. Thus, while members in a FTA continue to maintain a different set of tariffs on imports from nonmembers, customs union members are required to adopt a common external tariff schedule on all imports from the rest of the world. Customs unions overcome the "policing" (transshipment) problem associated with a FTA under which nonmembers may have incentives to export goods to a FTA member with high external tariffs through another FTA member with lower external tariffs.

The primary motivation for a free trade area is that it is a step toward freer trade and therefore is viewed as a means of increasing welfare. One of the chief economic benefits of economic integration is brought about by the substitution of lower cost foreign supplies of a good for higher costs domestic production. Whenever a FTA has the effect of replacing higher cost domestic production with lower cost foreign production, economic gain occurs, and this gain has been labeled "trade creation." On the other hand, when lower cost sources are replaced by higher cost sources of supply, "trade diversion" occurs, and there is a economic loss incurred because of the integration. A net gain from a FTA will be realized if the sum of cost savings through trade creation exceeds the sum of cost increments through trade diversion, and a net loss incurred if the reverse balance occurs. 8/

The economic effects of an FTA can be explained in terms of figure 8 which implicitly assumes a four-region world with two importers and two exporters. M represents a particular importing country which is entering into an FTA by reducing its tariff on commodity i, NM an aggregate of other importing countries which do not reduce their tariffs (not shown explicitly), F a particular exporter to which the tariff reduction is applicable, and R an aggregate of all other exporters.

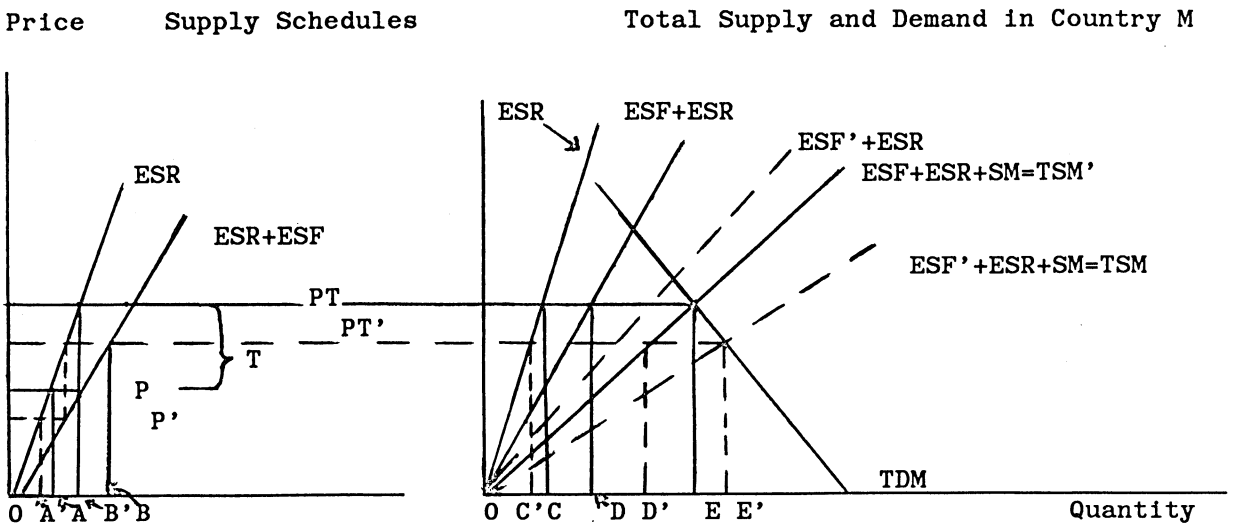
Panel A shows the excess supply schedules facing the FTA importing country M. ESF is the excess supply function facing M from the FTA member F. ESR is similarly the excess supply function pertinent to the ROW exporter. Panel B depicts the domestic market of the importing country M entering into an FTA with F. DF is the total demand faced by country M. The total supply available to country M, assuming a homogeneous product, is the sum of ESF, ESR, and domestic supply SM, and is represented by TSM. The intersection of TSM and TDF provides the domestic equilibrium price PT. Before the creation of the FTA, the price in M's market is PT, the price paid to F and RW is P. Country M consumes DE of its own production, CD imports from F, and OC imports from R.

With the creation of a free trade area between F and M, M removes its import

8/ For further details on the economic gains and losses associated with trade creation and trade diversion, see Chacholiades (4).

tariff on F's export of the commodity. From M's point of view, the removal of the tariff causes a rightward shift in the excess supply curve facing M from ESF to ESF'. There is no change in ESR given that the original tariffs still remain in place for country R. Total supply curve TS for M shifts to the right in response to a shift in ESF, and as a result, the price of the commodity in M's market declines to PT'. Country M consumes D'E' of its own product, OC' of imports from R, and C'D' imports from the free trade partner F. Consumption of domestically produced product in country M changes by EE'-DD', but whether this implies an increase or a decrease in consumption depends on whether EE' or DD' dominates (substitution between domestic and imported products). Total imports into M, however, increase by DD', the net result of F increasing its exports by DD'+C'C (=A'A+BB'), and R reducing its exports by C'C (=BB'). The price F receives for its commodity increases from P to PT', while the price obtained by R will likely be lower if the tariff is specific. The increase in the amount exported by F to M (=DD'+C'C) is made available by the increase in F's production, the decline in F's consumption, and the decline in exports to those countries which did not join the free trade area.

Figure 8--The Formation of a Free Trade Area



The preceding analysis concentrated on the effects of a FTA in a partial equilibrium framework. Only a single commodity was studied. But the formation of a FTA will in general affect a large number of commodities. When more than one commodity is considered, a large number of secondary repercussions need to be taken into account. As a result, various degrees of complementarity and substitutability will exist on both the demand and supply sides. Moreover, the analysis assumes that the increase in imports following the formation of a FTA is matched by a corresponding increase in exports at the given terms of trade so that trade remains balanced. In general, the terms of trade will have to change to re-establish the balance between exports and imports. These limitations of the partial equilibrium approach to the theory of a FTA point to the need for a more general equilibrium analysis. That, however, is beyond the intent of the brief theoretical survey of this paper. Interested readers are referred to Chacholiades (4) for greater details on the subject.

A Simple Free Trade Area Model in SWOPSIM

To illustrate how a free trade area can be analyzed with the Armington-type framework illustrated above, we consider a situation where countries C1 and C2 enter into a FTA. Assume that before entering into a FTA, C1 has a tariff of 25 percent on all beef imports, while C2 has a similar import tariff of 20 percent. Coarse grains trade is largely free, unimpeded by any restrictive trade measures. With the formation of a FTA, both C1 and C2 remove tariffs on beef imports between themselves, but maintain their original tariff regime vis-a-vis RW.

The mechanics of creating a FTA are relatively simple. In the world model illustrated in figure 7, tariff removal is introduced by entering negative numbers in the appropriate rows of the import subsidy equivalent (IMSUBEQ) column. A 25-percent reduction in tariffs by C2 for beef imports from C1 would be represented by a -1231.5 (25 percent of trade price of 4926) in P15. Similarly, a 20-percent removal of tariffs by C1 for beef imports from C2 would be depicted by a -370.2 (20 percent of trade price of 1851) in cell P5.

Figure 9 partially illustrates the results of creating a FTA between C1 and C2. With C2 lifting its 25-percent import tariff on beef from C1, the consumer price of C1BF in C2 decreases by 17.4 percent. Similarly, with C1 removing its 20-percent tariff for beef imports from C2, the consumer price of C2BF in C1 falls by 6.4 percent.

Figure 9--Results of the Establishment of a Free Trade Area Between C1 and C2

	AK	AL	AM	AN	AO	AP	AQ
3	DARM-C1	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
4	C1BF	-.02	-.02	-.03	-.12	-.02	81.86
5	C2BF	1.65	ERROR	-11.01	17.85	-6.42	17.85
6	RWBF	.00	ERROR	.00	-.16	.00	-.16
7	C1CG	.00	.00	.00	.00	.00	.00
8	C2CG	.07	ERROR	.09	-.33	.08	-.33
9	RWCG	.00	ERROR	.00	ERROR	.00	ERROR
14	DARM-C2	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
15	C1BF	-.02	ERROR	-33.65	81.86	-17.38	81.86
16	C2BF	1.65	.78	1.13	-1.19	.59	17.85
17	RWBF	.00	ERROR	.00	.62	.00	.62
18	C1CG	.00	ERROR	.00	.53	.00	.53
19	C2CG	.07	.05	.10	.09	.11	-.25
20	RWCG	.00	ERROR	.00	ERROR	.00	ERROR
25	DARM-RW	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%
26	C1BF	-.02	ERROR	-.02	ERROR	-.02	ERROR
27	C2BF	1.65	ERROR	1.65	ERROR	1.65	ERROR
28	RWBF	.00	.00	.00	.00	.00	-.05
29	C1CG	.00	ERROR	.00	.00	.00	.00
30	C2CG	.07	ERROR	.07	-.24	.07	-.24
31	RWCG	.00	.00	.00	.00	.00	ERROR

Figure 9--Concluded

	DARM-WD	WDPRICE%	WDTRADE%
34			
35	C1BF	-.Ø2	81.86
36	C2BF	1.65	17.85
37	RWBF	.ØØ	-.Ø5
38	C1CG	.ØØ	.ØØ
39	C2CG	.Ø7	-.25
4Ø	RWCG	.ØØ	ERROR

The fall in the price of imported beef following the removal of tariffs lead to substitutions between domestic and imported beef in both countries. C1 reduces its consumption of domestic beef by 13 MMT (not shown in fig. 9), and increases its imports of C2BF by 11 MMT. There is almost a one-to-one substitution between domestic and C2 beef in C1. In C2, the substitution is one to one. The demand for domestically produced beef falls by 11 MMT, and this is matched by an equivalent increase in the import demand for C1BF.

Consumer prices of domestic beef--C1BF in C1 and C2BF in C2-- change very little. The slight increase in the price of domestic beef in C1 indicates that the increase in export demand of C1BF is larger than the fall in domestic demand and supply for C1BF in C1. Similarly, the fall in consumer price of C2BF in C2 implies that the increase in export demand is larger than the fall in domestic supply and demand for C2BF in C2.

The third-country impacts in our example are not very large. Exports and imports from RW remain virtually the same. Similarly, the effects on the coarse grains sector are very minimal. To obtain bigger effects, one would either have to establish stronger cross-price relationships, or provide shocks of larger magnitudes.

This example completes our documentation of a method for constructing a bilateral trade flow model within the SWOPSIM framework. In this framework the logic of an Armington approach is used to construct the model and establish certain key cross-price relationships for the products under consideration. There is, however, nothing sacrosanct about this approach, and a number of other schemes could be devised to achieve the same end. Moreover, for illustrative purposes, this example uses synthetic estimates of the elasticity of substitution and own-price elasticities for the two goods. If this modeling approach is to be used for empirical analyses, it may be desirable to estimate these parameters empirically. Finally, more recent theoretical work may provide a newer foundation for achieving the Armington goals of model simplification; however the Armington approach is still widely used in an number of practical trade models including those characterized as "computable general equilibrium" models (9).

REFERENCES

1. Abbott, Philip C., and Philip L. Paarlberg. "Modeling the Impact of the 1980 Grain Embargo," Embargoes, Surplus Disposal, and U.S. Agriculture, Staff Report No. AGES860910, U.S. Dept. Agr., Econ. Res. Serv., Nov. 1986.

2. Armington, P.S. "A Theory of Demand for Products Distinguished by Place of Production," IMF Staff Papers 16(1969): 159-178.

3. Armington, P.S. "The Geographic Pattern of Trade and the Effects of Price Changes," IMF Staff Papers 17(1970): 179-199.

4. Chacholiades, M. International Trade Theory and Policy, New York: McGraw-Hill, 1978.

5. Figueroa, Enrique E. "An Analysis of the U.S. Grain Embargo Using a Quarterly Armington-Type Model," Embargoes, Surplus Disposal, and U.S. Agriculture, Staff Report No. AGES860910, U.S. Dept. Agr., Econ. Res. Serv., Nov. 1986.

6. Grennes, T., P.R. Johnson, and M. Thursby. The Economics of World Grain Trade, New York: Praeger Publishers, 1977.

7. Honma, M., and E. O. Heady. An Econometric Model for International Wheat Trade: Exports, Imports, and Trade Flows, CARD Report 124, Center for Agricultural and Rural Development, Ames, IA, 1984.

8. Roningen, Vernon O. "A Static World Policy Simulation (SWOPSIM) Modeling Framework," Staff Report No. AGES860625. U.S. Dept. Agr., Econ. Res. Serv., July 1986.

9. Srinivasan, T.N., and J. Whalley, eds. General Equilibrium Trade Policy Modeling, Cambridge: MIT Press, 1986.

10. Suryana, A. "Trade Prospects of Indonesian Palm Oil in the International Markets for Fats and Oils." Unpublished Ph.D. dissertation, North Carolina State Univ., Raleigh, NC., 1986.

11. Thompson, Robert L. A Survey of Recent U.S. Development in International Agricultural Trade Models, BLA-21, U.S. Dept. Agr., Econ. Res. Serv., Sept. 1981.

APPENDIX A: UPDATED SWOPSIM COMPUTER PROGRAMS INCLUDING MODIFICATIONS FOR THE ARMINGTON TYPE OF BILATERAL TRADE FLOW MODEL

The section below outlines the family of programs which create and modify SWOPSIM models. This section is followed by a listing of the programs themselves which use the master file to create SWOPSIM models. Comments within the programs provide documentation for a programmer. The programs all assume the input and output information is on the "D:" drive. This assumption can be changed by using a text editor to change to another drive designation in all programs.

Several improvements have been made in the programs which generate SWOPSIM models since the original documentation was published (8). First, the capability to generate Armington type bilateral trade flow models has been added to the programs. Second, the BASIC programs have been modified so they can be compiled and run much faster. Third, SWOPSIM has been modified so that products or country/regions can be omitted from a model in a very simple way. This latter feature means that, given a set of country/region spreadsheets filled out with base period data, a user can generate any number of submodels from the set of products and country/regions specified in the master model file. Finally, some useful aggregation and table generation procedures have been created.

Overview of SWOPSIM Computer Programs

Program	Function
Master.CAL	A master spreadsheet which defines the region and product coverage of a set of SWOPSIM models. This spreadsheet must be specified before any of the programs are run. An Armington type of bilateral trade flow model is chosen by repeating the two-letter commodity codes with two-letter country code prefixes.
CREATE.BAT	A (batch) program which clears old models and invokes the CSHEET (basic) program. Note that these batch programs assume a compiled version of the basic programs unless otherwise noted. See Roningen (8) for earlier versions of batch programs which assume uncompiled basic programs. Precompiled listings are provided following this overview.
CSHEET.EXE	The program, given the master file structure, creates a set of spreadsheets for each country marked in the master file. Each spreadsheet includes a place for elasticities, base data, and policy summaries in the form of subsidy equivalents. If a bilateral trade flow option is chosen, formulas are added which generate own- and cross-price elasticities from an overall demand elasticity and an elasticity of substitution.
EQUATION.BAT	This program invokes two basic programs (EQNA and EQNB) which replace existing model equations with new ones for a selected country/region. The equations include the elasticities currently documented in the country/region spreadsheet that is selected. If these elasticities are changed, this program and model creation programs need to be run again to incorporate the new elasticities.

EQNA.EXE	The first of the equation creation programs. This program reads the master file and writes out the elasticities from the selected country/region file.
EQNB.EXE	The second equation creation program calculates equation intercepts and writes them and the new equations in appropriate cells of the selected spreadsheet. Old intercepts and equations are replaced.
COMODMOD.BAT	This program creates a world (multi-region) single product model in a spreadsheet from base data and equations in the country/region spreadsheets. If subsidy equivalents are changed, the product model spreadsheet can be solved for a new equilibrium by changing the world product price enough to clear the world market. Cross-price effects are not included in the single product model. An option exists which allows selected country/regions to be omitted from the single product model. This option simply inserts base values rather than equations into the selected country/region row(s).
COMOD.EXE	This (compiled) basic program invoked by COMODMOD creates the world single product model spreadsheet.
WORLDMOD.BAT	This batch procedure clears the old world model away and creates a new multi-region, multi-product model from the country/region spreadsheets. The world model contains all of the regions and products specified in the master file and includes all cross-product effects.
WORLD.EXE	This is the basic program invoked by WORLDMOD which creates the full world SWOPSIM model. An option allows the user to omit selected products and/or country/regions from a world model. This option inserts values rather than equations into the world model spreadsheet for the items omitted. In effect, this option holds the values for the omitted items constant in the world model generated by SWOPSIM.
AGCTY.BAT	A procedure which allows the aggregation of selected data across country/region spreadsheets. This is useful for checking, for example, on the consistency of the base data across countries/regions. If a single product does not have balanced world trade in the base period, any model spreadsheet will begin to solve even if no policy changes have been introduced.
AG.EXE	The basic program invoked by AGCTY.
ADDVAL.BAT	A procedure which allows a formula, variable, or value to be added to a product row in a world model. The addition must be entered by hand into the ADDVAL.BAS program. This procedure is useful for generating scenarios or indicators for presentation purposes. The basic program is not compiled.
ADDVAL.BAS	The basic program invoked by ADDVAL.BAT

TABLE.BAT — A batch procedure which selects a particular variable from the world model and inserts its value into the master file (replacing .'s, 1's, etc.). This procedure helps to put world model results in an easily readable form for comparisons across country/regions and products. The user has an option of gathering variables from either the world model or the individual country/region spreadsheets.

TAB.EXE — The basic program invoked by TABLE.BAT.

AGMOD.BAT — A procedure which allows the user to aggregate models across countries/regions listed in the master model file. Base data is aggregated and supply and demand elasticities are weighted by supply and demand quantities, respectively. Once equations are created for the aggregate model, it can be used as another region model provided its code replaces the aggregated codes in the master model file. This procedure allows the user to readily create a series of models sized to concentrate on particular problems.

AGMODB.EXE — The basic program invoked by AGMOD.

Program Listings

The batch procedures above assume the spreadsheet used is SuperCalc3, Release 2.1 [SORCIM/IUS Micro Software, SuperCalc 3 (Release 2.1 - User's Guide and Reference Manual, Second ed., rev. 1984, San Jose, CA]. Release 2.1 has an improved and fast solution technique for simultaneous equations. SuperCalc4 is now available and will work with these programs provided batch and basic programs are edited. SuperCalc4 allows easy conversion of spreadsheets to and from other brands of spreadsheets such as LOTUS.

These program listings expect SuperCalc3 to be on the logged drive and assume the programs themselves, spreadsheets, etc. are on the D: drive. "D:" can be globally edited in all programs and procedures to obtain other drive designations. Note that basic programs that follow have suffixes of BAS because they are not compiled for listing purposes.

CREATE.BAT

```
Give four letter name of master spreadsheet file (e.g. CREATE DEMO).

ERASE D:%1-??.*
ERASE D:%1^??.*
D:CSHEET
SDIR D:??.XQT
D:LOAD
```

CSHEET.BAS

```
1Ø REM - CSHEET - CREATE COUNTRY/REGION SPREADSHEETS FROM MASTER FILE SPECS.
2Ø CLS 'XQT FILE IS CREATED FOR EACH COUNTRY/REGION IN MASTER FILE
3Ø PRINT"PROGRAM TO CREATE NEW BLANK COUNTRY/REGION SPREADSHEETS FROM MASTER"
4Ø PRINT"FILE (SPREADSHEET).  THIS PROGRAM WILL REPLACE OLD SPREADSHEETS - "
```

```
50 PRINT"ELASTICITIES AND BASE DATA MUST BE ADDED TO THE NEW SPREADSHEETS IN"
60 PRINT"ORDER TO CREATE CONSTANTS AND EQUATIONS WITH THE 'EQUATION'"
70 PRINT"PROGRAM.":PRINT
80 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
90 IF LEN(FILE$)<>4 THEN 20 'MASTER FILE NAME MUST BE 4 CHARACTERS
100 NAM$=FILE$+"-"
110 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
120 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN PERHAPS UP TO 110 PRODUCT GROUPS
130 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
140 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
150 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
160 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
170 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
180 LCL=LEN(CL$)/2
190 DIM CLM$(0,123)
200 FOR I=1 TO LCL '122 COLUMNS MAX.
210 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
220 F$="D:"+FILE$+".PRN"
230 OPEN"I",1,F$
240 DIM D(123,42)
250 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
260 LINE INPUT #1,W$
270 LINE INPUT #1,W$
280 LINE INPUT #1,W$
290 LINE INPUT #1,CY$
300 LINE INPUT #1,W$
310 STAR=(INSTR(CY$,"-")-11)/3
320 LCY=(LEN(CY$)-8)/3
330 IF STAR < LCY THEN LCY=STAR
340 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
350 FOR I=1 TO LCY
360 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
370 LPR=0
380 PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
390 LPR=LPR+1
400 LINE INPUT#1,W$
410 WP$=MID$(W$,5,4)
420 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 440
430 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 420
440 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 520 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
450 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
460 X$=MID$(W$,(J-1)*3+9,3)
470 IF X$="  D" THEN X$="  2"
480 IF X$="  S" THEN X$="  3"
490 IF X$=" SD" OR X$=" DS" THEN X$="  4"
500 D(LPR,J)=VAL(X$):NEXT J
510 GOTO 390
520 CLOSE 1
530 PRINT:PRINT:INPUT"DO YOU WANT SYMMETRY FORMULAS IN MATRICES (Y OR N)";W$
540 IF LEFT$(W$,1)="Y" THEN SYMTRY=1 ELSE SYMTRY=0
550 OPEN"O",1,"D:LOAD.BAT"
560 FOR I=1 TO LCY
570 W$="SC3 D:"+CYM$(0,I):GOSUB 3270
580 W$="ERASE D:"+CYM$(0,I)+".XQT":GOSUB 3270
590 NEXT I
600 CLOSE 1
```

```
610 PRINT:PRINT
620 LPR=LPR-1
630 PRINT"CONTINUING . . . . . .":PRINT
640 GOSUB 1980
650 FOR K=1 TO LCY 'MAJOR LOOP TO CREATE FILE FOR EACH COUNTRY/REGION
660 FOR I=1 TO LPR 'CHECK WHETHER ANY PRODUCT IS INCLUDED FOR COUNTRY/REGION
670 IF D(I,K)>0 THEN 700
680 NEXT I
690 GOTO 3180 'IF NO PRODUCT, THEN SKIP COUNTRY/REGION
700 F$="D:"+CYM$(0,K)+".XQT"
710 OPEN"O",1,F$
720 W$="/GN":GOSUB 3220 'BEGIN WRITING SUPERCALC COMMANDS TO XQT FILE
730 W$="/GM":GOSUB 3220
740 W$="/FCA,TR":GOSUB 3220
750 W$="=A1":GOSUB 3220
760 W$=CHR$(34)+NAM$+CYM$(0,K):GOSUB 3210
770 W$="=C1":GOSUB 3220
780 W$=CHR$(34)+"XRATE-(LC/US$)-->":GOSUB 3210
790 W$="=E1":GOSUB 3220
800 W$="0":GOSUB 3220
810 W$="=H1":GOSUB 3220
820 W$=CHR$(34)+"XRATE-ELASTICITY->":GOSUB 3210
830 W$="=J1":GOSUB 3220
840 W$="0":GOSUB 3220
850 W$="=A3":GOSUB 3220
860 W$=CHR$(34)+"SUPPLY-EL":GOSUB 3210
870 W$="/FR3,TR":GOSUB 3220
880 FOR I=1 TO LPR:IF D(I,K)=0 THEN 910 'WRITE SUPPLY ELAST. MATRIX COL. HEADS
890 W$="="+CLM$(0,I+1)+"3":GOSUB 3220
900 W$=CHR$(34)+PRM$(0,I):GOSUB 3210
910 NEXT I
920 LG=0
930 FOR I=1 TO LPR:IF D(I,LCY)=3 OR D(I,LCY)=4 THEN 940 ELSE 970 'D. VAR. TO S.
940 LG=LG+1:W$="="+CLM$(0,LPR+1+LG)+"3":GOSUB 3220
950 IF D(I,K)=3 OR D(I,K)=4 THEN 960 ELSE 970
960 W$=CHR$(34)+"D"+PRM$(0,I):GOSUB 3210
970 NEXT I
980 LGS=LG+1 'WRITE SUPPLY ROW SUM HEAD
990 W$="="+CLM$(0,LPR+1+LGS)+"3":GOSUB 3220
1000 W$=CHR$(34)+"SUPSUM":GOSUB 3210
1010 W$="="+CLM$(0,LPR+2+LGS)+"3":GOSUB 3220
1020 W$=CHR$(34)+"S-D SUM":GOSUB 3210
1030 FOR I=1 TO LPR 'WRITE SUPPLY ELASTICITY ROW
1040 IF D(I,K)=0 THEN 1200
1050 W$="=A"+STR$(I+3):GOSUB 3220
1060 W$=CHR$(34)+PRM$(0,I):GOSUB 3210
1070 FOR J=1 TO LPR 'WRITE COLUMN OF ZERO ELASTICITIES FOR SUPPLY MATRIX ROW
1080 IF D(J,K)=0 THEN 1170
1090 W$="="+CLM$(0,J+1)+STR$(I+3):GOSUB 3220
1100 IF SYMTRY=1 AND I>J THEN GOTO 1140 'ADD SYMMETRY FORMULAS FOR SUPPLY
1110 W$="0":GOSUB 3220
1120 W$="/FE"+CLM$(0,J+1)+STR$(I+3)+",$":GOSUB 3220
1130 GOTO 1170
1140 W$="C"+STR$(J+2*LPR+8)+"*"+CLM$(0,I+1)+STR$(J+3)+"*G"+STR$(J+2*LPR+8)
1150 W$=W$+"/(C"+STR$(I+2*LPR+8)+"*G"+STR$(I+2*LPR+8)+")":GOSUB 3220
1160 W$="/FE"+CLM$(0,J+1)+STR$(I+3)+",$":GOSUB 3210
```

```
1170 NEXT J
1180 W$="="+CLM$(0,LPR+1+LGS)+STR$(I+3):GOSUB 3220 'WRITE SUPPLY ROW SUMS
1190 W$="SUM(B"+STR$(I+3)+":"+CLM$(0,LPR+1)+STR$(I+3)+")":GOSUB 3250
1200 NEXT I
1210 W$="=A"+STR$(LPR+5):GOSUB 3220
1220 W$=CHR$(34)+"DEMAND-EL":GOSUB 3210
1230 W$="/FR"+STR$(LPR+5)+",TR":GOSUB 3220
1240 FOR I=1 TO LPR:IF D(I,K)=0 THEN 1270 'WRITE DEM. ELAST. MATRIX COL. HEADS
1250 W$="="+CLM$(0,I+1)+STR$(LPR+5):GOSUB 3220
1260 W$=CHR$(34)+PRM$(0,I):GOSUB 3210
1270 NEXT I
1280 LF=0
1290 FOR I=1 TO LPR:IF D(I,LCY)=2 OR D(I,LCY)=4 THEN 1300 ELSE 1330 'S. VAR. TO D.
1300 LF=LF+1:W$="="+CLM$(0,LPR+1+LF)+STR$(LPR+5):GOSUB 3220
1310 IF D(I,K)=2 OR D(I,K)=4 THEN 1320 ELSE 1330
1320 W$=CHR$(34)+"S"+PRM$(0,I):GOSUB 3210
1330 NEXT I
1340 LFS=LF+1 'WRITE DEMAND ROW SUM HEAD
1350 W$="="+CLM$(0,LPR+1+LFS)+STR$(LPR+5):GOSUB 3220
1360 W$=CHR$(34)+"DEMSUM":GOSUB 3210
1370 FOR I=1 TO LPR 'WRITE DEMAND ELASTICITY ROW
1380 IF D(I,K)=0 THEN 1560
1390 W$="=A"+STR$(I+LPR+5):GOSUB 3220
1400 W$=CHR$(34)+PRM$(0,I):GOSUB 3210
1410 FOR J=1 TO LPR 'WRITE COLUMN OF ZERO ELASTICITIES FOR DEMAND MATRIX ROW
1420 IF D(J,K)=0 THEN 1510
1430 W$="="+CLM$(0,J+1)+STR$(I+LPR+5):GOSUB 3220
1440 IF SYMTRY=1 AND I>J THEN GOTO 1480 'ADD SYMMETRY FORMULAS FOR DEMAND
1450 W$="0":GOSUB 3220
1460 W$="/FE"+CLM$(0,J+1)+STR$(I+LPR+5)+",$":GOSUB 3220
1470 GOTO 1510
1480 W$="D"+STR$(J+2*LPR+8)+"*"+CLM$(0,I+1)+STR$(J+LPR+5)+"*H"+STR$(J+2*LPR+8)
1490 W$=W$+"/(D"+STR$(I+2*LPR+8)+"*H"+STR$(I+2*LPR+8)+")":GOSUB 3220
1500 W$="/FE"+CLM$(0,J+1)+STR$(I+LPR+5)+",$":GOSUB 3210
1510 NEXT J
1520 W$="="+CLM$(0,LPR+1+LFS)+STR$(I+LPR+5):GOSUB 3220 'WRITE DEMAND ROW SUMS
1530 W$="SUM(B"+STR$(I+LPR+5)+":"+CLM$(0,LPR+1)+STR$(I+LPR+5)+")":GOSUB 3250
1540 W$="="+CLM$(0,LPR+2+LGS)+STR$(I+3):GOSUB 3220
1550 W$=CLM$(0,LPR+1+LGS)+STR$(I+3)+"-"+CLM$(0,LPR+1+LFS)+STR$(I+LPR+5):GOSUB 3250
1560 NEXT I
1570 IB=1:IHEAD=0:IE=1 'WRITE ARMINGTON MODEL DATA
1580 IF IB>LPR THEN 1850
1590 IE=IE+1:IF IE>LPR THEN 1610
1600 IF RIGHT$(PRM$(0,IB),2)=RIGHT$(PRM$(0,IE),2) THEN 1590
1610 IE=IE-1:IF IE=IB OR D(IB,K)=0 THEN 1840
1620 IHEAD=1:W$="="+CLM$(0,LPR+2+LFS)+STR$(IB+LPR+5):GOSUB 3220
1630 W$="SUM(H"+STR$(IB+2*LPR+8)+":H"+STR$(IE+2*LPR+8)+")":GOSUB 3220 'DSUM
1640 W$="/FE"+CLM$(0,LPR+2+LFS)+STR$(IB+LPR+5)+",$":GOSUB 3210
1650 FOR IJ=IB TO IE
1660 W$="="+CLM$(0,LPR+3+LFS)+STR$(IJ+LPR+5):GOSUB 3220
1670 W$="H"+STR$(IJ+2*LPR+8)+"/"+CLM$(0,LPR+2+LFS)+STR$(IB+LPR+5):GOSUB 3220 'SHARE OF DEMAND
1680 W$="/FE"+CLM$(0,LPR+3+LFS)+STR$(IJ+LPR+5)+",$":GOSUB 3210
1690 NEXT IJ
1700 W$="="+CLM$(0,LPR+4+LFS)+STR$(IB+LPR+5):GOSUB 3220
1710 W$="-.5":GOSUB 3220 'OWN PRICE ELASTICITY OF DEMAND
1720 W$="="+CLM$(0,LPR+5+LFS)+STR$(IB+LPR+5):GOSUB 3220
```

```
1730 W$="3":GOSUB 3220 'ELASTICITY OF SUBSTITUTION
1740 FOR IJC=IB TO IE
1750 FOR IJR=IB TO IE
1760 W$="="+CLM$(0,IJC+1)+STR$(IJR+LPR+5):GOSUB 3220
1770 IF IJC=IJR THEN 1780 ELSE 1820
1780 W$="-(1-"+CLM$(0,LPR+3+LFS)+STR$(IJR+LPR+5)+")*"+CLM$(0,LPR+5+LFS)
1790 W$=W$+STR$(IB+LPR+5)+"+"+CLM$(0,LPR+3+LFS)+STR$(IJR+LPR+5)+"*"
1800 W$=W$+CLM$(0,LPR+4+LFS)+STR$(IB+LPR+5):GOSUB 3210
1810 GOTO 1830
1820 W$=CLM$(0,LPR+3+LFS)+STR$(IJC+LPR+5)+"*("+CLM$(0,LPR+5+LFS)+STR$(IB+LPR+5)+"+"+CLM$(0,LPR+4+LFS)+STR$(IB+LPR+5)+")"
     :GOSUB 3210
1830 NEXT IJR:NEXT IJC
1840 IB=IE+1:IE=IB:GOTO 1580
1850 IF IHEAD=0 THEN 1940 'WRITE ARMINGTON DATA HEAD IF ARMINGTON SPEC. USED
1860 W$="="+CLM$(0,LPR+2+LFS)+STR$(LPR+5):GOSUB 3220
1870 W$=CHR$(34)+"DSUM":GOSUB 3210
1880 W$="="+CLM$(0,LPR+3+LFS)+STR$(LPR+5):GOSUB 3220
1890 W$=CHR$(34)+"DSHARE":GOSUB 3210
1900 W$="="+CLM$(0,LPR+4+LFS)+STR$(LPR+5):GOSUB 3220
1910 W$=CHR$(34)+"OWN PR.":GOSUB 3210
1920 W$="="+CLM$(0,LPR+5+LFS)+STR$(LPR+5):GOSUB 3220
1930 W$=CHR$(34)+"ELASUBS":GOSUB 3210
1940 W$="=A"+STR$(2*LPR+8):GOSUB 3210 'BEGIN TO WRITE DATA PART OF SPREADSHEET
1950 W$=CHR$(34)+NAM$+CYM$(0,K):GOSUB 3210
1960 W$="/FR"+STR$(2*LPR+8)+",TR":GOSUB 3220
1970 GOTO 2410
1980 DIM N$(0,43) 'SUBROUTINE TO CREATE DATA COLUMN HEADS
1990 N$(0,1)="WDPRICE"   'B
2000 N$(0,2)="PRPRICE"   'C
2010 N$(0,3)="CNPRICE"   'D
2020 N$(0,4)="TDPRICE"   'E
2030 N$(0,5)="XRATE"     'F
2040 N$(0,6)="SUPPLY"    'G
2050 N$(0,7)="DEMAND"    'H
2060 N$(0,8)="NTRADE"    'I
2070 N$(0,9)="XRATE EL"  'J
2080 N$(0,10)="WDPT.EL"  'K
2090 N$(0,11)="SSHIFT"   'L
2100 N$(0,12)="DSHIFT"   'M
2110 N$(0,13)="PRSUBEQ"  'N
2120 N$(0,14)="CNSUBEQ"  'O
2130 N$(0,15)="IMSUBEQ"  'P
2140 N$(0,16)="EXSUBEQ"  'Q
2150 N$(0,17)="IMQUOTA"  'R
2160 N$(0,18)="EXQUOTA"  'S
2170 N$(0,19)="TDCONST"  'T
2180 N$(0,20)="PRCONST"  'U
2190 N$(0,21)="CNCONST"  'V
2200 N$(0,22)="LPRPRICE" 'W
2210 N$(0,23)="LCNPRICE" 'X
2220 N$(0,24)="SCROSS"   'Y
2230 N$(0,25)="DCROSS"   'Z
2240 N$(0,26)="SCONST"   'AA
2250 N$(0,27)="DCONST"   'AB
2260 N$(0,28)="SUPPLYEQ" 'AC
2270 N$(0,29)="DEMANDEQ" 'AD
```

```
2280 N$(0,30)="NTRADEEQ" 'AE
2290 N$(0,31)="SUPPLYD"  'AF
2300 N$(0,32)="DEMANDD"  'AG
2310 N$(0,33)="NTRADED"  'AH
2320 N$(0,34)="PRPRICED" 'AI
2330 N$(0,35)="CNPRICED" 'AJ
2340 N$(0,36)="TDPRICE%" 'AK
2350 N$(0,37)="SUPPLY%"  'AL
2360 N$(0,38)="PRPRICE%" 'AM
2370 N$(0,39)="DEMAND%"  'AN
2380 N$(0,40)="CNPRICE%" 'AO
2390 N$(0,41)="NTRADE%"  'AP
2400 RETURN
2410 FOR I=1 TO 41 'WRITE DATA COLUMN HEADS ON SPREADSHEET
2420 W$="="+CLM$(0,I+1)+STR$(2*LPR+8):GOSUB 3220
2430 W$=CHR$(34)+N$(0,I):GOSUB 3210
2440 NEXT I
2450 FOR I=1 TO LPR 'LOOP TO WRITE DATA COLUMN FOR EACH PRODUCT GROUP
2460 IF D(I,K)=0 THEN 3110 'SKIP ROW IF PRODUCT NOT INCLUDED FOR COUNTRY
2470 S$=RIGHT$(STR$(I+2*LPR+8),LEN(STR$(I+2*LPR+8))-1) 'SELECT ROW
2480 W$="=A"+S$:GOSUB 3220
2490 W$=CHR$(34)+PRM$(0,I):GOSUB 3210
2500 T$=STR$(I+4)
2510 W$="=B"+S$:GOSUB 3220 'LOAD WDPRICE FROM MASTER FILE
2520 W$="/LD:"+FILE$+",PAR"+T$+":AR"+T$+",B"+S$+",V":GOSUB 3210
2530 W$="=C"+S$:GOSUB 3220 'WRITE ZERO WHERE DATA IS TO BE ENTERED
2540 W$="0":GOSUB 3220
2550 W$="=D"+S$:GOSUB 3220 'WRITE ZERO WHERE DATA IS TO BE ENTERED
2560 W$="0":GOSUB 3220
2570 W$="=E"+S$:GOSUB 3220 'WRITE ZERO WHERE DATA IS TO BE ENTERED
2580 W$="0":GOSUB 3220
2590 W$="=F"+S$:GOSUB 3220 'XRATE FROM TOP OF SHEET
2600 W$="E1":GOSUB 3210
2610 W$="=G"+S$:GOSUB 3220 'PUT ZERO WHERE DATA IS TO BE ENTERED
2620 W$="0":GOSUB 3220
2630 W$="=H"+S$:GOSUB 3220 'PUT ZERO WHERE DATA IS TO BE ENTERED
2640 W$="0":GOSUB 3220
2650 W$="=I"+S$:GOSUB 3220 'NET TRADE
2660 W$="G"+S$+"-H"+S$:GOSUB 3210
2670 W$="=J"+S$:GOSUB 3220 'XRATE EL FROM TOP OF SHEET
2680 W$="J1":GOSUB 3210
2690 W$="=K"+S$:GOSUB 3220 'SET WORLD PRICE TRANSMISSION ELASTICITY TO 1
2700 W$="1":GOSUB 3220
2710 W$="=L"+S$:GOSUB 3220 'COLUMN FOR SUPPLY SHIFT%
2720 W$="0":GOSUB 3250
2730 W$="=M"+S$:GOSUB 3220 'COLUMN FOR DEMAND SHIFT%
2740 W$="0":GOSUB 3250
2750 W$="=T"+S$:GOSUB 3220 'TRADE PRICE CONSTANT
2760 W$="E"+S$+"/((F"+S$+"^J"+S$+")*(B"+S$+"^K"+S$+"))":GOSUB 3210
2770 W$="=U"+S$:GOSUB 3220 'PRODUCER PRICE CONSTANT
2780 W$="C"+S$+"-E"+S$:GOSUB 3210
2790 W$="=V"+S$:GOSUB 3220 'CONSUMER PRICE CONSTANT
2800 W$="D"+S$+"-C"+S$:GOSUB 3210
2810 W$="=W"+S$:GOSUB 3220 'LIBERALIZED PRODUCER PRICE
2820 W$="MAX(U"+S$+"-N"+S$+"+IF(AE"+S$+"<0,P"+S$+",0)"
2830 W$=W$+"-IF(AE"+S$+">=0,Q"+S$+",0)"+"+T"+S$+"*(F"+S$
```

```
2840 W$=W$+"^J"+S$+")*(B"+S$+"^K"+S$+"),1)":GOSUB 3210
2850 W$="=X"+S$:GOSUB 3220 'LIBERALIZED CONSUMER PRICE
2860 W$="MAX(W"+S$+"+N"+S$+"+O"+S$+"+V"+S$+",1)":GOSUB 3210
2870 W$="=AE"+S$:GOSUB 3220 'NET TRADE EQUATION
2880 W$="AC"+S$+"-AD"+S$:GOSUB 3210
2890 W$="=AF"+S$:GOSUB 3220 'SUPPLY DIFFERENCE
2900 W$="AC"+S$+"-G"+S$:GOSUB 3260
2910 W$="=AG"+S$:GOSUB 3220 'DEMAND DIFFERENCE
2920 W$="AD"+S$+"-H"+S$:GOSUB 3260
2930 W$="=AH"+S$:GOSUB 3220 'NET TRADE DIFFERENCE
2940 W$="AE"+S$+"-I"+S$:GOSUB 3260
2950 W$="=AI"+S$:GOSUB 3220 'PRODUCER PRICE DIFFERENCE
2960 W$="W"+S$+"-C"+S$:GOSUB 3210
2970 W$="=AJ"+S$:GOSUB 3220 'CONSUMER PRICE DIFFERENCE
2980 W$="X"+S$+"-D"+S$:GOSUB 3210
2990 W$="=AK"+S$:GOSUB 3220 '% CHANGE IN TRADE PRICE
3000 W$="((T"+S$+"*(F"+S$+"^J"+S$+")*(B"+S$+"^K"+S$+"))-E"+S$+")*100/E"+S$:GOSUB 3250
3010 W$="=AL"+S$:GOSUB 3220 '% CHANGE IN SUPPLY
3020 W$="AF"+S$+"*100/G"+S$:GOSUB 3250
3030 W$="=AM"+S$:GOSUB 3220 '% CHANGE IN PRODUCER PRICE
3040 W$="AI"+S$+"*100/C"+S$:GOSUB 3250
3050 W$="=AN"+S$:GOSUB 3220 '% CHANGE IN DEMAND
3060 W$="AG"+S$+"*100/H"+S$:GOSUB 3250
3070 W$="=AO"+S$:GOSUB 3220 '% CHANGE IN CONSUMER PRICE
3080 W$="AJ"+S$+"*100/D"+S$:GOSUB 3250
3090 W$="=AP"+S$:GOSUB 3220 '% CHANGE IN NET TRADE
3100 W$="AH"+S$+"*100/I"+S$:GOSUB 3250
3110 NEXT I
3120 W$="=A1":GOSUB 3220
3130 W$="!":GOSUB 3220
3140 W$="/SD:"+NAM$+CYM$(0,K)+",A":GOSUB 3220 'SAVE THE SPREADSHEET
3150 REM W$="/ODA1:AP"+S$+",DD:"+NAM$+CYM$(0,K):GOSUB 2490 'SAVE PRN SPREADSH.
3160 W$="/Q,Y":GOSUB 3220
3170 CLOSE 1
3180 NEXT K 'END OF LOOP FOR EACH COUNTRY/REGION
3190 SYSTEM
3200 END
3210 GOSUB 3220:PRINT #1,"/P":RETURN 'WRITE TO SHEET AND PROTECT CELL
3220 P0=INSTR(W$," "):IF P0=0 THEN 3240 'REMOVE SPACES FROM STRING
3230 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 3220
3240 PRINT #1,W$:RETURN 'WRITE TO SHEET
3250 GOSUB 3220:PRINT #1,"/FE,$":PRINT #1,"/P":RETURN 'WRITE TO SHEET, PROTECT AND USE $ FORMAT
3260 GOSUB 3220:PRINT #1,"/FE,I":PRINT #1,"/P":RETURN 'WRITE TO SHEET, PROTECT AND USE INTEGER FORMAT
3270 PRINT #1,W$:RETURN 'PRINT WITH BLANKS
```

EQUATION.BAT

```
Give the 4 letter name of master spreadsheet (e.g. EQUATION DEMO).

SDIR D:%1-??.CAL
ERASE D:TEST.PRN
ERASE D:SUP.PRN
ERASE D:DEM.PRN
ERASE D:%1-??.PRN
D:EQNA
SC3 D:TEST
```

```
ERASE D:TEST.XQT
D:EQNB
SC3 D:TEST
ERASE D:TEST.XQT
ERASE D:TEST.TXT
ERASE D:TEST.CAL
ERASE D:SUP.PRN
ERASE D:DEM.PRN
SDIR D:%1-??.CAL
```

EQNA.BAS

```
10 REM - EQNA - PART A, CREATE EQUATIONS FOR COUNTRY/REGION MODEL
20 REM COUNTRY/REGION SPREADSHEETS MUST HAVE BASE PRICE AND QUANTITY DATA ADDED TO THEM BEFORE THIS PROGRAM IS RUN
30 CLS 'SUP AND DEM PRINT FILES ARE TEMPORARILY CREATED
40 PRINT"PROGRAM TO SELECT A COUNTRY/REGION FOR EQUATION WRITING":PRINT
50 PRINT"ELASTICITIES AND BASE DATA HAVE TO BE ADDED TO COUNTRY/REGION"
60 PRINT"FILES BEFORE THIS PROGRAM IS RUN.":PRINT
70 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
80 NAM$=FILE$+"-"
90 IF LEN(FILE$)<>4 THEN 30
100 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
110 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN PERHAPS UP TO 110 PRODUCT GROUPS
120 REM AN ELASTICITY LESS THAN -9.999 OR GREATER THAN 99.99 CAN CAUSE AN ERROR
130 REM IN THE EQUATION GENERATION PROCEDURE.  LARGE PRODUCT SETS AND RESULTING
140 REM LARGE ELASTICITY MATRICES NEED LONGER PROGRAM RUNNING TIMES
150 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
160 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
170 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
180 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
190 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
200 LCL=LEN(CL$)/2
210 DIM CLM$(0,123)
220 FOR I=1 TO LCL '122 COLUMNS MAX.
230 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
240 F$="D:"+FILE$+".PRN"
250 OPEN"I",1,F$
260 DIM D(123,42)
270 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
280 LINE INPUT #1,W$
290 LINE INPUT #1,W$
300 LINE INPUT #1,W$
310 LINE INPUT #1,CY$
320 LINE INPUT #1,W$
330 STAR=(INSTR(CY$,"-")-11)/3
340 LCY=(LEN(CY$)-8)/3
350 IF STAR < LCY THEN LCY=STAR
360 FOR I=1 TO LCY
370 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):NEXT I
380 LPR=0
390 PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
400 LPR=LPR+1
410 LINE INPUT#1,W$
420 WP$=MID$(W$,5,4)
430 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 450
440 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 430
```

```
450 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 530 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
460 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
470 X$=MID$(W$,(J-1)*3+9,3)
480 IF X$="  D" THEN X$="  2"
490 IF X$="  S" THEN X$="  3"
500 IF X$=" SD" OR X$=" DS" THEN X$="  4"
510 D(LPR,J)=VAL(X$):NEXT J
520 GOTO 400
530 PRINT:CLOSE 1:LPR=LPR-1
540 PRINT:PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
550 FOR I=1 TO LCY:PRINT CYM$(0,I);" ";:NEXT I:PRINT
560 PRINT:PRINT:PRINT:INPUT"ENTER 2 DIGIT COUNTRY/REGION CODE";CY$
570 FOR JC=1 TO LCY 'COUNTRY/REGION IS PEGGED AND CHECKED
580 IF CY$=CYM$(0,JC) THEN 610
590 NEXT JC
600 GOTO 540
610 LF=0:LG=0 'COUNT NUMBER OF QUANTITIES INCLUDED IN S & D EQUATIONS IN RW
620 DIM DEMQT(123),SUPQT(123):IDPOS=0:ISPOS=0
630 FOR I=1 TO LPR: IF D(I,LCY)=2 OR D(I,LCY)=4 THEN 640 ELSE 670
640 LF=LF+1
650 IDPOS=IDPOS+1
660 DEMQT(IDPOS)=I
670 IF D(I,LCY)=3 OR D(I,LCY)=4 THEN 680 ELSE 710
680 LG=LG+1
690 ISPOS=ISPOS+1
700 SUPQT(ISPOS)=I
710 NEXT I
720 PRINT
730 OPEN"O",1,"D:TEST.TXT"
740 W$=NAM$+CY$
750 PRINT #1,W$
760 PRINT #1,LPR
770 PRINT #1,LG
780 FOR I=1 TO LG
790 PRINT #1,SUPQT(I):NEXT I
800 PRINT #1,LF
810 FOR I=1 TO LF
820 PRINT #1,DEMQT(I):NEXT I
830 FOR I=1 TO LPR
840 PRINT #1,PRM$(0,I):NEXT I
850 CLOSE 1
860 OPEN"O",1,"D:TEST.XQT" 'WRITE OUT XQT FILE TO GET ELASTICITY MATRICES
870 W$="/LD:"+NAM$+CY$+",A":GOSUB 1030
880 W$="/GB":GOSUB 1030
890 BC$="B"
900 ECD$=CLM$(0,LPR+1+LF)
910 ECS$=CLM$(0,LPR+1+LG)
920 BR$="4"
930 ER$=RIGHT$(STR$(3+LPR),LEN(STR$(3+LPR))-1)
940 W$="/FG6":GOSUB 1030
950 W$="/OD"+BC$+BR$+":"+ECS$+ER$+",DD:SUP":GOSUB 1030 'WRITE SUPPLY ELAS.
960 BR$=RIGHT$(STR$(3+LPR+3),LEN(STR$(3+LPR+3))-1)
970 ER$=RIGHT$(STR$(3+LPR+2+LPR),LEN(STR$(3+LPR+2+LPR))-1)
980 W$="/OD"+BC$+BR$+":"+ECD$+ER$+",DD:DEM":GOSUB 1030 'WRITE DEMAND ELAS.
990 W$="/Q,Y":GOSUB 1030
1000 CLOSE 1
```

```
1010 SYSTEM
1020 END
1030 P0=INSTR(W$," "):IF P0=0 THEN 1050 'REMOVE BLANKS FROM STRING
1040 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 1030
1050 PRINT #1,W$:RETURN 'SUBROUTINE TO PRINT W$ STRING
```

EQNB.BAS

```
10 REM - EQNB - PART B, CREATE CONSTANTS AND EQUATIONS FOR COUNTRY/REGION
20 REM COUNTRY/REGION SPREADSHEETS MUST HAVE BASE PRICE AND QUANTITY DATA ADDED TO THEM BEFORE THIS PROGRAM IS RUN
30 CLS 'A COUNTRY/REGION IS SELECTED AND AN XQT FILE OF EQUATIONS IS CREATED
40 OPEN"I",1,"D:TEST.TXT"
50 DIM SUPQT(123),DEMQT(123)
60 INPUT #1,CY$:
70 INPUT #1,LPR
80 INPUT #1,LG
90 FOR I=1 TO LG
100 INPUT #1,SUPQT(I):NEXT I
110 INPUT #1,LF
120 FOR I=1 TO LF
130 INPUT #1,DEMQT(I):NEXT I
140 PRINT:PRINT"DOING STUFF FOR MODEL SHEET ---> ";CY$:PRINT
150 CLOSE 1
160 DIM SUP$(7,123),DEM$(7,123)
170 OPEN"I",1,"D:SUP.PRN"
180 J1=0
190 FOR J=1 TO LPR +LG STEP 22 'READ IN SUPPLY ELASTICITIES
200 J1=J1+1
210 FOR I=1 TO LPR
220 LINE INPUT #1,W$:SUP$(J1,I)=W$:NEXT I
230 NEXT J
240 CLOSE 1:OPEN"I",1,"D:DEM.PRN":J1=0
250 FOR J=1 TO LPR +LF STEP 22 'READ IN DEMAND ELASTICITIES
260 J1=J1+1
270 FOR I=1 TO LPR
280 LINE INPUT #1,W$:DEM$(J1,I)=W$:NEXT I
290 NEXT J
300 CLOSE 1
310 OPEN"O",1,"D:TEST.XQT"
320 W$="/LD:"+NA$+CY$+",A":GOSUB 1100
330 W$="/UY"+STR$(9+2*LPR)+":AD"+STR$(9+3*LPR):GOSUB 1100
340 W$="/CG"+STR$(9+2*LPR)+":H"+STR$(9+3*LPR)+",AC"+STR$(9+2*LPR)+",V":GOSUB 1100
350 W$="/UAC"+STR$(9+2*LPR)+":AD"+STR$(9+3*LPR):GOSUB 1100
360 FOR I=1 TO LPR 'MAJOR LOOP GOING THROUGH PRODUCTS
370 SI$=RIGHT$(STR$(I+2*LPR+8),LEN(STR$(I+2*LPR+8))-1)
380 FOR J=1 TO LPR +LG 'CHECK TO SEE IF PRODUCT ROW HAS ANY ELASTICITIES
390 J2=FIX((J-1)/22)+1
400 J3=J-(J2-1)*22
410 IF MID$(SUP$(J2,I),(J3-1)*6+4,3)<>"   " THEN 440
420 NEXT J
430 GOTO 980
440 W$="=Y"+SI$:GOSUB 1100 'SUPPLY CROSS EFFECT
450 W$="1*"
460 FOR J=1 TO LPR +LG
470 J2=FIX((J-1)/22)+1
480 J3=J-(J2-1)*22
```

```
490 IF VAL(MID$(SUP$(J2,I),(J3-1)*6+3,4))=0 OR I=J THEN 560
500 IF J<=LPR THEN J1=J ELSE J1=SUPQT(J-LPR)
510 SJ$=RIGHT$(STR$(J1+2*LPR+8),LEN(STR$(J1+2*LPR+8))-1)
520 IF J<=LPR THEN 550
530 W$=W$+"AD"+SJ$+"^"+MID$(SUP$(J2,I),(J3-1)*6+2,5)+"*"
540 GOTO 560
550 W$=W$+"W"+SJ$+"^"+MID$(SUP$(J2,I),(J3-1)*6+2,5)+"*"
560 NEXT J
570 IF LEN(W$)<>0 THEN W$=LEFT$(W$,LEN(W$)-1)
580 GOSUB 1100
590 W$="=Z"+SI$:GOSUB 1100 'DEMAND CROSS EFFECT
600 W$="1*"
610 FOR J=1 TO LPR + LF
620 J2=FIX((J-1)/22)+1
630 J3=J-(J2-1)*22
640 IF VAL(MID$(DEM$(J2,I),(J3-1)*6+3,4))=0 OR I=J THEN 710
650 IF J<=LPR THEN J1=J ELSE J1=DEMQT(J-LPR)
660 SJ$=RIGHT$(STR$(J1+2*LPR+8),LEN(STR$(J1+2*LPR+8))-1)
670 IF J<=LPR THEN 700
680 W$=W$+"AC"+SJ$+"^"+MID$(DEM$(J2,I),(J3-1)*6+2,5)+"*"
690 GOTO 710
700 W$=W$+"X"+SJ$+"^"+MID$(DEM$(J2,I),(J3-1)*6+2,5)+"*"
710 NEXT J
720 IF LEN(W$)<>0 THEN W$=LEFT$(W$,LEN(W$)-1)
730 GOSUB 1100
740 W$="=AA"+SI$:GOSUB 1100 'SUPPLY CONST
750 W$="G"+SI$+"/(Y"+SI$+"*"
760 I2=FIX((I-1)/22)+1
770 I3=I-(I2-1)*22
780 IF VAL(MID$(SUP$(I2,I),(I3-1)*6+3,4))=0 THEN 800
790 W$=W$+"(C"+SI$+"^"+MID$(SUP$(I2,I),(I3-1)*6+2,5)+")*"
800 W$=LEFT$(W$,LEN(W$)-1)
810 W$=W$+")":GOSUB 1100
820 W$="=AB"+SI$:GOSUB 1100 'DEMAND CONST
830 W$="H"+SI$+"/(Z"+SI$+"*"
840 IF VAL(MID$(DEM$(I2,I),(I3-1)*6+3,4))=0 THEN 860
850 W$=W$+"(D"+SI$+"^"+MID$(DEM$(I2,I),(I3-1)*6+2,5)+")*"
860 W$=LEFT$(W$,LEN(W$)-1)
870 W$=W$+")":GOSUB 1100
880 W$="!":GOSUB 1100
890 W$="/SD:TEST,PAA"+STR$(9+2*LPR)+":AB"+SI$
900 W$="=AC"+SI$:GOSUB 1100 'SUPPLY EQUATION
910 SUPELAS$=MID$(SUP$(I2,I),(I3-1)*6+2,5)
920 IF VAL(SUPELAS$)=0 THEN SUPELAS$="0"
930 W$="(1+L"+SI$+")*AA"+SI$+"*Y"+SI$+"*W"+SI$+"^"+SUPELAS$:GOSUB 1100
940 W$="=AD"+SI$:GOSUB 1100 'DEMAND EQUATION
950 DEMELAS$=MID$(DEM$(I2,I),(I3-1)*6+2,5)
960 IF VAL(DEMELAS$)=0 THEN DEMELAS$="0"
970 W$="(1+M"+SI$+")*AB"+SI$+"*Z"+SI$+"*X"+SI$+"^"+DEMELAS$:GOSUB 1100
980 NEXT I
990 W$="!":GOSUB 1100
1000 W$="/SD:TEST,PAA"+STR$(9+2*LPR)+":AB"+SI$+",V":GOSUB 1100
1010 W$="/LD:TEST,PAA"+STR$(9+2*LPR)+":AB"+SI$+",AA"+STR$(9+2*LPR)+",V":GOSUB 1100
1020 W$="=A1":GOSUB 1100
1030 W$="/PY"+STR$(9+2*LPR)+":AD"+SI$:GOSUB 1100
1040 W$="/SD:"+CY$+",OA":GOSUB 1100 'SAVE SPREADSHEET WITH EQUATIONS
```

```
1050 REM W$="/ODA1:AP"+SI$+",DD:"+CY$:GOSUB 1060 'SAVE PRINT FILE OF SHEET
1060 W$="/Q,Y":GOSUB 1100
1070 CLOSE 1
1080 SYSTEM
1090 END
1100 LL=INSTR(W$," ") 'SUBROUTINE TO REMOVE BLANKS AND WRITE OUT STRING
1110 IF LL=0 THEN 1130
1120 W$=LEFT$(W$,LL-1)+RIGHT$(W$,LEN(W$)-LL):GOTO 1100
1130 PRINT #1,W$:RETURN
```

COMODMOD.BAT

```
Give 4 letter name of master spreadsheet file (e.g. COMODMOD DEMO).

SDIR D:%1^??.CAL
ERASE D:TEST.XQT
D:COMOD
D:TEST
```

COMOD.BAS

```
10 REM - COMOD - CREATE WORLD PRODUCT SPREADSHEET FOR SELECTED PRODUCT
20 REM COUNTRY/REGION SPREADSHEETS MUST HAVE BASE PRICE AND QUANTITY DATA ADDED TO THEM BEFORE THIS PROGRAM IS RUN
30 CLS 'XQT FILE IS CREATED FOR PRODUCT SELECTED FROM MASTER FILE
40 PRINT"PROGRAM TO CREATE A WORLD PRODUCT MODEL FROM COUNTRY/REGION"
50 PRINT"SPREADSHEETS.  THE SPREADSHEETS SHOULD HAVE ELASTICITIES, BASE DATA,"
60 PRINT"AND EQUATIONS ADDED TO THEM BEFORE THIS PROGRAM IS RUN."
70 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
80 IF LEN(FILE$)<>4 THEN 30
90 NAM$=FILE$+"-"
100 NAMC$=FILE$+"^"
110 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
120 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN ABOUT UP TO 110 PRODUCT GROUPS
130 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
140 DIM CYMO(42) 'VECTOR OF CODES TO OMIT COUNTRY/REGION FROM MODEL (0=OMIT)
150 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
160 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
170 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
180 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
190 LCL=LEN(CL$)/2
200 DIM CLM$(0,123)
210 FOR I=1 TO LCL '122 COLUMNS MAX.
220 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
230 F$="D:"+FILE$+".PRN"
240 OPEN"I",1,F$
250 DIM D(123,42)
260 LINE INPUT #1,W$ 'BEGIN READING MASTER PRN FILE
270 LINE INPUT #1,W$
280 LINE INPUT #1,W$
290 LINE INPUT #1,W$
300 LINE INPUT #1,CY$
310 LINE INPUT #1,W$
320 STAR=(INSTR(CY$,"-")-11)/3
330 LCY=(LEN(CY$)-8)/3
340 IF STAR < LCY THEN LCY=STAR
350 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
```

```
360 FOR I=1 TO LCY
370 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
380 LPR=0
390 PRINT:PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
400 LPR=LPR+1
410 LINE INPUT#1,W$
420 WP$=MID$(W$,5,4)
430 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 450
440 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 430
450 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 530 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
460 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
470 X$=MID$(W$,(J-1)*3+9,3)
480 IF X$="  D" THEN X$="  2"
490 IF X$="  S" THEN X$="  3"
500 IF X$=" SD" OR X$=" DS" THEN X$="  4"
510 D(LPR,J)=VAL(X$):NEXT J
520 GOTO 400
530 CLOSE 1
540 LPR=LPR-1
550 PRINT:PRINT:INPUT"ENTER PRODUCT GROUP CODE";PR$
560 IF LEN(PR$)>4 THEN 550
570 FOR K=1 TO LCY:CYMO(K)=1:NEXT K 'FILL WITH CODES (1's) TO KEEP COUNTRY/REGIONS
580 CLS:PRINT:INPUT"OMIT ANY COUNTRY/REGIONS (Y OR N)";ROMIT$ 'LOOP TO OMIT COUNTRY/REGIONS BY KEEPING QUANTITIES
    CONSTANT
590 IF LEFT$(ROMIT$,1)="Y" THEN 600 ELSE 730
600 PRINT:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
610 PRINT:INPUT"COUNTRY/REGION TO OMIT (HIT ENTER TO CONTINUE)";ROMIT$
620 IF ROMIT$="RW" THEN PRINT:PRINT"RW NOT PERMITTED":ROMIT$="":GOTO 610
630 IF ROMIT$="" THEN 680
640 FOR KK=1 TO LCY:IF CYM$(0,KK)=ROMIT$ THEN 670
650 NEXT KK
660 GOTO 610
670 CYMO(KK)=0:ROMIT$="":GOTO 610
680 CLS:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
690 PRINT:PRINT"YOU HAVE OMITTED: ":PRINT:FOR K=1 TO LCY:IF CYMO(K)=0 THEN PRINT CYM$(0,K);" ";
700 NEXT K
710 PRINT:PRINT:INPUT"OKAY (Y OR N)";ROMIT$
720 IF LEFT$(ROMIT$,1)="N" THEN GOTO 570
730 PRINT:PRINT"CONTINUING WITH ";PR$;" . . .":PRINT
740 OPEN"O",1,"D:TEST.BAT"
750 W$="ERASE D:"+NAMC$+PR$+".*":GOSUB 2130
760 W$="SC3 D:TEST":GOSUB 2130
770 W$="ERASE D:TEST.XQT":GOSUB 2130
780 W$="SDIR D:????^??.CAL":GOSUB 2130
790 CLOSE 1
800 FOR K=1 TO LPR
810 IF PR$=PRM$(0,K) THEN 830
820 NEXT K
830 PN=K
840 F$="D:TEST.XQT"
850 OPEN"O",1,F$ 'OPEN PRODUCT XQT FILE
860 PRINT:PRINT
870 W$="/GN":GOSUB 2100
880 KI$=STR$(8+2*LPR)
890 W$="/LD:"+NAM$+CYM$(0,LCY)+",PB"+KI$+":AZ"+KI$+",B1":GOSUB 2100
900 W$="=A1":GOSUB 2100
```

```
910 W$=NAMC$+PRM$(0,PN):GOSUB 2090
920 W$="/FR1,TR":GOSUB 2100
930 W$="/GM":GOSUB 2100
940 FOR K=1 TO LCY 'MAJOR LOOP TO LOAD EQUATIONS FOR EACH COUNTRY/REGION
950 PRINT CYM$(0,K);" ";
960 W$="=A"+STR$(K+1):GOSUB 2100
970 W$=CHR$(34)+CYM$(0,K):GOSUB 2100:W$="/FE,A"+STR$(K+1)+":A"+STR$(K+1)+",TR":GOSUB 2100:W$="/P":GOSUB 2100
980 IF D(PN,K)=0 THEN 1110 'IF PRODUCT NOT MODELED FOR COUNTRY, THEN SKIP
990 KI$=STR$(8+2*LPR)
1000 KI$=STR$(PN+2*LPR+8) 'ROW LIFTED FROM COUNTRY DATA SET
1010 IF CYMO(K)=0 THEN 1020 ELSE 1050
1020 W$="/LD:"+NAM$+CYM$(0,K)+",PG"+KI$+":I"+KI$+",G"+STR$(K+1)+",V":GOSUB 2100 'BASE DATA
1030 W$="/LD:"+NAM$+CYM$(0,K)+",PAC"+KI$+":AE"+KI$+",AC"+STR$(K+1)+",V":GOSUB 2100 'EQUATION NUMBERS
1040 GOTO 1110
1050 W$="/LD:"+NAM$+CYM$(0,K)+",PB"+KI$+":M"+KI$+",B"+STR$(K+1)+",V":GOSUB 2100 'BASE DATA
1060 W$="/LD:"+NAM$+CYM$(0,K)+",PN"+KI$+":S"+KI$+",N"+STR$(K+1):GOSUB 2100 'POLICIES
1070 W$="/LD:"+NAM$+CYM$(0,K)+",PT"+KI$+":V"+KI$+",T"+STR$(K+1)+",V":GOSUB 2100 'CONSTANTS
1080 W$="/LD:"+NAM$+CYM$(0,K)+",PW"+KI$+":X"+KI$+",W"+STR$(K+1):GOSUB 2100 'LIBERALIZED PRICE EQUATIONS
1090 W$="/LD:"+NAM$+CYM$(0,K)+",PY"+KI$+":AB"+KI$+",Y"+STR$(K+1)+",V":GOSUB 2100 'CONSTANTS
1100 W$="/LD:"+NAM$+CYM$(0,K)+",PAC"+KI$+":AZ"+KI$+",AC"+STR$(K+1):GOSUB 2100 'EQUATIONS AND INDICATORS
1110 NEXT K
1120 SL$=RIGHT$(STR$(LCY+3),LEN(STR$(LCY+3))-1) 'SOLUTION MECH. ROW
1130 W$="/FR"+SL$+",TR":GOSUB 2100
1140 W$="=G"+SL$:GOSUB 2100 'BEGIN CREATING WORLD MARKET CLEARING MECH.
1150 W$="1":GOSUB 2100
1160 FOR K=1 TO LCY:KI$=STR$(PN+2*LPR+8)
1170 W$="/CG"+STR$(K+1)+":G"+STR$(K+1)+",G"+SL$+",+":GOSUB 2100
1180 NEXT K
1190 X$="0":Y$="0":Z$="0":U$="0" 'WRITE BASE AVERAGE WORLD TRADE
1200 FOR J=1 TO LCY:PS$=RIGHT$(STR$(J+1),LEN(STR$(J+1))-1)
1210 IF J<12 THEN X$=X$+"+ABS(I"+PS$+")" ELSE GOTO 1230
1220 GOTO 1280
1230 IF J<22 THEN Y$=Y$+"+ABS(I"+PS$+")" ELSE GOTO 1250
1240 GOTO 1280
1250 IF J<32 THEN Z$=Z$+"+ABS(I"+PS$+")" ELSE GOTO 1270
1260 GOTO 1280
1270 U$=U$+"+ABS(I"+PS$+")"
1280 NEXT J
1290 W$="=I"+SL$:GOSUB 2100
1300 W$=X$:GOSUB 2090
1310 W$="=J"+SL$:GOSUB 2100
1320 W$=Y$:GOSUB 2090
1330 W$="=K"+SL$:GOSUB 2100
1340 W$=Z$:GOSUB 2090
1350 W$="=L"+SL$:GOSUB 2100
1360 W$=U$:GOSUB 2090
1370 W$="=M"+SL$:GOSUB 2100
1380 W$=CHR$(34)+"ABWDTRD":GOSUB 2090
1390 W$="=N"+SL$:GOSUB 2100
1400 W$="(I"+SL$+"+J"+SL$+"+K"+SL$+"+L"+SL$+")/2":GOSUB 2090
1410 X$="0":Y$="0":Z$="0":U$="0" 'WRITE BASE AVERAGE WORLD TRADE
1420 FOR J=1 TO LCY:PS$=RIGHT$(STR$(J+1),LEN(STR$(J+1))-1)
1430 IF J<12 THEN X$=X$+"+ABS(AE"+PS$+")" ELSE GOTO 1450
1440 GOTO 1500
1450 IF J<22 THEN Y$=Y$+"+ABS(AE"+PS$+")" ELSE GOTO 1470
1460 GOTO 1500
```

```
1470 IF J<32 THEN Z$=Z$+"+ABS(AE"+PS$+")" ELSE GOTO 1490
1480 GOTO 1500
1490 U$=U$+"+ABS(AE"+PS$+")"
1500 NEXT J
1510 W$="=P"+SL$:GOSUB 2100
1520 W$=X$:GOSUB 2090
1530 W$="=Q"+SL$:GOSUB 2100
1540 W$=Y$:GOSUB 2090
1550 W$="=R"+SL$:GOSUB 2100
1560 W$=Z$:GOSUB 2090
1570 W$="=S"+SL$:GOSUB 2100
1580 W$=U$:GOSUB 2090
1590 W$="=T"+SL$:GOSUB 2100
1600 W$=CHR$(34)+"ABWDTEQ":GOSUB 2090
1610 W$="=U"+SL$:GOSUB 2100
1620 W$="(P"+SL$+"+Q"+SL$+"+R"+SL$+"+S"+SL$+")/2":GOSUB 2090
1630 W$="=W"+SL$:GOSUB 2100
1640 W$=CHR$(34)+"WDTRADE%":GOSUB 2090
1650 W$="=X"+SL$:GOSUB 2100
1660 W$="/FE,$":GOSUB 2100
1670 W$="(U"+SL$+"-N"+SL$+")*100/N"+SL$:GOSUB 2090
1680 W$="=Y"+SL$:GOSUB 2100
1690 W$=CHR$(34)+"WDPRICE%":GOSUB 2090
1700 W$="=Z"+SL$:GOSUB 2100
1710 W$="/FE,$":GOSUB 2100
1720 W$="(AD"+SL$+"-AB"+SL$+")*100/AB"+SL$:GOSUB 2090
1730 W$="=AJ"+SL$:GOSUB 2100
1740 W$=CHR$(34)+"SUPDEM%":GOSUB 2090
1750 W$="=AK"+SL$:GOSUB 2100
1760 W$="/FE,$":GOSUB 2100
1770 W$="(SUM(AC1:AC"+STR$(LCY+1)+")-G"+SL$+")*100/G"+SL$:GOSUB 2090
1780 W$="=G"+SL$:GOSUB 2090
1790 W$="=AD"+SL$:GOSUB 2100
1800 W$="B"+STR$(1+LCY):GOSUB 2090
1810 W$="=AC"+SL$:GOSUB 2100
1820 W$=CHR$(34)+"LWDPRICE":GOSUB 2090
1830 W$="=AB"+SL$:GOSUB 2100
1840 W$="/CB"+STR$(1+LCY)+":B"+STR$(1+LCY)+",AB"+SL$:GOSUB 2090
1850 W$="=AA"+SL$:GOSUB 2100
1860 W$=CHR$(34)+"WDPRICE":GOSUB 2090
1870 W$="=AE"+SL$:GOSUB 2100
1880 W$="SUM(AE2:AE"+STR$(LCY+1)+")":GOSUB 2090
1890 W$="=AG"+SL$:GOSUB 2100
1900 W$=CHR$(34)+"DAMP.WT":GOSUB 2090
1910 W$="=AH"+SL$:GOSUB 2100
1920 W$="1":GOSUB 2090
1930 W$="=AI"+SL$:GOSUB 2100
1940 W$="AD"+SL$+"*(1-AH"+SL$+"*AE"+SL$+"/G"+SL$+")":GOSUB 2090
1950 FOR K=1 TO LCY
1960 W$="=B"+STR$(K+1):GOSUB 2100
1970 W$="/U":GOSUB 2100
1980 W$="AI"+SL$:GOSUB 2090
1990 NEXT K
2000 PRINT:PRINT
2010 W$="=A1":GOSUB 2100
2020 W$="!":GOSUB 2100
```

```
2030 W$="/SD:"+NAMC$+PRM$(0,PN)+",A":GOSUB 2100 'SAVE THE SPREADSHEET
2040 REM W$="/ODA1:AP"+SL$+",DD:"+NAMC$+PRM$(0,PN):GOSUB 1210
2050 W$="/Q,Y":GOSUB 2100
2060 CLOSE 1
2070 SYSTEM
2080 END
2090 GOSUB 2100:PRINT #1,"/P":RETURN 'SAVE A STRING AND PROTECT A CELL
2100 P0=INSTR(W$," "):IF P0=0 THEN 2120 'REMOVE BLANKS FROM STRING
2110 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 2100
2120 PRINT #1,W$:RETURN 'SAVE A STRING
2130 PRINT #1,W$:RETURN 'SAVE A STRING
```

WORLDMOD.BAT

```
Give 4 letter name of master spreadsheet file (e.g. WORLDMOD DEMO).

SDIR D:%1-??.*
ERASE D:%1-WD.*
D:WORLD
SC3 D:TEST
ERASE D:TEST.XQT
SDIR D:%1-??.*
```

WORLD.BAS

```
10 REM - WORLD - CREATE WORLD PRODUCT MODEL SPREADSHEET FROM COUNTRY/REGION SPREADSHEETS
20 REM COUNTRY/REGION SPREADSHEETS MUST HAVE PRICE AND QUANTITY BASE DATA ADDED TO THEM BEFORE THIS PROGRAM IS RUN
30 CLS 'WORLD FILE IS CREATED FROM COUNTRY/REGION FILES
40 PRINT"PROGRAM TO CREATE A WORLD MULTI-REGION MULTI-PRODUCT MODEL FROM"
50 PRINT"COUNTRY/REGION SPREADSHEETS.  THE SPREADSHEETS MUST CONTAIN BASE"
60 PRINT"DATA, ELASTICITIES, AND EQUATIONS BEFORE THE WORLD MODEL IS"
70 PRINT"CREATED WITH THIS PROGRAM":PRINT
80 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
90 IF LEN(FILE$)<>4 THEN 30
100 NAM$=FILE$+"-"
110 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
120 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN ABOUT UP TO 110 PRODUCT GROUPS
130 DIM PRMO(123) 'VECTOR OF CODES TO OMIT PRODUCT FROM WORLD MODEL (0=OMIT)
140 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
150 DIM CYMO(42) 'VECTOR OF CODES TO OMIT COUNTRY/REGION MODEL (0=OMIT)
160 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
170 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
180 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
190 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
200 LCL=LEN(CL$)/2
210 DIM CLM$(0,123)
220 FOR I=1 TO LCL '122 COLUMNS MAX.
230 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
240 F$="D:"+FILE$+".PRN"
250 OPEN"I",1,F$
260 DIM D(123,42)
270 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
280 LINE INPUT #1,W$
290 LINE INPUT #1,W$
300 LINE INPUT #1,W$
310 LINE INPUT #1,CY$
```

```
320 LINE INPUT #1,W$
330 STAR=(INSTR(CY$,"-")-11)/3
340 LCY=(LEN(CY$)-8)/3
350 IF STAR < LCY THEN LCY=STAR
360 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
370 FOR I=1 TO LCY
380 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
390 LPR=0
400 PRINT:PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
410 LPR=LPR+1
420 LINE INPUT#1,W$
430 WP$=MID$(W$,5,4)
440 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 460
450 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 440
460 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 540 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
470 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
480 X$=MID$(W$,(J-1)*3+9,3)
490 IF X$="  D" THEN X$="  2"
500 IF X$="  S" THEN X$="  3"
510 IF X$=" SD" OR X$=" DS" THEN X$="  4"
520 D(LPR,J)=VAL(X$):NEXT J
530 GOTO 410
540 CLOSE 1
550 LPR=LPR-1
560 PRINT:PRINT:INPUT"RIGHTMOST COLUMN INCLUDED (AZ IS DEFAULT)";RCOLUMN$
570 IF LEN(RCOLUMN$)<>2 THEN RCOLUMN$="AZ"
580 PRINT:PRINT"RIGHTMOST COLUMN IS ";RCOLUMN$
590 PRINT:INDOMIT$="":INPUT"OMIT INDICATORS TO SAVE MEMORY (Y OR N)";INDOMIT$
600 FOR K=1 TO LCY:CYMO(K)=1:NEXT K ' FILL WITH CODES (1's) TO KEEP COUNTRY/REGIONS
610 CLS:PRINT:INPUT"OMIT ANY COUNTRY/REGIONS (Y OR N)";ROMIT$ 'LOOP TO OMIT COUNTRY/REGIONS BY KEEPING QUANTITIES
    CONSTANT
620 IF LEFT$(ROMIT$,1)="Y" THEN 630 ELSE 760
630 PRINT:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
640 PRINT:INPUT"COUNTRY/REGION TO OMIT (HIT ENTER TO CONTINUE)";ROMIT$
650 IF ROMIT$="RW" THEN PRINT:PRINT"RW NOT PERMITTED": ROMIT$="":GOTO 640
660 IF ROMIT$="" THEN 710
670 FOR KK=1 TO LCY:IF CYM$(0,KK)=ROMIT$ THEN 700
680 NEXT KK
690 GOTO 640
700 CYMO(KK)=0:ROMIT$="":GOTO 640
710 CLS:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
720 PRINT:PRINT"YOU HAVE OMITTED: ":PRINT:FOR K=1 TO LCY:IF CYMO(K)=0 THEN PRINT CYM$(0,K);" ";
730 NEXT K
740 PRINT:PRINT:INPUT"OKAY (Y OR N)";ROMIT$
750 IF LEFT$(ROMIT$,1)="N" THEN GOTO 600
760 FOR I=1 TO LPR:PRMO(I)=1:NEXT I 'LOOP TO INCLUDE ALL PRODUCT GROUPS
770 CLS:PRINT:INPUT"OMIT ANY PRODUCT GROUPS (Y OR N)";ROMIT$ 'LOOP TO OMIT PRODUCT GROUPS FROM WORLD MODEL
780 IF LEFT$(ROMIT$,1)="Y" THEN 790 ELSE 920
790 CLS:PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT:FOR I=1 TO LPR:PRINT PRM$(0,I);" ";:NEXT I:PRINT
800 PRINT:PRINT"YOU HAVE OMITTED:":PRINT:FOR I=1 TO LPR:IF PRMO(I)=0 THEN PRINT PRM$(0,I);" ";
810 NEXT I:PRINT
820 PRINT:INPUT"PRODUCT GROUP TO OMIT (HIT ENTER TO CONTINUE)";ROMIT$
830 IF ROMIT$="" THEN 870
840 FOR I=1 TO LPR:IF PRM$(0,I)=ROMIT$ THEN 860
850 NEXT I:GOTO 820
860 PRMO(I)=0:ROMIT$="":GOTO 790
```

```
870 CLS:PRINT"PRODUCT GROUPS ARE:":PRINT:FOR I=1 TO LPR:PRINT PRM$(0,I);" ";:NEXT I:PRINT
880 PRINT:PRINT"YOU HAVE OMITTED:":PRINT:FOR I=1 TO LPR:IF PRMO(I)=0 THEN PRINT PRM$(0,I);" ";
890 NEXT I
900 PRINT:PRINT:INPUT"OKAY (Y OR N)";ROMIT$
910 IF LEFT$(ROMIT$,1)="N" THEN GOTO 760
920 OPEN"O",1,"D:TEST.XQT"
930 W$="/GM":GOSUB 3170
940 W$="/GN":GOSUB 3170
950 FOR K=1 TO LCY 'LOOP TO ADD EACH COUNTRY/REGION FILE TO WORLD FILE
960 KP=(K-1)*(LPR+5)+1 'POSITION FOR EACH NEW FILE ADDED
970 DB$=STR$(KP+1)
980 DE$=STR$(KP+5+2*LPR)
990 IF CYMO(K)=0 THEN 1090
1000 W$="/LD:"+NAM$+CYM$(0,K)+",PA1:S200,A"+STR$(KP)+",V":GOSUB 3170 'LOAD BASE DATA
1010 W$="/LD:"+NAM$+CYM$(0,K)+",PT1:V200,T"+STR$(KP)+",V":GOSUB 3170 'LOAD PRICE LINKAGE EQUATION CONSTANTS
1020 W$="/LD:"+NAM$+CYM$(0,K)+",PW1:Z200,W"+STR$(KP):GOSUB 3170 'LOAD PRICE LINKAGE EQUATIONS
1030 W$="/LD:"+NAM$+CYM$(0,K)+",PAA1:AB200,AA"+STR$(KP)+",V":GOSUB 3170 'LOAD EQUATION CONSTANTS
1040 W$="/LD:"+NAM$+CYM$(0,K)+",PAC1:AE200,AC"+STR$(KP):GOSUB 3170 'LOAD EQUATIONS
1050 IF INDOMIT$="Y" THEN 1070
1060 W$="/LD:"+NAM$+CYM$(0,K)+",PAF1:AP200,AF"+STR$(KP):GOSUB 3170 'LOAD EQUATIONS
1070 W$="/LD:"+NAM$+CYM$(0,K)+",PAQ1:"+RCOLUMN$+"200,AQ"+STR$(KP):GOSUB 3170 'LOAD EQUATIONS
1080 GOTO 1120
1090 W$="/LD:"+NAM$+CYM$(0,K)+",PA1:A200,A"+STR$(KP)+",V":GOSUB 3170 'LOAD PRODUCT CODES FOR OMITTED COUNTRY/REGION
1100 W$="/LD:"+NAM$+CYM$(0,K)+",PG1:I200,G"+STR$(KP)+",V":GOSUB 3170 'LOAD FIXED QUANTITY DATA FOR OMITTED
     COUNTRY/REGION
1110 W$="/CG1:I200,AC1":GOSUB 3170
1120 FOR I=1 TO LPR:IF PRMO(I)=1 THEN 1200 'LOOP TO OMIT PRODUCT
1130 LO$=STR$(KP+7+2*LPR+I)
1140 W$="/UE"+LO$+":F"+LO$:GOSUB 3170:W$="/UJ"+LO$+":AZ"+LO$:GOSUB 3170
1150 W$="/BE"+LO$+":F"+LO$:GOSUB 3170:W$="/BJ"+LO$+":AZ"+LO$:GOSUB 3170
1160 W$="/CC"+LO$+":D"+LO$+",W"+LO$:GOSUB 3170
1170 W$="/CG"+LO$+":I"+LO$+",AC"+LO$:GOSUB 3170
1180 W$="/PW"+LO$+":AE"+LO$:GOSUB 3170
1190 W$="/PE"+LO$+":H"+LO$:GOSUB 3170
1200 NEXT I
1210 W$="/UA"+DB$+":AZ"+DE$:GOSUB 3170 'DELETE ELASTICITY MATRICES
1220 W$="/DR"+DB$+":"+DE$:GOSUB 3170
1230 W$="=A"+STR$(KP):GOSUB 3170
1240 W$="/FR,,TL":GOSUB 3170
1250 W$="=A1":GOSUB 3170
1260 NEXT K
1270 KP=LCY*(LPR+5)+1
1280 KPP=(LCY-1)*(LPR+5)+1
1290 W$="=V"+STR$(KP):GOSUB 3170
1300 W$=CHR$(34)+"WDTRD1":GOSUB 3160
1310 W$="=W"+STR$(KP):GOSUB 3170
1320 W$=CHR$(34)+"WDTRD2":GOSUB 3160
1330 W$="=AE"+STR$(KP):GOSUB 3170
1340 W$=CHR$(34)+"WDTRADE":GOSUB 3160
1350 W$="/CA"+STR$(KPP+2)+":B"+STR$(KPP+LPR+3)+",A"+STR$(KP):GOSUB 3170
1360 W$="/CA"+STR$(KPP+3)+":A"+STR$(KPP+LPR+3)+",AB"+STR$(KP+1):GOSUB 3170
1370 W$="=A"+STR$(KP):GOSUB 3170
1380 W$="/U":GOSUB 3170
1390 W$=NAM$+"WD":GOSUB 3160
1400 W$="=AB"+STR$(KP):GOSUB 3170
1410 W$=NAM$+"WD":GOSUB 3160
```

```
142Ø W$="=E"+STR$(KP):GOSUB 317Ø
143Ø W$=CHR$(34)+"SUPDWD1":GOSUB 316Ø
144Ø W$="=F"+STR$(KP):GOSUB 317Ø
145Ø W$=CHR$(34)+"SUPDWD2":GOSUB 316Ø
146Ø W$="=G"+STR$(KP):GOSUB 317Ø
147Ø W$=CHR$(34)+"SUPDEMWD":GOSUB 316Ø
148Ø W$="=I"+STR$(KP):GOSUB 317Ø
149Ø W$=CHR$(34)+"ABWDTRD1":GOSUB 316Ø
15ØØ W$="=J"+STR$(KP):GOSUB 317Ø
151Ø W$=CHR$(34)+"ABWDTRD2":GOSUB 316Ø
152Ø W$="=K"+STR$(KP):GOSUB 317Ø
153Ø W$=CHR$(34)+"ABWDTRD3":GOSUB 316Ø
154Ø W$="=L"+STR$(KP):GOSUB 317Ø
155Ø W$=CHR$(34)+"ABWDTRD4":GOSUB 316Ø
156Ø W$="=N"+STR$(KP):GOSUB 317Ø
157Ø W$=CHR$(34)+"ABWDTRD":GOSUB 316Ø
158Ø W$="=T"+STR$(KP):GOSUB 317Ø
159Ø W$=CHR$(34)+"SUPDEQ1":GOSUB 316Ø
16ØØ W$="=U"+STR$(KP):GOSUB 317Ø
161Ø W$=CHR$(34)+"SUPDEQ2":GOSUB 316Ø
162Ø W$="=AC"+STR$(KP):GOSUB 317Ø
163Ø W$=CHR$(34)+"SUPDEMEQ":GOSUB 316Ø
164Ø W$="=AD"+STR$(KP):GOSUB 317Ø
165Ø W$=CHR$(34)+"WDPRICE":GOSUB 316Ø
166Ø W$="=X"+STR$(KP):GOSUB 317Ø
167Ø W$=CHR$(34)+"ABSWDTD1":GOSUB 316Ø
168Ø W$="=Y"+STR$(KP):GOSUB 317Ø
169Ø W$=CHR$(34)+"ABSWDTD2":GOSUB 316Ø
17ØØ W$="=Z"+STR$(KP):GOSUB 317Ø
171Ø W$=CHR$(34)+"ABSWDTD3":GOSUB 316Ø
172Ø W$="=AA"+STR$(KP):GOSUB 317Ø
173Ø W$=CHR$(34)+"ABSWDTD4":GOSUB 316Ø
174Ø W$="=AF"+STR$(KP):GOSUB 317Ø
175Ø W$=CHR$(34)+"ABSWDTRD":GOSUB 316Ø
176Ø W$="=AG"+STR$(KP):GOSUB 317Ø
177Ø W$=CHR$(34)+"WEIGHT":GOSUB 316Ø
178Ø W$="=AH"+STR$(KP):GOSUB 317Ø
179Ø W$=CHR$(34)+"LWDPRICE":GOSUB 316Ø
18ØØ W$="=AI"+STR$(KP):GOSUB 317Ø
181Ø W$=CHR$(34)+"SUPDEM%":GOSUB 316Ø
182Ø W$="=AJ"+STR$(KP):GOSUB 317Ø
183Ø W$=CHR$(34)+"WDPRICED":GOSUB 316Ø
184Ø W$="=AK"+STR$(KP):GOSUB 317Ø
185Ø W$=CHR$(34)+"WDPRICE%":GOSUB 316Ø
186Ø W$="=AL"+STR$(KP):GOSUB 317Ø
187Ø W$=CHR$(34)+"WDTRADE%":GOSUB 316Ø
188Ø FOR I=1 TO LPR 'CREATE WORLD TRADE BASE (AVERAGE VALUE)
189Ø X$="Ø":Y$="Ø":Z$="Ø":U$="Ø"
19ØØ FOR J=1 TO LCY:JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
191Ø IF D(I,J)=Ø THEN 199Ø
192Ø IF J<12 THEN X$=X$+"+ABS(I"+PS$+")" ELSE 194Ø
193Ø GOTO 199Ø
194Ø IF J<22 THEN Y$=Y$+"+ABS(I"+PS$+")" ELSE 196Ø
195Ø GOTO 199Ø
196Ø IF J<32 THEN Z$=Z$+"+ABS(I"+PS$+")" ELSE 198Ø
197Ø GOTO 199Ø
```

```
1980 U$=U$+"+ABS(I"+PS$+")"
1990 NEXT J
2000 W$="=I"+STR$(KP+I):GOSUB 3170
2010 W$=X$:GOSUB 3160
2020 W$="=J"+STR$(KP+I):GOSUB 3170
2030 W$=Y$:GOSUB 3160
2040 W$="=K"+STR$(KP+I):GOSUB 3170
2050 W$=Z$:GOSUB 3160
2060 W$="=L"+STR$(KP+I):GOSUB 3170
2070 W$=U$:GOSUB 3160
2080 W$="=N"+STR$(KP+I):GOSUB 3170
2090 W$="(I"+STR$(KP+I)+"+J"+STR$(KP+I)+"+K"+STR$(KP+I)+"+L"+STR$(KP+I)+")/2":GOSUB 3160
2100 NEXT I
2110 FOR I=1 TO LPR 'CREATE WORLD TRADE SUM
2120 X$="0":Y$="0"
2130 FOR J=1 TO LCY:JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
2140 IF D(I,J)=0 THEN 2160
2150 IF J<20 THEN X$=X$+"+AE"+PS$ ELSE Y$=Y$+"+AE"+PS$
2160 NEXT J
2170 W$="=V"+STR$(KP+I):GOSUB 3170
2180 W$=X$:GOSUB 3160
2190 W$="=W"+STR$(KP+I):GOSUB 3170
2200 W$=Y$:GOSUB 3160
2210 W$="=AE"+STR$(KP+I):GOSUB 3170
2220 W$="0+V"+STR$(KP+I)+"+W"+STR$(KP+I):GOSUB 3160
2230 NEXT I
2240 FOR I=1 TO LPR 'CREATE BASE SUPPLY=DEMAND SUM
2250 X$="0":Y$="0"
2260 FOR J=1 TO LCY:JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
2270 IF D(I,J)=0 THEN 2290
2280 IF J<21 THEN X$=X$+"+G"+PS$ ELSE Y$=Y$+"+G"+PS$
2290 NEXT J
2300 W$="=E"+STR$(KP+I):GOSUB 3170
2310 W$=X$:GOSUB 3160
2320 W$="=F"+STR$(KP+I):GOSUB 3170
2330 W$=Y$:GOSUB 3160
2340 W$="=G"+STR$(KP+I):GOSUB 3170
2350 W$="E"+STR$(KP+I)+"+F"+STR$(KP+I):GOSUB 3160
2360 NEXT I
2370 FOR I=1 TO LPR 'CREATE SUPPLY EQUATION SUM FOR WORLD
2380 X$="0":Y$="0"
2390 FOR J=1 TO LCY:JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
2400 IF D(I,J)=0 THEN 2420
2410 IF J<20 THEN X$=X$+"+AC"+PS$ ELSE Y$=Y$+"+AC"+PS$
2420 NEXT J
2430 W$="=T"+STR$(KP+I):GOSUB 3170
2440 W$=X$:GOSUB 3160
2450 W$="=U"+STR$(KP+I):GOSUB 3170
2460 W$=Y$:GOSUB 3160
2470 W$="=AC"+STR$(KP+I):GOSUB 3170
2480 W$="T"+STR$(KP+I)+"+U"+STR$(KP+I):GOSUB 3160
2490 NEXT I
2500 FOR I=1 TO LPR 'CREATE SUM OF ABSOLUTE VALUE OF TRADE FOR WORLD
2510 X$="0":Y$="0":Z$="0":U$="0"
2520 FOR J=1 TO LCY:JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
2530 IF D(I,J)=0 THEN 2610
```

```
2540 IF J<11 THEN X$=X$+"+ABS(AE"+PS$+")" ELSE GOTO 2560
2550 GOTO 2610
2560 IF J<21 THEN Y$=Y$+"+ABS(AE"+PS$+")" ELSE GOTO 2580
2570 GOTO 2610
2580 IF J<31 THEN Z$=Z$+"+ABS(AE"+PS$+")" ELSE GOTO 2600
2590 GOTO 2610
2600 U$=U$+"+ABS(AE"+PS$+")"
2610 NEXT J
2620 W$="=X"+STR$(KP+I):GOSUB 3170
2630 W$=X$:GOSUB 3160
2640 W$="=Y"+STR$(KP+I):GOSUB 3170
2650 W$=Y$:GOSUB 3160
2660 W$="=Z"+STR$(KP+I):GOSUB 3170
2670 W$=Z$:GOSUB 3160
2680 W$="=AA"+STR$(KP+I):GOSUB 3170
2690 W$=U$:GOSUB 3160
2700 W$="=AF"+STR$(KP+I):GOSUB 3170
2710 W$="(X"+STR$(KP+I)+"+Y"+STR$(KP+I)+"+Z"+STR$(KP+I)+"+AA"+STR$(KP+I)+")/2":GOSUB 3160
2720 NEXT I
2730 FOR I=1 TO LPR 'CREATE WORLD MARKET CLEARING MECHANISM
2740 KP$=RIGHT$(STR$(KP+I),LEN(STR$(KP+I))-1)
2750 W$="/CB"+STR$(KPP+I+2)+":B"+STR$(KPP+I+2)+",AD"+KP$:GOSUB 3170 'COPY IN WDPRICES
2760 W$="=AD"+KP$:GOSUB 3170
2770 W$="/U":GOSUB 3170
2780 W$="=AG"+KP$:GOSUB 3170 'WEIGHTS
2790 W$="1":GOSUB 3160
2800 W$="=AH"+KP$:GOSUB 3170 'NEW WORLD PRICE
2810 W$="AD"+KP$+"*(1-AG"+KP$+"*AE"+KP$+"/AC"+KP$+")":GOSUB 3170
2820 W$="/FE,$":GOSUB 3160
2830 W$="=AI"+KP$:GOSUB 3170 'ADD SUPPLY=DEMAND % CHANGE FROM BASE
2840 W$="(AC"+KP$+"-G"+KP$+")*100/G"+KP$:GOSUB 3170
2850 W$="/FE,$":GOSUB 3160
2860 W$="=AJ"+KP$:GOSUB 3170
2870 W$="AH"+KP$+"-B"+KP$:GOSUB 3170
2880 W$="/FE,$":GOSUB 3160
2890 W$="=AK"+KP$:GOSUB 3170
2900 W$="AJ"+KP$+"*100/B"+KP$:GOSUB 3170
2910 W$="/FE,$":GOSUB 3160
2920 W$="=AL"+KP$:GOSUB 3170
2930 W$="(AF"+KP$+"-N"+KP$+")*100/N"+KP$:GOSUB 3170
2940 W$="/FE,$":GOSUB 3160
2950 FOR J=1 TO LCY 'PUT WORLD PRICES IN COUNTRY/REGION ROWS
2960 JP=(J-1)*(LPR+5)+3:PS$=RIGHT$(STR$(JP+I),LEN(STR$(JP+I))-1)
2970 W$="=B"+PS$:GOSUB 3170
2980 W$="/U":GOSUB 3170
2990 W$="AD"+KP$:GOSUB 3170
3000 W$="/FE,$":GOSUB 3160
3010 NEXT J
3020 W$="=AD"+KP$:GOSUB 3170
3030 W$="AH"+KP$:GOSUB 3170
3040 W$="/FE,$":GOSUB 3160
3050 NEXT I
3060 W$="/FGTR":GOSUB 3170
3070 PRINT:PRINT
3080 W$="=AB"+STR$(KP):GOSUB 3170
3090 REM W$="!":GOSUB 1600
```

```
3100 W$="/SD:"+NAM$+"WD,A":GOSUB 3170 'SAVE THE SPREADSHEET
3110 REM W$="/ODA1:AP"+STR$(KP+LPR+4)+",DD:"+NAM$+"WD":GOSUB 1600
3120 W$="/Q,Y":GOSUB 3170
3130 CLOSE 1
3140 SYSTEM
3150 END
3160 GOSUB 3170:PRINT #1,"/P":RETURN 'SAVE A STRING AND PROTECT A CELL
3170 P0=INSTR(W$," "):IF P0=0 THEN 3190 'REMOVE BLANKS FROM STRING
3180 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 3170
3190 PRINT #1,W$:RETURN 'SAVE A STRING
```

AGCTY.BAT

```
D:AG
SC3 D:TEST
ERASE D:TEST.XQT
```

AG.BAS

```
10 REM - AG - AGGREGATE ACROSS COUNTRY/REGION DATA SHEETS
20 REM COUNTRY/REGION SPREADSHEETS
30 CLS 'AGGREGATE SELECTED PARTS OF COUNTRY/REGION FILES
40 PRINT:PRINT"PROGRAM TO AGGREGATE SELECTED PARTS OF COUNTRY/REGION SHEETS"
50 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
60 NAM$=FILE$+"-"
70 IF LEN(FILE$)<>4 THEN 30
80 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
90 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN ABOUT UP TO 110 PRODUCT GROUPS
100 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
110 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
120 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
130 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
140 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
150 LCL=LEN(CL$)/2
160 DIM CLM$(0,123)
170 FOR I=1 TO LCL '122 COLUMNS MAX.
180 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
190 F$="D:"+FILE$+".PRN"
200 OPEN"I",1,F$
210 DIM D(123,42)
220 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
230 LINE INPUT #1,W$
240 LINE INPUT #1,W$
250 LINE INPUT #1,W$
260 LINE INPUT #1,CY$
270 LINE INPUT #1,W$
280 STAR=(INSTR(CY$,"-")-11)/3
290 LCY=(LEN(CY$)-8)/3
300 IF STAR < LCY THEN LCY=STAR
310 FOR I=1 TO LCY
320 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):NEXT I
330 LPR=0
340 PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
350 LPR=LPR+1
360 LINE INPUT#1,W$
370 WP$=MID$(W$,5,4)
```

```
380 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 400
390 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 380
400 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 480 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
410 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
420 X$=MID$(W$,(J-1)*3+9,3)
430 IF X$="  D" THEN X$="  2"
440 IF X$="  S" THEN X$="  3"
450 IF X$=" SD" OR X$=" DS" THEN X$="  4"
460 D(LPR,J)=VAL(X$):NEXT J
470 GOTO 350
480 PRINT:CLOSE 1:LPR=LPR-1:DIM RCY$(0,51):IR=0
490 CLS:PRINT:PRINT"POSSIBLE COUNTRIES/REGIONS ARE:":PRINT
500 FOR I=1 TO LCY:PRINT CYM$(0,I);" ";:NEXT I:PRINT
510 PRINT:PRINT"INCLUDED SO FAR:";:FOR K=1 TO IR:PRINT " ";RCY$(0,K);:NEXT K:PRINT
520 PRINT:INPUT"ENTER 2 DIGIT COUNTRY/REGION CODE TO BE AGGREGATED ('ENTER' TO QUIT)";RRCY$
530 IF RRCY$="  " OR LEN(RRCY$)=0 THEN 620
540 FOR JC=1 TO LCY 'COUNTRY/REGION IS PEGGED AND CHECKED
550 IF RRCY$=CYM$(0,JC) THEN 580
560 NEXT JC
570 GOTO 490
580 FOR K=1 TO IR:IF RRCY$=RCY$(0,K) THEN 490
590 NEXT K
600 IR=IR+1:RCY$(0,IR)=RRCY$
610 GOTO 490
620 PRINT:PRINT"ADD CELL RANGE":PRINT:PRINT:INPUT"TOP LEFT CELL COLUMN (LETTER) OF BLOCK TO BE ADDED";TLCOL$
630 INPUT"TOP LEFT CELL ROW (NUMBER) OF BLOCK TO BE ADDED";TLROW$
640 PRINT:INPUT"BOTTOM RIGHT CELL COLUMN (LETTER) OF BLOCK TO BE ADDED";BRCOL$
650 INPUT"BOTTOM RIGHT CELL ROW (NUMBER) OF BLOCK TO BE ADDED";BRROW$
660 PRINT:PRINT"HOW MANY COLUMNS FROM ";TLCOL$;" TO ";BRCOL$;:INPUT COLNUM
670 TL$=TLCOL$+TLROW$:BR$=BRCOL$+BRROW$
680 PRINT:PRINT"IS BLOCK ";TL$;":";BR$;" (";COLNUM;" COLUMNS) OKAY (Y OR N)";
690 INPUT Y$:IF Y$="N" THEN 620
700 OPEN"O",1,"D:TEST.XQT"
710 W$="/GN":GOSUB 880
720 COL$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
730 ROWNUM=VAL(BRROW$)-VAL(TLROW$)+1
740 W$="/LD:"+NAM$+"RW"+",PA"+TLROW$+":A"+BRROW$+",A1":GOSUB 880
750 FOR R=1 TO ROWNUM:FOR C=1 TO COLNUM
760 W$="="+MID$(COL$,C+1,1)+STR$(R):GOSUB 880
770 W$="0":GOSUB 880
780 NEXT C,R
790 W$="=A1":GOSUB 880
800 FOR I=1 TO IR
810 W$="/LD:"+NAM$+RCY$(0,I)+",P"+TL$+":"+BR$+",B1,+":GOSUB 880
820 W$="/UA1:Z500":GOSUB 880
830 NEXT I
840 W$="=A1":GOSUB 880
850 CLOSE 1
860 SYSTEM
870 END
880 P0=INSTR(W$," "):IF P0=0 THEN 900
890 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 880
900 PRINT #1,W$:RETURN
```

ADDVAR.BAT

```
SDIR D:????-WD.CAL
BASIC D:ADDVAR
SC3 D:TEST
```

ADDVAR.BAS

```
10 REM - ADDVAR - ADD VARIABLE, FORMULA, OR VALUE TO SELECTED PRODUCT ROW(S) OF WORLD MODEL
20 REM NECESSARY DATA AND VARIABLES FOR ANY FORMULA (EXCEPT A TIME COUNTER) MUST ALREADY BE IN THE COUNTRY/REGION
   SPREADSHEET WHEN THE WORLD MODEL IS CREATED
30 CLS
40 PRINT"PROGRAM TO ADD A VARIABLE, FORMULA, OR VALUE TO SELECTED PRODUCT"
50 PRINT"ROWS OF WORLD MODEL.  SPREADSHEETS SHOULD ALREADY HAVE NECESSARY"
60 PRINT"VARIABLES BEFORE WORLD MODEL IS CREATED (EXCEPT TIME COUNTER)"
70 PRINT"EDIT LINE 960-1260 TO CHANGE FORMULA, VALUES, COLUMN POSITIONS, ETC."
80 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
90 IF LEN(FILE$)<>4 THEN 30
100 NAM$=FILE$+"-"
110 NAMC$=FILE$+"^"
120 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
130 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN ABOUT UP TO 110 PRODUCT GROUPS
140 DIM PRMO(123) 'VECTOR OF CODES TO OMIT PRODUCT IN FORMULA GENERATION
150 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
160 DIM CYMO(42) 'VECTOR OF CODES TO OMIT COUNTRY/REGION FROM MODEL (0=OMIT)
170 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
180 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
190 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
200 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
210 LCL=LEN(CL$)/2
220 DIM CLM$(0,123)
230 FOR I=1 TO LCL '122 COLUMNS MAX.
240 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
250 F$="D:"+FILE$+".PRN"
260 OPEN"I",1,F$
270 DIM D(123,42)
280 LINE INPUT #1,W$ 'BEGIN READING MASTER PRN FILE
290 LINE INPUT #1,W$
300 LINE INPUT #1,W$
310 LINE INPUT #1,W$
320 LINE INPUT #1,CY$
330 LINE INPUT #1,W$
340 STAR=(INSTR(CY$,"-")-11)/3
350 LCY=(LEN(CY$)-8)/3
360 IF STAR < LCY THEN LCY=STAR
370 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
380 FOR I=1 TO LCY
390 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
400 LPR=0
410 PRINT:PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
420 LPR=LPR+1
430 LINE INPUT#1,W$
440 WP$=MID$(W$,5,4)
450 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 470
460 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 450
470 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 550 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
480 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
```

```
490 X$=MID$(W$,(J-1)*3+9,3)
500 IF X$="  D" THEN X$="  2"
510 IF X$="  S" THEN X$="  3"
520 IF X$=" SD" OR X$=" DS" THEN X$="  4"
530 D(LPR,J)=VAL(X$):NEXT J
540 GOTO 420
550 CLOSE 1
560 LPR=LPR-1
570 FOR J=1 TO LPR:PRMO(J)=0:NEXT J:PRINT
580 CLS:PRINT"PRODUCTS ARE:":PRINT:FOR J=1 TO LPR:PRINT PRM$(0,J);" ";:NEXT J:PRINT
590 PRINT:PRINT:INPUT"ENTER PRODUCT CODE ('ALL' FOR ALL PRODUCTS, 'ENTER TO CONTINUE)";PR$
600 IF PR$="" THEN 670
610 IF PR$="ALL" THEN 620 ELSE 640
620 FOR I=1 TO LPR:PRMO(I)=1:NEXT I
630 GOTO 660
640 FOR I=1 TO LPR:IF PR$=PRM$(0,I) THEN PRMO(I)=1:GOTO 580
650 NEXT I:GOTO 580
660 IF LEN(PR$)>4 THEN 590
670 FOR K=1 TO LCY:CYMO(K)=1:NEXT K 'FILL WITH CODES (1's) TO KEEP COUNTRY/REGIONS
680 CLS:PRINT:INPUT"OMIT ANY COUNTRY/REGIONS (Y OR N)";ROMIT$ 'LOOP TO OMIT COUNTRY/REGIONS BY KEEPING QUANTITIES
    CONSTANT
690 IF LEFT$(ROMIT$,1)="Y" THEN 700 ELSE 840
700 PRINT:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
710 PRINT:INPUT"COUNTRY/REGION TO OMIT (HIT ENTER TO CONTINUE)";ROMIT$
720 IF ROMIT$="RW" THEN PRINT:PRINT"RW NOT PERMITTED":ROMIT$="":GOTO 710
730 IF ROMIT$="" THEN 820
740 FOR KK=1 TO LCY:IF CYM$(0,KK)=ROMIT$ THEN 770
750 NEXT KK
760 GOTO 710
770 CYMO(KK)=0:ROMIT$=""
780 CLS:PRINT"COUNTRY/REGIONS ARE:":PRINT:FOR K=1 TO LCY:PRINT CYM$(0,K);" ";:NEXT K:PRINT
790 PRINT:PRINT"YOU HAVE OMITTED: ":PRINT:FOR K=1 TO LCY:IF CYMO(K)=0 THEN PRINT CYM$(0,K);" ";
800 NEXT K:PRINT
810 GOTO 710
820 PRINT:PRINT:INPUT"OKAY (Y OR N)";ROMIT$
830 IF LEFT$(ROMIT$,1)="N" THEN GOTO 670
840 OPEN"O",1,"D:TEST.XQT" 'OPEN PRODUCT XQT FILE
850 W$="/LD:"+FILE$+"-WD,A":GOSUB 1350
860 W$="=AO1":GOSUB 1390:W$="YCOUNT":GOSUB 1350
870 W$="=AP1":GOSUB 1390:W$="0":GOSUB 1390
880 FOR K=1 TO LCY 'LOOP TO ADD VARIABLE, FORMULA, OR VALUE
890 IF CYMO(K)=0 THEN 1290
900 FOR J=1 TO LPR 'LOOP THROUGH PRODUCTS FOR EACH COUNTRY/REGION
910 IF PRMO(J)=0 THEN 1280
920 IF D(J,K)=0 THEN 1280
930 J1=3+(K-1)*(5+LPR)+J
940 REM PUT COLUMN HEADS AND FORMULA IN THE FOLLOWING STATEMENTS
950 REM 960-1020 ARE PROJECTION VARIABLES AND DATA
960 REM TCT$="AP1" 'LOCATION OF TIME COUNTER VARIABLE IN WORLD MODEL
970 REM W$="=L"+STR$(J1):GOSUB 1360:W$="/U":GOSUB 1360 'SUPPLY SHIFT VARIABLE
980 REM W$="((1+AT"+STR$(J1)+")^"+TCT$+"-1)":GOSUB 1360 'SUPPLY GROWTH VARIABLE
990 REM INCG$="M"+STR$((K-1)*(LPR+5)+1) 'LOCATION OF INCOME GROWTH RATE
1000 REM POPG$="P"+STR$((K-1)*(LPR+5)+1) 'LOCATION OF POPULATION GROWTH RATE
1010 REM W$="=M"+STR$(J1):GOSUB 1360:W$="/U":GOSUB 1360 'SUPPLY SHIFT VARIABLE
1020 REM W$="(((1+"+INCG$+")^"+TCT$+"*(1+"+POPG$+")^-"+TCT$+")^AU"+STR$(J1)+"*(1+"+POPG$+")^"+TCT$+")-1":GOSUB 1360
     'DEMAND GROWTH VARIABLE
```

```
1030 REM 1040-1070 ARE PROTECTION FORMULAS
1040 W$="=N"+STR$(J1):GOSUB 1360:W$="/U":GOSUB 1360 'PRODUCER SUBS. EQ.
1050 W$="C"+STR$(J1)+"-E"+STR$(J1):GOSUB 1360
1060 W$="=O"+STR$(J1):GOSUB 1360:W$="/U":GOSUB 1360 'CONSUMER SUBS. EQ.
1070 W$="E"+STR$(J1)+"-D"+STR$(J1):GOSUB 1360
1080 REM
1090 REM
1100 REM
1110 REM
1120 REM
1130 REM
1140 REM
1150 REM
1160 REM
1170 REM
1180 REM
1190 REM
1200 REM
1210 REM
1220 REM
1230 REM
1240 REM
1250 REM
1260 REM
1270 REM END OF VARIABLE ADDITION LINES
1280 NEXT J
1290 NEXT K
1300 W$="=A1":GOSUB 1390
1310 W$="=AB"+STR$(LCY*(LPR+5)+1):GOSUB 1390
1320 CLOSE 1
1330 SYSTEM
1340 END
1350 GOSUB 1360:PRINT #1,"/P":RETURN 'SAVE A STRING AND PROTECT A CELL
1360 P0=INSTR(W$," "):IF P0=0 THEN 1380 'REMOVE BLANKS FROM STRING
1370 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 1360
1380 PRINT #1,W$:RETURN 'SAVE A STRING
1390 PRINT #1,W$:RETURN 'SAVE A STRING
```

TABLE.BAT

```
SDIR D:????-WD.CAL
D:TAB
SC3 D:TEST
```

TAB.BAS

```
10 REM - TAB - CREATE TABLE FROM WORLD MODEL SIMULATION RESULTS OR
20 REM         COUNTRY/REGION SPREADSHEETS
30 CLS:PRINT:PRINT
40 PRINT"PROGRAM TO SELECT A WORLD MODEL VARIABLE FOR INSERTION"
50 PRINT"INTO A MASTER FILE TYPE OF TABLE":PRINT
60 PRINT:INPUT"NAME OF WORLD (WD) MODEL";FILE$
70 IF LEN(FILE$)<>4 THEN 80 'MASTER FILE NAME MUST BE 4 CHARACTERS
80 NAM$=FILE$+"-"
90 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
100 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN PERHAPS UP TO 110 PRODUCT GROUPS
```

```
110 DIM CYM$(0,42) 'MASTER FILE CAN CONTAIN UP TO 41 COUNTRIES/REGIONS
120 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
130 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
140 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
150 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
160 LCL=LEN(CL$)/2
170 DIM CLM$(0,123)
180 FOR I=1 TO LCL '122 COLUMNS MAX.
190 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
200 F$="D:"+FILE$+".PRN"
210 OPEN"I",1,F$
220 DIM D(123,42)
230 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
240 LINE INPUT #1,W$
250 LINE INPUT #1,W$
260 LINE INPUT #1,W$
270 LINE INPUT #1,CY$
280 LINE INPUT #1,W$
290 STAR=(INSTR(CY$,"-")-11)/3
300 LCY=(LEN(CY$)-8)/3
310 IF STAR < LCY THEN LCY=STAR
320 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
330 FOR I=1 TO LCY
340 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
350 LPR=0
360 PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
370 LPR=LPR+1
380 LINE INPUT#1,W$
390 WP$=MID$(W$,5,4)
400 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 420
410 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 400
420 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 500 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
430 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
440 X$=MID$(W$,(J-1)*3+9,3)
450 IF X$="  D" THEN X$="  2"
460 IF X$="  S" THEN X$="  3"
470 IF X$=" SD" OR X$=" DS" THEN X$="  4"
480 D(LPR,J)=VAL(X$):NEXT J
490 GOTO 370
500 CLOSE 1:LPR=LPR-1
510 DIM N$(0,44) 'SUBROUTINE TO CREATE DATA COLUMN HEADS
520 N$(0,0)="NAME    COLUMN  DESCRIPTION ------------------------------------"
530 N$(0,1)="WDPRICE     B   base WorlD PRICE"
540 N$(0,2)="PRPRICE     C   base PRoducer PRICE"
550 N$(0,3)="CNPRICE     D   base CoNsumer PRICE"
560 N$(0,4)="TDPRICE     E   base TraDe PRICE"
570 N$(0,5)="XRATE       F   eXchange RATE"
580 N$(0,6)="SUPPLY      G   base SUPPLY quantity"
590 N$(0,7)="DEMAND      H   base DEMAND quantity"
600 N$(0,8)="NTRADE      I   base Net TRADE"
610 N$(0,9)="XRATE EL    J   eXchange RATE ELasticity"
620 N$(0,10)="WDPT.EL     K   WorlD Price Transmission ELasticity"
630 N$(0,11)="SSHIFT      L   Supply SHIFT variable"
640 N$(0,12)="DSHIFT      M   Demand SHIFT variable"
650 N$(0,13)="PRSUBEQ     N   PRoducer SUBsidy EQuivalent"
660 N$(0,14)="CNSUBEQ     O   CoNsumer SUBsidy EQuivalent"
```

```
670 N$(0,15)="IMSUBEQ    P   IMport SUBsidy EQuivalent"
680 N$(0,16)="EXSUBEQ    Q   EXport SUBsidy EQuivalent"
690 N$(0,17)="IMQUOTA    R   IMport QUOTA"
700 N$(0,18)="EXQUOTA    S   EXport QUOTA"
710 N$(0,19)="TDCONST    T   world-TraDe price constant"
720 N$(0,20)="PRCONST    U   PRoducer-trade price constant"
730 N$(0,21)="CNCONST    V   CoNsumer-producer price constant"
740 N$(0,22)="LPRPRICE   W   Liberalized PRoducer PRICE"
750 N$(0,23)="LCNPRICE   X   Liberalized CoNsumer PRICE"
760 N$(0,24)="SCROSS     Y   Supply equation CROSS price terms"
770 N$(0,25)="DCROSS     Z   Demand equation CROSS price terms"
780 N$(0,26)="SCONST     AA  Supply equation CONSTant"
790 N$(0,27)="DCONST     AB  Demand equation CONSTant"
800 N$(0,28)="SUPPLYEQ   AC  liberalized SUPPLY EQuation quantity"
810 N$(0,29)="DEMANDEQ   AD  liberalized DEMAND EQuation quantity"
820 N$(0,30)="NTRADEEQ   AE  liberalized Net TRADE EQuation quantity"
830 N$(0,31)="SUPPLYD    AF  (liberal. - base) SUPPLY quantity Difference"
840 N$(0,32)="DEMANDD    AG  (liberal. - base) DEMAND quantity Difference"
850 N$(0,33)="NTRADED    AH  (liberal. - base) Net TRADE quantity Difference"
860 N$(0,34)="PRPRICED   AI  (liberal. - base) PRoducer PRICE Difference"
870 N$(0,35)="CNPRICED   AJ  (liberal. - base) CoNsumer PRICE Difference"
880 N$(0,36)="TDPRICE%   AK  (liberal. - base) TraDe PRICE Difference"
890 N$(0,37)="SUPPLY%    AL  (liberal. - base) SUPPLY quantity % change"
900 N$(0,38)="PRPRICE%   AM  (liberal. - base) PRoducer PRICE % change"
910 N$(0,39)="DEMAND%    AN  (liberal. - base) DEMAND quantity % change"
920 N$(0,40)="CNPRICE%   AO  (liberal. - base) CoNsumer PRICE % change"
930 N$(0,41)="NTRADE%    AP  (liberal. - base) Net TRade quantity % change"
940 N$(0,42)="other   AQ-AZ  other variables/indicators created for model"
950 NAM$="D:"+FILE$+"-WD,P"
960 PRINT
970 PRINT:INPUT"COLUMN (letter) OF VARIABLE ('enter' for COLUMN list";COL$
980 IF LEN(COL$)=1 THEN COL$=" "+COL$
990 FOR J=1 TO 41
1000 IF COL$=MID$(CL$,(J*2)+1,2) THEN GOTO 1020
1010 NEXT J
1020 T$=N$(0,J)
1030 IF LEN(COL$)>2 THEN 970
1040 IF COL$="" THEN 1050 ELSE 1110
1050 CLS:PRINT N$(0,0):PRINT:FOR I=1 TO 18:PRINT N$(0,I):NEXT I
1060 PRINT:PRINT"                    ";:INPUT"PRESS 'enter' TO CONTINUE";W$
1070 CLS:PRINT N$(0,0):PRINT:FOR I=19 TO 36:PRINT N$(0,I):NEXT I
1080 PRINT:PRINT"                    ";:INPUT"PRESS 'enter' TO CONTINUE";W$
1090 CLS:PRINT N$(0,0):PRINT:FOR I=28 TO 43:PRINT N$(0,I):NEXT I
1100 GOTO 960
1110 PRINT:PRINT"SELECT VARIABLE FROM WORLD MODEL (WD = default) OR"
1120 INPUT"COUNTRY/REGION SPREADSHEETS (SH)";SOU$
1130 PRINT
1140 IF LEN(SOU$)>2 THEN 1110
1150 IF SOU$="" THEN SOU$="WD"
1160 OPEN"O",1,"D:TEST.XQT"
1170 W$="/LD:"+FILE$+",PA1:"+MID$(CL$,LCY*2+1,2)+STR$(4+LPR)+",A1":GOSUB 1480
1180 W$="/UA1:AR100":GOSUB 1480
1190 W$="/BB1:AP1":GOSUB 1480
1200 W$="=A2":GOSUB 1480
1210 W$=COL$:GOSUB 1480
1220 W$="=B1":GOSUB 1480
```

```
1230 W$=T$:GOSUB 1510
1240 W$="=B1":GOSUB 1480
1250 W$="/FE,,TL":GOSUB 1480
1260 W$="=A2":GOSUB 1480
1270 W$="/FE,,TL":GOSUB 1480
1280 W$="/BB5:AP100":GOSUB 1480
1290 W$="/PA1:AR100":GOSUB 1480
1300 W$="=A1":GOSUB 1480
1310 W$="/FGI":GOSUB 1480
1320 W$="/FGTR":GOSUB 1480
1330 CODE$="WD"
1340 FOR I=1 TO LCY
1350 IF SOU$="WD" THEN 1390 ELSE 1360
1360 CODE$=CYM$(0,I)
1370 I1=9+2*LPR
1380 GOTO 1400
1390 I1=4+(I-1)*(LPR+5)
1400 W$="/LD:"+FILE$+"-"+CODE$+",P"+COL$+STR$(I1)+":"+COL$+STR$(I1+LPR-1)+","+MID$(CL$,(I)*2+1,2)+"5,V":GOSUB 1480
1410 NEXT I
1420 W$="/LD:"+FILE$+",PA79:C200,A"+STR$(7+LPR):GOSUB 1480
1430 W$="/UA"+STR$(7+LPR)+":C200":GOSUB 1480
1440 W$="/FEA"+STR$(7+LPR)+":C200,TL":GOSUB 1480
1450 W$="/PA"+STR$(7+LPR)+":C200":GOSUB 1480
1460 W$="=A1":GOSUB 1480
1470 CLOSE 1:SYSTEM
1480 P0=INSTR(W$," "):IF P0=0 THEN 1500 'REMOVE BLANKS FROM STRING
1490 W$=LEFT$(W$,P0-1)+RIGHT$(W$,LEN(W$)-P0):GOTO 1480
1500 PRINT #1,W$:RETURN 'PRINT STRING ON DISK FILE
1510 PRINT #1,W$:RETURN
```

AGMOD.BAT

```
D:AGMODB
SC3 D:TEST
ERASE D:TEST.XQT
```

AGMODB.BAS

```
10 REM - AGMODB - AGGREGATE COUNTRY/REGION SPREADSHEETS
20 CLS
30 PRINT"PROGRAM TO AGGREGATE SELECTED SPREADSHEETS."
40 PRINT"ELASTICITIES AND SUMMED BASE DATA WILL BE ADDED TO AGGREGATE"
50 PRINT"SPREADSHEET.  A NEW NAME MUST BE GIVEN TO THE AGGREGATE REGION."
60 PRINT
70 PRINT:INPUT"ENTER NAME OF MASTER FILE";FILE$
80 IF LEN(FILE$)<>4 THEN 20 'MASTER FILE NAME MUST BE 4 CHARACTERS
90 NAM$=FILE$+"-"
100 PRINT:PRINT"READING MASTER FILE - ";FILE$:PRINT
110 DIM PRM$(0,123) 'MASTER FILE CAN CONTAIN PERHAPS UP TO 110 PRODUCT GROUPS
120 DIM CYM$(0,42),AG$(0,42) 'MASTER FILE CAN CONTAIN 41 COUNTRIES/REGIONS
130 CL$=" A B C D E F G H I J K L M N O P Q R S T U V W X Y ZAAABACADAEAFAGAH"
140 CL$=CL$+"AIAJAKALAMANAOAPAQARASATAUAVAWAXAYAZBABBBCBDBEBFBGBHBIBJBKBLBMBN"
150 CL$=CL$+"BOBPBQBRBSBTBUBVBWBXBYBZCACBCCCDCECFCGCHCICJCKCLCMCNCOCPCQCRCSCT"
160 CL$=CL$+"CUCVCWCXCYCZDADBDCDDDEDFDGDHDIDJDKDLDMDNDODPDQDR"
170 LCL=LEN(CL$)/2
180 DIM CLM$(0,123)
```

```
190 FOR I=1 TO LCL '122 COLUMNS MAX.
200 CLM$(0,I)=MID$(CL$,(I-1)*2+1,2):NEXT I
210 F$="D:"+FILE$+".PRN"
220 OPEN"I",1,F$
230 DIM D(123,42)
240 LINE INPUT #1,W$ 'BEGIN READING TLIB.PRN MASTER FILE
250 LINE INPUT #1,W$
260 LINE INPUT #1,W$
270 LINE INPUT #1,W$
280 LINE INPUT #1,CY$
290 LINE INPUT #1,W$
300 STAR=(INSTR(CY$,"-")-11)/3
310 LCY=(LEN(CY$)-8)/3
320 IF STAR < LCY THEN LCY=STAR
330 PRINT:PRINT"COUNTRIES/REGIONS ARE:":PRINT
340 FOR I=1 TO LCY
350 CYM$(0,I)=MID$(CY$,(I-1)*3+10,2):PRINT CYM$(0,I);" ";:NEXT I:PRINT
360 LPR=0
370 PRINT:PRINT"PRODUCT GROUPS ARE:":PRINT
380 LPR=LPR+1
390 LINE INPUT#1,W$
400 WP$=MID$(W$,5,4)
410 PBLANK=INSTR(WP$," "):IF PBLANK=0 THEN 430
420 WP$=RIGHT$(WP$,LEN(WP$)-1):GOTO 410
430 IF MID$(W$,7,2)=" ^" OR MID$(W$,7,2)="  " THEN 510 ELSE PRM$(0,LPR)=WP$:PRINT PRM$(0,LPR);" ";
440 FOR J=1 TO LCY 'PUT ONE, TWO, THREE, FOUR OR ZERO IN D MATRIX FOR EACH ROW
450 X$=MID$(W$,(J-1)*3+9,3)
460 IF X$="  D" THEN X$="  2"
470 IF X$="  S" THEN X$="  3"
480 IF X$=" SD" OR X$=" DS" THEN X$="  4"
490 D(LPR,J)=VAL(X$):NEXT J
500 GOTO 380
510 CLOSE 1:LPR=LPR-1:IAG=0
520 CLS:PRINT" THE COUNTRY/REGIONS ARE":PRINT
530 FOR I=1 TO LCY:PRINT CYM$(0,I);" ";:NEXT I:PRINT
540 PRINT:PRINT" THE COUNTRY/REGIONS INCLUDED SO FAR ARE:":PRINT
550 FOR I=1 TO IAG:PRINT AG$(0,I);" ";:NEXT I:PRINT
560 PRINT:INPUT"ENTER 2 DIGIT COUNTRY/REGION CODE FOR AGGREGATION ('ENTER' WHEN DONE)";AGG$
570 IF AGG$=" " OR LEN(AGG$)=0 THEN 660
580 FOR JC=1 TO LCY 'COUNTRY/REGION IS PEGGED AND CHECKED
590 IF AGG$=CYM$(0,JC) THEN 620
600 NEXT JC
610 GOTO 520
620 FOR K=1 TO IAG:IF AGG$=AG$(0,K) THEN 540
630 NEXT K
640 IAG=IAG+1:AG$(0,IAG)=AGG$
650 GOTO 520
660 REM FIND POSITIONS OF MATRIX BLOCKS IN COUNTRY/REGION SPREADSHEETS
670 SB$="B 4" 'UPPER LEFT SUP. MATRIX
680 SE$=MID$(CL$,2*(LPR+1)-1,2)+STR$(3+LPR) 'LOWER RIGHT SUP. MATRIX
690 SOB$=MID$(CL$,2*(LPR+2)-1,2)+"4" 'UPPER LEFT DEM. VAR. MATRIX
700 ID=0:IS=0 'CHECK ON NUMBER OF QUANTITY VARIABLES
710 FOR I=1 TO LPR
720 IF D(I,LCY)=3 OR D(I,LCY)=4 THEN IS=IS+1
730 IF D(I,LCY)=2 OR D(I,LCY)=4 THEN ID=ID+1
740 NEXT I
```

```
750 SOE$=MID$(CL$,2*(LPR+1+IS)-1,2)+STR$(3+LPR) 'LOWER RIGHT DEMAND VAR. MATRIX
760 DB$=" B"+STR$(LPR+6) 'UPPER LEFT DEM. MATRIX
770 DE$=MID$(CL$,2*(LPR+1)-1,2)+STR$(2*LPR+5) 'LOWER RIGHT DEM. MATRIX
780 DOB$=MID$(CL$,2*(LPR+2)-1,2)+STR$(LPR+6) 'UPPER LEFT SUP. VAR. MATRIX
790 DOE$=MID$(CL$,2*(LPR+1+ID)-1,2)+STR$(2*LPR+5) 'LOWER RIGHT SUP. VAR. MATRIX
800 IF IS>ID THEN IMAX=IS ELSE IMAX=ID
810 QB$=" G"+STR$(2*LPR+9) 'UPPER LEFT SUPPLY QUANTITY
820 QE$=" H"+STR$(3*LPR+8) 'LOWER LEFT DEMAND QUANTITY
830 BL$=" B"+STR$(3*LPR+10) 'UPPER LEFT WORK AREA
840 BR$=MID$(CL$,2*(LPR+1+IMAX)-1,2)+STR$(4*LPR+9) 'LOWER RIGHT WORK AREA
850 BWT$=" A"+STR$(3*LPR+10) 'TOP OF WEIGHT COLUMN
860 BWB$=" A"+STR$(4*LPR+9) 'BOTTOM OF WEIGHT COLUMN
870 REM LOAD RW REGION, CHANGE NAME, AND BLANK OUT AREAS
880 PRINT:PRINT
890 PRINT:PRINT
900 INPUT"ENTER NAME OF AGGREGATE REGION (2 LETTERS)";NM$
910 FOR I=1 TO LCY
920 IF NM$=CYM$(0,I) THEN 900
930 NEXT I
940 OPEN"O",1,"D:TEST.XQT"
950 W$="/LD:"+FILE$+"-RW,A":GOSUB 1670
960 W$="=A1":GOSUB 1670
970 W$="/UA1:A1":GOSUB 1670
980 W$=FILE$+"-"+NM$:GOSUB 1660
990 W$="/U"+BL$+":"+BR$:GOSUB 1670
1000 W$="/TC":GOSUB 1670
1010 W$="/U"+BWT$+":"+BWB$:GOSUB 1670
1020 W$="/B"+BWT$+":"+BWB$:GOSUB 1670
1030 W$="/U"+SB$+":"+SE$:GOSUB 1670
1040 W$="/B"+SB$+":"+SE$:GOSUB 1670
1050 IF SE$=SOE$ THEN 1080
1060 W$="/U"+SOB$+":"+SOE$:GOSUB 1670
1070 W$="/B"+SOB$+":"+SOE$:GOSUB 1670
1080 W$="/U"+DB$+":"+DE$:GOSUB 1670
1090 W$="/B"+DB$+":"+DE$:GOSUB 1670
1100 IF DE$=DOE$ THEN 1130
1110 W$="/U"+DOB$+":"+DOE$:GOSUB 1670
1120 W$="/B"+DOB$+":"+DOE$:GOSUB 1670
1130 W$="/U"+QB$+":"+QE$:GOSUB 1670
1140 W$="/B"+QB$+":"+QE$:GOSUB 1670
1150 BLB$=QB$:BRB$=QE$:GOSUB 1720
1160 BLB$=SB$:BRB$=SE$:GOSUB 1720
1170 IF SE$=SOE$ THEN 1190
1180 BLB$=SOB$:BRB$=SOE$:GOSUB 1720
1190 BLB$=DB$:BRB$=DE$:GOSUB 1720
1200 IF DE$=DOE$ THEN 1220
1210 BLB$=DOB$:BRB$=DOE$:GOSUB 1720
1220 BLB$=BL$:BRB$=BR$:GOSUB 1720
1230 BLB$=BWT$:BRB$=BWB$:GOSUB 1720
1240 W$="=A1":GOSUB 1670
1250 FOR K=1 TO IAG 'LOAD QUANTITIES
1260 W$="/LD:"+FILE$+"-"+AG$(0,K)+",P"+QB$+":"+QE$+","+QB$+",+":GOSUB 1670
1270 NEXT K
1280 FOR K=1 TO IAG
1290 W$="/U"+BWT$+":"+BWB$:GOSUB 1670
1300 W$="/B"+BWT$+":"+BWB$:GOSUB 1670
```

```
1310 W$="/LD:"+FILE$+"-"+AG$(Ø,K)+",P"+QB$+":"+"G"+STR$(3*LPR+8)+","+BWT$+",V":GOSUB 167Ø
1320 W$="/U"+BWT$+":"+BWB$:GOSUB 167Ø
1330 W$="/C"+QB$+":"+"G"+STR$(3*LPR+8)+","+BWT$+",/":GOSUB 167Ø
1340 W$="/U"+BWT$+":"+BWB$:GOSUB 167Ø
1350 CR$=LEFT$(SOE$,2)+RIGHT$(BL$,LEN(BL$)-2)
1360 W$="/LD:"+FILE$+"-"+AG$(Ø,K)+",P"+SB$+":"+SOE$+","+BL$+",V":GOSUB 167Ø
1370 W$="/U"+BL$+":"+BR$:GOSUB 167Ø
1380 W$="/R"+BWT$+":"+BWB$+","+BL$+":"+CR$+",*":GOSUB 167Ø
1390 W$="/C"+BL$+":"+BR$+","+SB$+",+":GOSUB 167Ø
1400 W$="/FE"+SB$+":"+SOE$+",$":GOSUB 167Ø
1410 NEXT K
1420 W$="/DR,"+STR$(3*LPR+1Ø)+":"+STR$(4*LPR+9):GOSUB 167Ø
1430 W$="/P"+SB$+":"+SOE$:GOSUB 167Ø
1440 FOR K=1 TO IAG
1450 W$="/U"+BWT$+":"+BWB$:GOSUB 167Ø
1460 W$="/B"+BWT$+":"+BWB$:GOSUB 167Ø
1470 W$="/LD:"+FILE$+"-"+AG$(Ø,K)+",P"+"H"+STR$(2*LPR+9)+":"+QE$+","+BWT$+",V":GOSUB 167Ø
1480 W$="/U"+BWT$+":"+BWB$:GOSUB 167Ø
1490 W$="/C"+"H"+STR$(2*LPR+9)+":"+QE$+","+BWT$+",/":GOSUB 167Ø
1500 W$="/U"+BWT$+":"+BWB$:GOSUB 167Ø
1510 CR$=LEFT$(DOE$,2)+RIGHT$(BL$,LEN(BL$)-2)
1520 W$="/LD:"+FILE$+"-"+AG$(Ø,K)+",P"+DB$+":"+DOE$+","+BL$+",V":GOSUB 167Ø
1530 W$="/U"+BL$+":"+BR$:GOSUB 167Ø
1540 W$="/R"+BWT$+":"+BWB$+","+BL$+":"+CR$+",*":GOSUB 167Ø
1550 W$="/C"+BL$+":"+BR$+","+DB$+",+":GOSUB 167Ø
1560 W$="/FE"+DB$+":"+DOE$+",$":GOSUB 167Ø
1570 NEXT K
1580 W$="/DR,"+STR$(3*LPR+1Ø)+":"+STR$(4*LPR+9):GOSUB 167Ø
1590 W$="/P"+DB$+":"+DOE$:GOSUB 167Ø
1600 W$="/P"+QB$+":"+QE$:GOSUB 167Ø
1610 W$="=A1":GOSUB 167Ø
1620 W$="!":GOSUB 167Ø
1630 CLOSE 1
1640 SYSTEM
1650 END
1660 GOSUB 167Ø:PRINT #1,"/P":RETURN 'WRITE TO SHEET AND PROTECT CELL
1670 PØ=INSTR(W$," "):IF PØ=Ø THEN 169Ø
1680 W$=LEFT$(W$,PØ-1)+RIGHT$(W$,LEN(W$)-PØ):GOTO 167Ø
1690 PRINT #1,W$:RETURN 'WRITE TO SHEET
1700 GOSUB 167Ø:PRINT #1,"/FE,$":PRINT #1,"/P":RETURN 'WRITE TO SHEET, PROTECT AND USE $ FORMAT
1710 GOSUB 167Ø:PRINT #1,"/FE,I":PRINT #1,"/P":RETURN 'WRITE TO SHEET, PROTECT AND USE INTEGER FORMAT
1720 REM SUBROUTINE TO FILL A BLOCK WITH ZEROS
1730 W$="="+BLB$:GOSUB 167Ø
1740 W$="Ø":GOSUB 167Ø
1750 W$="/R"+BLB$+":"+BLB$+","+BLB$+":"+LEFT$(BRB$,2)+RIGHT$(BLB$,LEN(BLB$)-2):GOSUB 167Ø
1760 W$="/R"+BLB$+":"+LEFT$(BRB$,2)+RIGHT$(BLB$,LEN(BLB$)-2)+","+BLB$+":"+LEFT$(BLB$,2)+RIGHT$(BRB$,LEN(BRB$)-2)
     :GOSUB 167Ø
1770 RETURN
```

APPENDIX B: MODIFICATION IN THE SWOPSIM "WORLDMOD" PROCEDURE ALLOWING PRODUCTS AND/OR COUNTRY/REGIONS TO BE OMITTED FROM A WORLD MODEL

SWOPSIM programs have been modified so that selected products or country/regions can be omitted (the latter can occur in both single and multi-product models). Prompts are answered in the COMODMOD and WORLDMOD procedures to invoke this new option. This option, in effect, allows a user to "hold constant" product or country/region values in a world model. This is done by replacing equations for the omitted items with numerical values which maintain the omitted items "constant" in other equations. This feature makes it possible to generate a wide variety of models from the same basic data spreadsheets created from one master model file.

Figure 10 shows the DEMO master model file from Roningen (8). Prompts in the COMODMOD procedure have been followed to omit country C2 (underlined in fig. 10) from a world WH model which is shown in Figure 11. Note that the C2 row in figure 11 has mostly blank terms except in those cases where C2 values are necessary to maintain a base period world trade balance.

Figure 12 shows the world model created by WORLDMOD from DEMO with country C1 and products BC, FM, SM, and SO (all underlined in fig. 10) omitted. Again note that blank spaces are left in most rows in figure 12 for this country (C1) and these products.

Figure 10--DEMO Master Model File

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	DEMO		SWOPSIM			DEMOnstration Static WOrld Policy SIMulation model																				
2																									
3			C1	C2	RW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4																									
5		MK	.	SD	SD	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6		BC	.	D	D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7		FM	.	D	D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8		BF	.	D	D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9		WH	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10		CN	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11		SB	.	S	S	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12		SM	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13		SO	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Figure 11--DEMO^WH Single Commodity World Model with Country C2 Omitted

	A	B	C	D	E	F	G	H	I	J	K
1	DEMO^WH	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
2	DEMO-C1	200	200	200	200	1	5000	9000	-4000	1	1
3	DEMO-C2	200					66000	27000	39000		
4	DEMO-RW	200	200	220	200	1	90000	125000	-35000	1	1
5											
6							161001		78000	0	0

Figure 11--Concluded

	L	M	N	O	P	Q	R	S	T	U	V
1	SSHIFT	DSHIFT	PRSUBEQ	CNSUBEQ	IMSUBEQ	EXSUBEQ	IMQUOTA	EXQUOTA	TDCONST	PRCONST	CNCONST
2	.ØØ	.ØØ							1	Ø	Ø
3											
4	.ØØ	.ØØ							1	Ø	2Ø
5											
6	Ø	ABWDTRD	39ØØØ		78ØØØ	Ø	Ø	Ø	ABWDTEQ	39ØØØ	

	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1	LPRPRICE	LCNPRICE	SCROSS	DCROSS	SCONST	DCONST	SUPPLYEQ	DEMANDEQ	NTRADEEQ	SUPPLYD	DEMANDD
2	2ØØ	2ØØ	.5887Ø4Ø	1	6ØØ.5622	127279.2	5ØØØ	9ØØØ	-4ØØØ	Ø	Ø
3							66ØØØ	27ØØØ	39ØØØ		
4	2ØØ	22Ø	.3394Ø27	56.2Ø512	18753Ø.47	14688.66	9ØØØØ	125ØØØ	-35ØØØ	Ø	Ø
5											
6	WDTRADE%	.ØØ	WDPRICE%	.ØØ	WDPRICE	2ØØ	LWDPRICE	2ØØ	-1.5e-1Ø		DAMP.WT

	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1	NTRADED	PRPRICED	CNPRICED	TDPRICE%	SUPPLY%	PRPRICE%	DEMAND%	CNPRICE%	NTRADE%	MKADJ
2	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	
3										
4	Ø	Ø	Ø	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	.ØØ	
5										
6	1	2ØØ	SUPDEM%	.ØØ						

Figure 12--DEMO-WD World Model with Country C1 and Products BT, FM, SM, and SO Omitted

	A	B	C	D	E	F	G	H	I	J	K
3	DEMO-C1										
4		26Ø.ØØ									
5		27ØØ.ØØ									
6		3ØØ.ØØ									
7		25ØØ.ØØ									
8	WH	2ØØ.ØØ									
9	CN	17Ø.ØØ									
1Ø		29Ø.ØØ									
11		25Ø.ØØ									
12		5ØØ.ØØ									

15 DEMO-C2 XRATE (LC/US$) = 1 XRATE ELASTICITY = 1

16

	DEMO-C2	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
17											
18	MK	26Ø.ØØ	26Ø	26Ø	26Ø	1	58ØØØ	58ØØØ	Ø	1	1
19	BC	27ØØ.ØØ									
2Ø	FM	3ØØ.ØØ									
21	BF	25ØØ.ØØ	25ØØ	5ØØØ	25ØØ	1	1ØØØØ	11ØØØ	-1ØØØ	1	1
22	WH	2ØØ.ØØ	2ØØ	22Ø	2ØØ	1	66ØØØ	27ØØØ	39ØØØ	1	1
23	CN	17Ø.ØØ	17Ø	2ØØ	17Ø	1	25ØØØØ	17ØØØØ	8ØØØØ	1	1
24	SB	29Ø.ØØ	29Ø	3ØØ	29Ø	1	55ØØØ	25ØØØ	3ØØØØ	1	1
25	SM	25Ø.ØØ									
26	SO	5ØØ.ØØ									

Figure 12--Concluded

29	DEMO-RW	XRATE (LC/US$) =	1			XRATE ELASTICITY =	1			
30										
31	DEMO-RW	WDPRICE	PRPRICE	CNPRICE	TDPRICE	XRATE	SUPPLY	DEMAND	NTRADE	XRATE EL	WDPT.EL
32	MK	260.00	260	260	260	1	65000	65000	0	1	1
33	BC	2700.00									
34	FM	300.00									
35	BF	2500.00	2500	5000	2500	1	11000	10000	1000	1	1
36	WH	200.00	200	220	200	1	90000	125000	-35000	1	1
37	CN	170.00	170	200	170	1	220000	320000	-100000	1	1
38	SB	290.00	290	300	290	1	5000	35000	-30000	1	1
39	SM	250.00									
40	SO	500.00									
41											
42											
43	DEMO-WD	WDPRICE			SUPDWD1	SUPDWD2	SUPDEMWD		ABWDTRD1	ABWDTRD2	ABWDTRD3
44	MK	260			123000	0	123000		0	0	0
45	BC	2700			0	0	0		0	0	0
46	FM	300			0	0	0		0	0	0
47	BF	2500			21000	0	21000		2000	0	0
48	WH	200			156000	0	156000		74000	0	0
49	CN	170			470000	0	470000		180000	0	0
50	SB	290			60000	0	60000		60000	0	0
51	SM	250			0	0	0		0	0	0
52	SO	500			0	0	0		0	0	0

	I	L	II	M	II	N	II	O	II	P	II	Q	II	R	II	S	II	T	II	U	II	V	I
17		SSHIFT		DSHIFT		PRSUBEQ		CNSUBEQ		IMSUBEQ		EXSUBEQ		IMQUOTA		EXQUOTA		TDCONST		PRCONST		CNCONST	
18		.00		.00														1		0		0	
19																							
20																							
21		.00		.00														1		0		2500	
22		.00		.00														1		0		20	
23		.00		.00														1		0		30	
24		.00		.00														1		0		10	
25																							
26																							
27																							
28																							
29		SSHIFT		DSHIFT		PRSUBEQ		CNSUBEQ		IMSUBEQ		EXSUBEQ		IMQUOTA		EXQUOTA		TDCONST		PRCONST		CNCONST	
30		.00		.00														1		0		0	
31																							
32																							
33		.00		.00														1		0		2500	
34		.00		.00														1		0		20	
35		.00		.00														1		0		30	
36		.00		.00														1		0		10	
37																							

This procedure of omitting country/regions and/or products is also useful for the creation of smaller models from a very large basic world data set. It also allows the researcher to carry out various types of sensitivity analyses where parts of the main model are "held constant" in world "sub-models".

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