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AN IMPLEMENTATION OF ORANI USING THE GEMPACK PROGRAM TABLO

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ABSTRACT

The ORANI model of the Australian economy, described by Dixon, Parmenter, Sutton and Vincent (1982) has hitherto been available via a series of computer programs especially written for the purpose. Here we introduce a new computer implementation of ORANI which uses only general purpose software, the GEMPACK suite. The GEMPACK program TABLO processes text files containing formal algebraic specifications of any linearized economic model, and automatically writes FORTRAN programs which may be used to solve the model. It is quicker and easier to use TABLO than it is to write your own software to solve the same model. The process of modifying or adding model equations is also enormously accelerated. Compared to traditional, model-specific programming, TABLO is also more reliable. Modelling via TABLO has the side benefit that documentation of a model is more or less automatic.

The definitive documentation of the TABLO implementation of ORANI is contained in the eight TABLO Input files which form the start of our model solution process. Because ORANI is such a complex model, these files are fairly large. Our aim here is to provide an overview of them, and to relate them to previous descriptions of ORANI.

An Implementation of ORANI
Using the GEMPACK Program TABLO

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George Codsi, Mark Horridge and K.R. Pearson

1 INTRODUCTION

The ORANI model of the Australian economy, described by Dixon, Parmenter, Sutton and Vincent (1982) (hereafter referred to as DPSV) has hitherto been available via a series of computer programs especially written for the purpose. In this document we introduce a new computer implementation of ORANI which uses only general purpose software, the GEMPACK suite. (For an overview of GEMPACK, see Codsi and Pearson (1988a) and (1988b); for a discussion of the rationale and framework within which GEMPACK has been developed see Pearson (1986a), and Codsi and Pearson (1987a).) The GEMPACK program TABLO processes text files containing formal algebraic specifications of any linearized economic model, and automatically writes FORTRAN programs which may be used to solve the model. It is quicker and easier to use TABLO than it is to write your own software to solve the same model. The process of modifying or adding model equations is also enormously accelerated. Compared to traditional, model-specific programming, TABLO is also more

reliable. There may often be doubt whether a given human-written FORTRAN program faithfully implements an economic model defined by a series of algebraic equations. TABLO removes this doubt. A TABLO Input file, which contains the algebraic specification of a model, comprises an easily intellegible, unambigous set of statements defining the equations, variables, coefficients and data sources of that model. Although Greek letters and sub- and superscripts are not permissible, the TABLO Input format mimics conventional algebraic model descriptions in other respects. Hence, modelling via TABLO has the side benefit that documentation of a model is more or less automatic.

The definitive documentation of the TABLO implementation of ORANI is contained in the eight TABLO Input files which form the start of our model solution process. Because ORANI is such a complex model, these files are fairly large. Our aim here is to provide an overview of them, and to relate them to previous descriptions of ORANI, particularly to the original DPSV specification.

The computer version of ORANI introduced here is the most faithful of all computer implementations to date. It implements all the equations and all the variables in DPSV, whereas the previous hand-coded versions were, in fact, a particular condensation of the full ORANI. For example, it is the first version to incorporate all the technical change variables of ORANI. Care has been taken to ensure that every DPSV equation is exactly reflected in the TABLO Input files. Within this rigid conservatism, we have introduced a number of enhancements to the original ORANI model. These consist chiefly of additional accounting equations that define new macro variables. This document also identifies a standard condensation of ORANI, which has been made as close as possible

to the standard condensation that has been widely used through the previous hand-coded versions of ORANI.

We hope that this version of ORANI will become the standard computer implementation. More importantly, we hope that future special versions of ORANI will be generated by TABLO Input files, rather than by custom-written programs. As these versions proliferate, model documentation and maintenance threaten to become time-consuming chores, or, worse, are neglected. The TABLO approach to model solution alleviates these problems. Most special versions of ORANI, moreover, differ from the DPSV version in relatively few respects. Now that the original ORANI is available in TABLO input form, variants may be constructed simply by the addition or subtraction of only a few equations.

The remainder of this document is structured as follows :

In Section 2 we describe in general terms the various files which make up the GEMPACK implementation of ORANI, in particular the important TABLO Input files that contain the algebraic definition of ORANI (and which are converted by the GEMPACK program TABLO into FORTRAN programs).

In Section 3 we provide a concordance between the DPSV description of ORANI and that contained in the eight TABLO Input files.

Section 4 is concerned with the treatment of indirect taxes.

In Section 5 we document new equations and variables which do not appear in DPSV.

Other, minor additions to the DPSV specification are described in

Section 6.

All the Tables referenced in the main part of this paper are placed after section 6.

There are 4 appendices :

Appendix A describes the (default) aggregation level of the TABLO implementation of ORANI as defined on the eight TABLO Input files and on the three associated data files.

Appendix B lists the headers on the three data files associated with this TABLO implementation of ORANI.

Appendix C indicates, for each DPSV variable, the name given to that variable in both this TABLO implementation and in the previous manually-coded implementation of (condensed) ORANI (as documented in Pearson (1986b).)

Appendix D deals with a technical matter, the representation of percentage changes in quantities which may initially have a zero value.

2 COMPONENTS OF THE IMPLEMENTATION

In this section we describe the files that define a complete (non-condensed) ORANI model, as described in DPSV. Table 1 (at the end of this document) lists these files and the names by which they will be referered to in this document.*

The first 8 files (all ending in the suffix 'TAB') are the TABLO Input files which specify the ORANI equation system. Each TABLO Input file represents one submodel of the full ORANI equation system. The equations have been divided between the files mainly on the basis of their subject matter, as described in Table 1. MACROTAB consists of scalar equations which relate only scalar variables. The final file, VARIABLETAB, consists chiefly of a list of variables. The purpose of this list is to define the order in which variables (which remain after the standard condensation) are printed out in the Solution file. However, the TABLO program requires at least one equation in each TABLO Input file, and so one macro equation is included here.

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* Because different computer systems have different conventions for file names, the actual names of these files at your GEMPACK site (if you have the TABLO implementation of ORANI) may differ from those used here, but should be similar. Consult your GEMPACK Manager for details.

Each TABLO Input file is processed seperately by the TABLO program. In each case, the user input necessary to process the file and to perform the standard condensation for that submodel,* is contained in a Stored-input file whose name is of the form TABLO_xxxx. (For example, the stored input to produce the standard condensation of the GOODS submodel is on the file TABLO_GOODS.) These Stored-input files are listed next in Table 1.

In order to arrive at the final, standard condensation of ORANI the eight (condensed) submodels must be united. Two GEMPACK programs, AMST and ASSEQ, are needed. The next two files listed in Table 1, AMST_ORANI and ASSEQ_ORANI contain the stored inputs, respectively, to amalgamate the 8 submodels into one model, and to assemble this single model into an Equations file (which can then be used to carry out experiments on the standard condensation of ORANI.)

The GEMPACK program SAGEM is run to find solution values for some particular experiment. The file SAGEM_EXAMPLE specifies a sample experiment, using a standard shortrun closure of ORANI. (This closure is substantially defined by Table 23.3, pp.143-144, of DPSV; the additional equations and variables, plus the slightly different treatment of taxes

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* Although the 8 TABLO Input files define the full, non-condensed ORANI model, it is unlikely that a GEMPACK user would want to know (or be able to compute) the solution value of every variable in ORANI. Hence, the Stored-input files that accompany the TABLO Input files include TABLO condensation instructions for a standard condensation of ORANI. The Tables at the end of this document explicitly identify this standard condensation, that is, they highlight which variables have been substituted out of full ORANI (and which equations were used to do the substitution) and which variables have been absorbed (that is, presumed to be exogenous and of zero value).
To change this standard condensation to one of your choice (or, indeed, to omit the condensation and implement the full ORANI), you need only change the user inputs on these Stored-input files. Section 8 of Codsi and Pearson (1987b) contains information on how to condense models.

in this TABLO version, however, require appropriate (but minor) differences in the list of exogenous variables.)

The last three files in Table 1 are the data files needed to implement this version of ORANI*. The first file (referred to as the 'FID' file) contains database flows, the second (the 'FIDPAR' file) contains parameter values, while the third and final file (the 'PROD' file) contains data relating to joint production, that is, the production of more than one commodity by certain industries.

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* All of these files are GEMPACK Header Array files. The 'FID' file contains standard header names that conform to the jointly agreed Impact/IAC standard for ORANI data files. The 'FIDPAR' file conforms to this same Impact/IAC standard, but has two non-standard additional headers named 'PH01' and 'P019' (see Appendix B for the usage of these two non-standard headers). The final 'PROD' file is special for the TABLO implementation of ORANI.
You would not normally need to know anything about either the standard header names or about Header Array files, unless you wished to modify the data on these files in some way. Mikkelsen and Pearson (1986) document the usage and structure of Header Array files. Appendix B lists the headers on the three files, indicating which are standard. If you wish to change the 'PROD' file, we suggest you contact the Impact Project for further information.

3 ORGANIZATION OF TABLO INPUT FILES

In this section we show how the equations and variables mentioned, respectively, in Tables 23.1 and 23.2 of DPSV correspond to the equations and variables in the 8 TABLO Input files.

The equations of DPSV are listed in Table 2 in numerical order. The columns are arranged as follows :

C1. Column 1 shows the DPSV number.

C2. Column 2 indicates whether this equation is substituted out in the standard condensation.

C3. Column 3 indicates the name of the TABLO Input file where the DPSV equation is defined.

C4. Column 4 gives the TABLO equation name used by the GEMPACK programs and which is defined in the TABLO Input file listed in the previous column.

C5. Column 5 briefly describes each equation.

Notice that each DPSV equation appears in only one TABLO Input file. Some of the original DPSV equations treating indirect taxes (DPSV equations 18.11, 18.15, 18.20 and 18.21) have been omitted. Equivalent new equations are described in Section 4.

Table 3 lists each DPSV variable* in column 1, while subsequent columns show its subscript range(s), its number of components, its

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* Appendix C lists, for each DPSV variable, the name corresponding to that variable in both the TABLO implementation and in the previous hand-coded implementation of (condensed) ORANI.

description, its corresponding TABLO implementation variable name and (if it is substituted or absorbed out of the standard condensation) the TABLO Input file(s) where substitution or absorption occurs. Variables which are substituted out in the standard condensation are marked with an asterisk (*). Variables which are absorbed in the standard condensation are marked with a hash (#).

Table 4 is largely a rearrangement of Table 2 to show which equations are in each TABLO Input file. As well, equations appear in Table 4 which are not in DPSV; they can be identified by the number given to them in column 2. The numbers given to these new equations consist first of the two letters NE (for New Equation), then the first letter of the TABLO Input file in which they are found, and finally an integer showing their order of specification in the TABLO Input file. These new equations are also listed separately in Table 5 together with equations that replace existing DPSV equations (the replaced DPSV equations mainly cover the handling of taxes). Additional new variables are listed in Table 6. All the new equations and variables are described in sections 4 and 5.

Table 7 shows all the variables that remain after the standard condensation, in the order in which they will appear when simulation results are printed. This order is directly determined by the order in which they appear in the TABLO Input file VARIABLETAB. They are grouped according to the number of elements in each vector variable, with the macros coming first. Within these groups the ranking is alphabetical. Thus, it is easy to find a particular result within even the thickest printout of simulation results.

4 TREATMENT OF INDIRECT TAXES

As set out in DPSV, ORANI's treatment of indirect taxes is extremely comprehensive. Every flow of goods to intermediate users, capital creation, households, 'other', or exports is taxed at its own individual rate.

Type of flow	Number
(i) intermediate	112 x 114 x 2
(ii) cap. creation	112 x 114 x 2
(iii) households	114 x 2
(iv) 'other'	114 x 2
(v) exports	114
(vi) imports	114
total	454 x 114 = 51,756 distinct tax rates

Each of these tax rates may be individually shocked, and each may be modelled either as ad valorem or as specific. Specific taxes are indexed to the CPI, and the degree of indexation may also vary between goods and users.

Apart from its complexity, the DPSV treatment presents a second problem. The basic tax variables (represented in the levels by the variables 'G' in DPSV, section 18) are taxes per unit of goods. Where a flow is initially not subject to tax, no shock to its corresponding percentage change variable 'g' can simulate the introduction of a tax.

For these reasons the previous manually-coded computer implementations of (condensed) ORANI have generally simplified the DPSV tax treatment drastically. Excepting import and export taxes, tax changes have been disallowed, and for these, either only specific taxes fully linked to the CPI or only ad valorem taxes are modelled.

Our TABLO implementation allows the same, or greater, degree of flexibility in the treatment of taxes as the DPSV original. Our equations modelling taxes are, however, slightly different. In this section we explain these differences from the DSPV equations.

Tax terms in the TABLO Input files occur in three types of equation:

(i) equations modelling price transmission,

(ii) equations modelling tax revenue,

(iii) equations modelling tax rates.

Our guiding principle has been to represent any tax terms occuring in the first two equation groups in the form of powers. (The power of a tax is defined as one plus the rate of the tax, where the latter is expressed as a fraction.) Whether or not the initial level of tax is zero, percentage changes in the powers remain defined.

4.1 Equations Modelling Price Transmission

The first group of equations model purchasers' prices in terms of basic prices and imposed taxes. They all take the percentage change form:

$$pp = Z(p0 + t) + (1-Z)pm$$

where pp is the purchasers' price, p0 the price exclusive of taxes or margins, t the power of the tax and pm a flow-specific index of margins prices. Z is the share of basic price plus tax in the purchasers' price.

4.2 Equations Modelling Tax Revenue

These six equations model the aggregate nominal revenue from the indirect taxes on the six different flows (that is, on flows to intermediate, investment, households, exports ,'other' and imports). The first five of these (all except nominal tariff revenue) are similar and will be illustrated using the equation showing the total yield from taxes on inputs to intermediate production (the variable taxrev1), in equation TAX_REV1. This equation is defined as follows :

```
EQUATION TAX_REV1
#NEG4 agg revenue from indirect taxes on flows to int #
taxrev1=     (1.0/AGGREV1)*
(SUM(i,COM,SUM(j,IND,
  KTILDETAX(i,j)*(p0(i,"domestic")+  x1csi(i,"domestic",j))
+ (KTILDETAX(i,j)+ ATILDE(i,j))*powtax1(i,"domestic",j)
+  PTILDETAX(i,j)*(p0(i,"imported")+  x1csi(i,"imported",j))
+ (PTILDETAX(i,j)+ FTILDE(i,j))*powtax1(i,"imported",j)))) ;
```

Here KTILDETAX(i,j) is the original levels amount of tax levied on usage of domestic good i by industry j. PTILDETAX(i,j) is the tax on the corresponding imported flow. AGGREV1 is the sum of these -- the total intermediate tax revenue. ATILDE and FTILDE are matrices showing the basic values of domestic and imported intermediate usage.

To understand this equation, it is useful to calculate the percentage change in the tax yield on a single flow. In levels, let R be the revenue yielded by a tax power T on a flow of volume Q at basic price P. Then:

$$R = PQT - PQ = PQ(T-1)$$

Using small letters to denote percentage changes:

$$rR = (p+q+t)PQT - (p+q)PQ$$

$$= (p+q)PQ(T-1) + tPQT$$

$$= (p+q)R + tPQT$$

= change in value of basic flow at original tax rate

+ tax change at original basic flow value

Our equation for intermediate tax revenue is simply the summation, over goods, industries and sources, of expressions such as this.

The equations calculating aggregate indirect tax revenue from flows to investment, households, exports, and 'other' are so similar to the previous equation that we will not reproduce them here. The final equation modelling tax revenue (equation TAX_REVM) is for import tariffs and differs slightly in format from the others.

```
EQUATION TAX_REVM
   # NEE2 aggregate tariff revenue #
   taxrevm =
   (1.0/AGGTAXM)*(
   SUM(i,COM, ZTILDE(i)*(pm(i) + phi + x0(i,"imported"))
 + I_totalimps(i)*powtaxm(i)  )  ) ;
```

ZTILDE(i) is the duty collected on imports of good i. AGGTAXM is the total of such duty. The difference is that import taxes are levied not on the basic value (at basic prices p0) but on the value at border prices (pm). I_totalimps(i) is the basic value of all imports of good i: this already includes duty.

Next, the change in the value of all indirect taxes is calculated as a share-weighted sum of all the preceding tax terms.

```
EQUATION IND_TAX
        # NEM1 aggregate value of indirect taxes #
        taxind  =(1.0/AGGTAX)*    (
                AGGTAX1*taxrev1 + AGGTAX2*taxrev2
              + AGGTAX3*taxrev3 + AGGTAX4*taxrev4
              + AGGTAX5*taxrev5 + AGGTAXM*taxrevm);
```

Here AGGTAX1, AGGTAX2, etc, are the total values of each type of indirect tax, and AGGTAX is their sum.

Equations Modelling Tax Rates

The third group relate changes in the powers of taxes to changes in ad valorem or in specific tax rates. For any one of the flows (i) to (vi) above, we may derive this relation as follows. We imagine that the tax consists both of a specific part and an ad valorem part. In levels, let:

P = basic price,

G = total tax per unit,

Gs = specific part of the unit tax,

Gv = ad valorem part of the unit tax,

S = specific rate of tax,

V = ad valorem rate of tax,

T = power of tax,

CPI= consumer price index,

H = (fixed) degree of indexation of specific part of tax.

Then $T.P = P + G = P + Gs + Gv$,

while $Gv = V.P$,

and $Gs = S.CPI.H$.

Hence: $T.P = P + S.CPI.H + V.P$.

In change form:

$$T.P(t + p) = P.p + S.CPI.H(s + H.cpi) + V.P(v + p)$$

$$= P.p + Gs(s + H.cpi) + Gv(v + p) .$$

Hence: $T.P(t + p) = P.p + G\{[Gs/G](s + H.cpi) + [Gv/G](v + p)\}$

$$= P.p + G\{[1-SHRVAL](s + H.cpi) + SHRVAL(v + p)\}$$

where $SHRVAL = Gv/G$ = share of tax revenue which is ad valorem.

Hence: $t+p = [P/(T.P)]p + [G/(T.P)]\{[1-SHRVAL](s+H.cpi) + SHRVAL(v+p)\}$

Hence: $t = -ZQp + ZQ\{[1-SHRVAL](s+H.cpi) + SHRVAL(v+p)\}$

where $ZQ = G/(T.P)$ = share of tax in taxpaid price.

Finally: $t = ZQ\ \{SHRVAL(v + p) + [1-SHRVAL](s + H.cpi) - p\}$

Flows to households - flow (iii)

The corresponding TABLO equation for taxes on consumer goods is:

```
EQUATION POW_HOUS_TAX
# NEH1 power of tax on sales to households #
(all,i,COM)(all,s,SOURCE)
    powtax3(i,s) = ZQHOUS(i,s)*
    (SHRVAL3*[valtax3(i,s)+p0(i,s)] +
     (1.0-SHRVAL3)*[spectax3(i,s)+UH1HOUS*xi3]
     - p0(i,s));
```

Notice that neither of the coefficients SHRVAL3 or UH1HOUS are subscripted. The current ORANI data base (as it exists at August 1988) does not contain values for these coefficients, and so each was set to one. This has the effect of making these tax rates wholly ad valorem, which mimics the previous hand-coded implementation of (condensed) ORANI. As all coefficients SHRVAL3 and UH1HOUS are the same (being equal to 1.0) for all such tax rates, the subscript is dropped. It would, of course, be a simple matter to restore either or both subscripts, if there were

data available in the ORANI data base.

The dimensionality of the tax rate variables has also been restricted by equations such as the next two, which again relate to taxes on consumer goods:

```
EQUATION VAL_HOUS_TAX
# NEH2 ad valorem tax on sales to households #
(all,i,COM)(all,s,SOURCE)
      valtax3(i,s) = taxrate3;

EQUATION SPEC_HOUS_TAX
# NEH3 specific on sales to households #
(all,i,COM)(all,s,SOURCE)
      spectax3(i,s) = taxrate3;
```

These equations are used to substitute out the tax variables valtax3(i,s) and spectax3(i,s), implying that shocks to the tax structure must be effected by shocking the exogenous variables for the tax rates, that is, variables TAXRATE1, TAXRATE2, TAXRATE3 and TAXRATE5. The motivation is to reduce the number of variables in the system to manageable proportions. The cost is that all rates of tax on consumers must vary by the same degree. Again, full flexibility can easily be restored by deleting the above two equations, if a particular experiment requires this.

Indirect taxes on intermediate, investment and 'other' demands are modelled in just the same way as for households. For export taxes, however, only the powers of tax are modelled. The reason is that some of these taxes are sometimes endogenous, and that where no tax is recorded in the data base, endogenous percentage changes in specific or ad valorem rates might be undefined or give rise to 'divide-by-zero' errors.

For import taxes, we have provided a relation between the powers of the tariffs and the 'IAC rates':

```
ZERODIVIDE DEFAULT 0.0 ;

COEFFICIENT (ALL, i, COM)
        ZQ_IMP(i)
        # tariffs: power to 'iac' rate conversion factor#;

FORMULA (ALL, i, COM) ZQ_IMP(i)=IACRAT(i)/(1.0+IACRAT(i));

EQUATION POW_IMP_TAX
#NEE1 power of tariff from changes in the 'IAC' rate #
(all,i,COM)
      powtaxm(i) =  ZQ_IMP(i)*iacrate(i);
! note that when the IAC rate is zero, zq_imp will be      !
! zero and corresponding members of iacrate can neither be !
! substituted out nor be endogenous, without modification  !
! to this code    !
```

Specific taxes, or 'true' (data base consistent) ad valorem taxes are not included for imports.

5 NEW EQUATIONS DEFINING NEW MACRO VARIABLE

Most of the new variables and equations introduced in this version of ORANI, but not present in DPSV, consist of new macro variables together with the equations which define them. If all of these variables are endogenous, then solutions of ORANI are unaffected by the presence of these additions. Hence, these new variables and equations do not contradict the standard, DPSV version of ORANI.

Table 8 lists these new macro equations. The first column shows the equation number. As explained above, the third letter of this number is the first letter of the TABLO Input file containing this equation. Hence, equations NEI1 and NEI3, for instance, are to be found in INVESTTAB. The second column shows the equation name -- used by TABLO for internal purposes. The third column shows the new variable which is defined by this new equation. The final column describes this variable.

We now explain in turn each equation in Table 8, using excerpts from the TABLO Input files, together with comments explaining each equation. TABLO notation is used: variables appear in lower case and their meanings may be drawn from Tables 3 or 7. Coefficients, which appear in upper case, are explained in the text.

5.1 Investment

The three variables in this group are indices of total investment - including the 'exogenous' components of investment. Using the TABLO notation, they are defined by:

```
EQUATION INV_REAL
       # NEI1  total real investment #
        iR = (1.0/AGGINV)*SUM(j,IND, INVEST(j)*y(j) );

EQUATION INV_PI
       # NEI2 investment price index #
        xi2 = (1.0/AGGINV)*SUM(j,IND, INVEST(j) *pi(j) );

EQUATION INV_NOM
        # NEI3 total nominal investment #
        in = iR + xi2;
```

Here, y(j) is investment by industry, pi(j) the price of a unit of capital, INVEST(j) the original levels-value of investment by industry (at purchasers' prices), and AGGINV is the total over all industries of the INVEST(j). Note that the corresponding DPSV indices, which only included 'private' or 'endogenous' investment, are still included in the model: their names are 'prinv' (nominal) and 'prinvr' (real).

5.2 'Other' Demands

These three variables are indices of 'other' demands; their equations are:

```
EQUATION EQ_XI5
# NEG13 'other' demands price index #
    xi5 = SUM(s,SOURCE, SUM(i,COM, WOTH(i,s) * p5cs(i,s)));

EQUATION OTH_REAL
# NEG14 aggregate real "other" demands #
 othreal = SUM(s,SOURCE, SUM(i,COM, WOTH(i,s) * x5cs(i,s)));

EQUATION OTH_NOM
# NEG15 aggregate nominal value of "other" demands #
    othnom = othreal + xi5;
```

Here, p5cs(i,s) is the price paid by 'other' for good i, source s, and WOTH(i,s) is the corresponding share in total 'other' expenditure at purchasers' prices.

5.3 Import and Export Prices

Exports and imports price indices are defined by:

```
EQUATION XI_EXPORTS
    # NEE6 exports price index #
    xi4 - phi = (1.0/AGGEXP)*SUM(r,COM,I_expearn(r)*pe(r)) ;

EQUATION XI_IMPORTS
    # NEE4 imports price index #
    xim - phi =(1.0/AGGIMP)*SUM(r,COM,I_impcost(r)*pm(r) ) ;
```

where I_expearn(r) is the original value at border prices of exports of good r and I_impcost(r) is the original value at border prices of imports. They sum to AGGEXP and AGGIMP.

For the purpose of seeing how a tariff change affects the price of imports in general we have also defined a duty-paid imports price index:

```
EQUATION XI_IMP_DUTYPAID
    # NEE5 duty paid imports price index #
    ximp0 =
    (1.0/[AGGIMP+AGGTAXM])*
              SUM(r,COM,I_totalimps(r)*p0(r,"imported") ) ;
```

Here I_totalimps(r) is the original value at basic prices of imports of good r and AGGTAXM total tariff revenue.

5.4 GDP Expenditure

These three variables measure GDP from the expenditure side; their equations are:

```
EQUATION GDP_EXP
        # NEM3 aggregate nominal GDP from expenditure side #
        gdpexp =(1.0/GDPEX)*      (
                AGGCON*c + AGGINV*in + AGGOTH*othnom
              + AGGEXP*(exp+phi) - AGGIMP*(imp+phi) );

EQUATION GDP_PI
        # NEM4 Price index for GDP, expenditure side #
        xigdp = (1.0/GDPEX)* (
                AGGCON*xi3 + AGGINV*xi2 + AGGOTH*xi5
              + AGGEXP*xi4 - AGGIMP*xim);

EQUATION GDP_REAL
        # NEM5 Real GDP, expenditure side #
       gdpreal = gdpexp - xigdp ;
```

Here AGGCON, AGGINV and AGGOTH are the original levels values, at purchasers' prices, of aggregate consumption, investment and 'other' demands. AGGEXP and AGGIMP are the original levels values, at border prices, of exports and imports. GDPEX is the sum of all five values.

5.5 Tax Revenue

The new equations and variables modelling tax revenue have already been discussed in detail in section 4.2 above. They are

- o the five equations (TAX_REV1 to TAX_REV5) defining the macros 'taxrev1' to 'taxrev5', which model the aggregate revenue from indirect taxes on flows to intermediates, capital creation, households and on export taxes, respectively,
- o the equation TAX_REVM defining the macro 'taxrevm', the aggregate tariff revenue, and
- o the equation IND_TAX defining the macro 'taxind', the aggregate value of indirect taxes.

5.6 Primary Factor Payments

These three equations determine the total value of primary factor payments:

```
EQUATION LAB_REV
# NEP2 aggregate payments to labour #
   labrev = (1.0/AGGLAB)*
            SUM(j,IND,SUM(m,OCC,
               UTILDE(m,j)*(p1laboi(j,m)+x1laboi(j,m)) ));
```

Here UTILDE(m,j) is the original value of wages paid by industry j to occupation m and AGGLAB is the total of all wages.

```
EQUATION CAP_REV
# NEP3 aggregate payments to capital #
   caprev = (1.0/AGGCAP)*
            SUM(j,IND, VTILDE(j) *(p1cap(j)+curcap(j)));

EQUATION LND_REV
# NEP4 aggregate payments to land #
   lndrev = (1.0/AGGLND)*
            SUM(j,IND, WTILDE(j) * (p1land(j)+n(j)));
```

Here VTILDE(j) and WTILDE(j) are the original costs to industry j of capital and land, while AGGCAP and AGGLND are their totals.

In a similar way, the next equation calculates the aggregate value of 'other cost ticket' payments:

```
EQUATION OCT_REV
# NEG16 aggregate other cost ticket payments #
     octrev = (1.0/AGGOCT)*
          SUM(j,IND, XTILDE(j) *(p1oct(j)+x1oct(j)));
```

Here XTILDE(j) is the original cost to industry j of 'other cost tickets' and AGGOCT the sum of the XTILDE(j).

5.7 GDP Income

GDP from the income side is the sum of all factor payments and indirect tax payments (with the 'other cost ticket' revenue included). We calculate it as a share-weighted sum of its component parts:

```
EQUATION GDP_INC
    # NEM2 aggregate nominal GDP from income side #
    gdpinc = (1.0/GDPIN)* (
            AGGLND*lndrev + AGGCAP*caprev + AGGLAB*labrev
          + AGGOCT*octrev + AGGTAX*taxind    );
```

GDPIN is the original levels value of GDP from the income side.

5.8 Real Factor Aggregates

We calculate a real output index using value-added weights:

```
EQUATION ZTOT
# NEP5 aggregate output: value-added weights #
      z_tot = (1.0/(AGGLAB+AGGCAP+AGGLND))*
              SUM(j,IND,TOTFACIND(j)*z(j));
```

Here TOTFACIND(j) is original value added by industry j, while the TOTFACIND(j) sum to (AGGLAB+AGGCAP+AGGLND).

We calculate indices of employment by industry:

```
EQUATION INDEMP
# NEP6 employment by industry #
   (all,j,IND)
    labind(j) =     (1.0/I_TEMIND(j))*
    SUM(m,OCC,UTILDE(m,j)*x1laboi(j,m));
 ! note I_TEMIND(j)=LABJ(j) unless LABJ(j)=0 !
```

For each industry, labind(j) aggregates percentage changes in employment of the various occupational types of labour, using weights which reflect wage costs.

Aggregates of labour and capital usage are calculated which also use primary factor cost weights:

```
EQUATION AGG_EMPLOYMENT
# NEP7 aggregate employment, wage bill weights #
     l = (1.0/AGGLAB)*
         SUM(j,IND, LABJ(j) * labind(j) );

EQUATION AGG_CAPITAL
# NEP1 aggregate usage of capital, rental weights #
        kT = (1.0/AGGCAP)*
             SUM(j,IND, VTILDE(j) * curcap(j));
```

Note that the variable 'l' replaces the DPSV variable of the same name, which was based on 'persons' weights. The DPSV measurement of the aggregate capital stock (using asset value weights) is still included as variable 'kO'.

6 OTHER CHANGES

A few more minor changes have been made to the DPSV version of ORANI. The first is that a new variable, f5gen, has been added which has the effect of increasing all 'other' demands uniformly. The 'other' demands equation becomes:

```
EQUATION OTH_DEM
# 16.1 "Other" demands #
(all,i,COM)(all,s,SOURCE)
    x5cs(i,s) =
         UH5*cr + f5(i,s) + f5gen ;
```

The purpose is to facilitate the simulation of a uniform endogenous reduction in government spending, perhaps to meet a budgetary target. Again, the indexation parameter UH5 -- which is set to one -- lacks subscripts. These may be restored, if data allows.

Second, the investment shift variable f2(j) now applies to all industries, rather than only to the 'exogenous' investment industries. The investment equations are:

```
EQUATION FUT_CAP_STK
    # 19.9 effect of investment on future capital stocks #
(ALL, j, IND)
futcap(j) = [1.0 - G(j)] * curcap(j) + G(j) * (y(j)-f2(j));

EQUATION INVEST_INDUST_EXO
    # 19.11 investment by exogenous industries #
(ALL, j, EXOIND)
    y(j) = UH2INV(j) * prinvr + f2(j);
```

For each industry j, a one per cent shock to f2(j) now leads, cet. par., to a one per cent increase in investment, y(j). Note that the variable representing next year's capital stocks, futcap(j), is substituted out.

Finally, the TABLO implementation of ORANI defines a new variable 'p5cs' for the purchasers' price paid for commodities (by source) by 'other' and a corresponding new zero pure profits equation for the distribution of commodities to 'other'. This new equation (called Z_PURE_PROF_OTH with number NEG17) is analagous to the DPSV equation 18.19 for zero pure profits in the distribution of goods to households:

```
EQUATION Z_PURE_PROF_OTH
# NEG17 ZPP in distribution of commodities to "other" #
(all,i,COM)(all,s,SOURCE)
p5cs(i,s) =
   + ZETA5(i,s)* (p0(i,s)+powtax5(i,s))
   + (1.0-ZETA5(i,s))*
   SUM(r,MARGCOM, MOTH(i,s,r)*(p0(r,"domestic")
                                  + a5marg(i,s,r) ) );
```

TABLE 1 FILES OF THE ORANI TABLO IMPLEMENTATION

TABLO Input files defining the ORANI model

GOODSTAB	Intermediate, investment and 'other' demands for goods Prices of domestic goods Goods market clearing
PRIMARYTAB	Factor demands
INVESTTAB	Investment by industry
JOINTPTAB	Outputs of domestic goods
EXPIMPTAB	Import prices Export demands Aggregate exports and imports
HCONTAB	Household demands
MACROTAB	Equations relating scalar variables
VARIABLETAB	List of variables left after condensation to control order of printing results

Stored-input files to produce a standard condensation of the 8 ORANI submodels

TABLO_GOODS TABLO_PRIMARY TABLO_INVEST TABLO_JOINTP
TABLO_EXPIMP TABLO_HCON TABLO_MACRO TABLO_VARIABLE

Stored-input files to amalgamate the 8 standard condensed submodels into a single standard condensation of ORANI

AMST_ORANI ASSEQ_ORANI

Stored-input file for an example simulation

SAGEM_EXAMPLE

Data input files

Impact/IAC Standard Format	FID	Full infinite Diagram
Impact/IAC Standard Format	FIDPAR	Extended Parameter File
Special Format	PROD	Details of Joint Production

TABLE 2 EQUATIONS OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV No.	Subst. out	TABLO Input file	TABLO Equation name	Description
12.23	Yes	GOODSTAB	INT_INP_DEM	Demands for intermediate inputs, domestic and imported
12.25	Yes	GOODSTAB	DEM_OCT	Demands for 'other cost' tickets
12.56	Yes	PRIMARYTAB	LABDEMOCC	Demands for labour by industry and skill group
12.64	Yes	PRIMARYTAB	FACDEM	Industry demands for primary factors
12.66	No	PRIMARYTAB	LABPRICE	Price to each industry of labour in general
12.81	Yes	JOINTPTAB	SUPPCOMPCOM	Supplies of composite commodities by industries
12.83	Yes	JOINTPTAB	SUPPCOMIND	Supplies of commodities by industries
12.84	Yes	JOINTPTAB	PRCOMPCOM	Prices of composite commodities
13.4	Yes	GOODSTAB	CAP_INP_DEM	Demands for inputs to capital creation
14.21	No	HCONTAB	HOUS_DEM_COM_SOURCE	Household demands for goods divided by source
14.23	Yes	HCONTAB	HOUS_PRICE_COM	General price of commodities to households
14.24	Yes	HCONTAB	HOUS_DEM_COM	Household demands for goods, all sources
15.2	No	EXPIMPTAB	FOR_EXP_PRIC	Export demand functions
16.1	Yes	GOODSTAB	OTH_DEM	'Other' demands for goods, by source
16.2	No	VARIABLETAB	HOUS_EXPEND	Real household expenditure
17.2.1	Yes	GOODSTAB	MARG_INT	Margins - to producers
17.2.2	Yes	GOODSTAB	MARG_CAP	Margins - to capital creation
17.5.3	Yes	GOODSTAB	MARG_HOUS	Margins - to households
17.5.5	Yes	GOODSTAB	MARG_OTH	Margins - to 'other' users
17.6	Yes	GOODSTAB	MARG_EXP	Margins - to ports for exports
18.2	No	GOODSTAB	ZPP_INT	Zero pure profits in production

TABLE 2 (continued) EQUATIONS OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV No.	Subst. out	TABLO Input file	TABLO Equation name	Description
18.3	Yes	GOODSTAB	TECH_INT	Technical change by industries
18.6	No	GOODSTAB	ZPP_CAP	Zero pure profits in capital creation
18.10	No	EXPIMPTAB	BAS_PRIC_IMP	Zero pure profits in importing
18.11	-	---	---	Tariff rates :
				replaced by new equation POW_IMP_TAX (NEE1)
18.14	No	EXPIMP	EXP_BAS_PRICES	Zero pure profits in exporting
18.15	-	---	---	Taxes per unit of export :
				deleted - only ad valorem export taxes allowed
18.18.1	Yes	GOODSTAB	PUR_PRI_INT	Purchasers' prices - intermediate production
18.18.2	No	GOODSTAB	PUR_PRI_CAP	Purchasers' prices - capital creation
18.19	Yes	HCONTAB	Z_PURE_PROF_HOUS	ZPP in distribution of goods to households
18.20	-	---	---	Subsidies on sales to domestic users :
				replaced by equations POW_INT_TAX (NEG1)
				and POW_CAP_TAX (NEG5)
18.21	-	---	---	Subsidies on sales to domestic users :
				replaced by equation POW_HOUS_TAX (NEH1)
19.7	No	INVESTTAB	RETURN_CAPITAL	Rates of return to capital
19.8	No	INVESTTAB	INVEST_INDUST_END	Equality of expected rates of return
19.9	Yes	INVESTTAB	FUT_CAP_STK	Effect of investment on future capital stocks
19.10	No	INVESTTAB	PRIV_INVEST_BUDGET	Total private nominal investment budget
19.11	No	INVESTTAB	INVEST_INDUST_EXO	Investment by exogenous industries

TABLE 2 (continued)

EQUATIONS OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV No.	Subst. out	TABLO Input file	TABLO Equation name	Description
19.12	No	INVESTTAB	PRIV_INV_EXPEND	Total real private investment
20.6	No	GOODSTAB	MKT_CLEAR_MARGINS	Demand equals supply for margin commodities
			MKT_CLEAR_NOMARGINS	Demand equals supply for non margin commodities
20.7	No	JOINTPTAB	TOTCOMOUT	Total output of domestic commodities
20.8	No	PRIMARYTAB	M_CLEAR_LAB	Demand equals supply for labour of each skill
20.9	No	PRIMARYTAB	M_CLEAR_CAP	Demand equals supply for capital
20.10	No	PRIMARYTAB	M_CLEAR_LAND	Demand equals supply for agricultural land
21.2	No	GOODSTAB	IMP_VOL	Import volumes
21.4	No	EXPIMPTAB	IMP_VALUE	Foreign currency value of imports
21.6	No	EXPIMPTAB	EXP_VALUE	Foreign currency value of exports
21.8	No	MACROTAB	BAL_TRADE	Balance of trade
22.1	No	HCONTAB	CPI	Consumer price index
22.2	No	INVESTTAB	CAP_GOODS_PI	Private investment goods price index
22.3	-	---	---	Aggregate employment, wage bill weights : replaced by equation AGG_EMPLOYMENT (NEP7)
22.4	No	PRIMARYTAB	AGG_CAP_STOCK	Aggregate capital stock, asset value weights
22.5	No	MACROTAB	INVEST_EXPEND_RAT	Ratio, private investment to household consumption
22.6	No	PRIMARYTAB	MONEY_WAGES	Flexible setting of money wages
22.7	Yes	GOODSTAB	PRI_OCT	Indexing of prices of 'other cost' tickets

TABLE 3 VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
			All variables are percentage changes with the exception of ΔB		
z_j	$j=1,\ldots,h.$	h	Industry activity levels	z(j)	-
* $x^{(k)}_{(is)j}$	$i=1,\ldots,g.$ $j=1,\ldots,h.$ $s,k=1,2.$	4gh	Demands for inputs (domestic and imported) for current production and capital creation	* x1csi(i,s,j) * x2csi(i,s,j)	GOODS GOODS
* $x^{(1)}_{g+2,j}$	$j=1,\ldots,h.$	h	Demands for "other cost" tickets	* x1oct(j)	GOODS
* $x^{(1)}_{(g+1,1,q)j}$	$q=1,\ldots,M.$ $j=1,\ldots,h.$	Mh	Demands for labour inputs by skill group and industry	* x1laboi(j,q)	PRIMARY
* $x^{(1)}_{(g+1,v)j}$	$v=1,2,3.$ $j=1,\ldots,h.$	3h	Industry demands for labor in general, capital and agricultural land	* x1facind(j,v)	PRIMARY
* $x^{(0)}_{(r^*)j}$	$j=1,\ldots,h.$ $r=1,\ldots,N(j).$	$\sum_{j=1}^{h} N(j)$	Supplies of composite commodities by industry. N(j) is the number of composites produced by industry j.	* x0ccom(r,j)+	JOINTP

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.
\+ In the TABLO implementation, 'r' ranges over the set COMPCOM used to denote the (at most six) different composite commodities produced by any industry.

TABLE 3 (Continued)

VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
* $x^{(0)}_{(i1)j}$	j=1,...,h. i=1,...,g.	gh	Supplies of commodities by industry	* x0ci(i,j)	JOINTP
* $x^{(k)}_{(is)}$	k=3,5, s=1,2. i=1,...,g.	4g	Household and "other" demands for goods by type and source	x3cs(i,s) * x5cs(i,s)	- GOODS
* $x^{(3)}_{i}$	i=1,...,g.	g	Household demands for goods by type, undifferentiated by source	* x3(i)	HCON
$x^{(4)}_{(i1)}$	i=1,...,g.	g	Export volumes	x4(i)	-
* $x^{(is)jk}_{(ri)}$	j=1,...,h. i,r=1,...,g. k,s=1,2.	$4g^2h$	Demands for margin services to facilitate the flow of goods to production and capital creation	* x1marg(i,s,j,r) * x2marg(i,s,j,r)	GOODS GOODS
* $x^{(is)k}_{(ri)}$	i,r=1,...,g. k=3,5. s=1,2.	$4g^2$	Demands for margin services to facilitate the flow of goods to households and "other" users	* x3marg(i,s,r) * x5marg(i,s,r)	GOODS GOODS
* $x^{(i1)4}_{(ri)}$	r,i=1,..,g.	g^2	Demands for margin services to facilitate the flow of goods to ports for export	* x4marg(i,r)	GOODS

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$x^{(0)}_{(ri)}$	r=1,...,g.	g	Total supplies of domestic commodities	x0(r, "domestic")	-
y_j	j=1,...,h.	h	Capital creation by using industry	y(j)	-
* $p^{(k)}_{(is)j}$	i=1,...,g. j=1,...,h. k,s=1,2.	4gh	Purchasers' price for produced inputs for current production and capital creation	* p1csi(i,s,j) * p2csi(i,s,j)	GOODS GOODS
$p^{(1)}_{(g+1,v)j}$	v=1,2,3. j=1,...,h.	3h	Prices paid by each industry for their labour in general, rental of capital and rental of agricultural land	p1lab(j) v=1 p1cap(j) v=2 p1land(j) v=3	- - -
$p^{(1)}_{(g+1,1,m)j}$	m=1,...,M. j=1,...,h.	Mh	Prices paid by industries for units of labor of different skill categories	p1laboi(j,m)	-
* $p^{(3)}_{i}$	i=1,...,g.	g	Purchasers' price for consumer goods by type but not by source	* p3(i)	HCON
* $p^{(3)}_{(is)}$	i=1,...,g. s=1,2.	2g	Purchasers' prices paid for commodities by households	* p3cs(i,s)	HCON

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$p^{e}_{(i1)}$	i=1,...,g.	g	F.o.b. foreign currency export prices	pe(i)	-
$p^{(0)}_{(is)}$	i=1,...,g. s=1,2.	2g	Basic prices of both domestic goods and imports	p0(i,s)	-
* $p^{(0)}_{(t*)j}$	t=1,...,N(j). j=1,...h.	$\sum_{j=1}^{h} N(j)$	Prices of composite commodities	* p0ccom(t,j)+	JOINTP
* $p^{(1)}_{g+2,j}$	j=1,...,h.	h	Prices of "other cost" tickets to each industry	* ploct(j)	GOODS
π_j	j=1,...,h.	h	Costs of units of capital	pi(j)	-
$p^{m}_{(i2)}$	i=1,...,g.	g	C.i.f. foreign currency import prices	pm(i)	-
ϕ		1	The exchange rate, $A per $US, say	phi	-
q		1	Number of households	q	-

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.
\+ In the TABLO implementation, 't' ranges over the set COMPCOM used to denote the (at most six) different composite commodities produced by any industry.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
* $k_j(1)$	j=1,...,h.	h	Future capital stocks	* futcap(j)	INVEST
$k_j(0)$	j=1,...,h.	h	Current capital stocks	curcap(j)	-
$r_j(0)$	j=1,...,h.	h	Current rates of return on fixed capital	r0(j)	-
ω		1	Exonomy-wide expected rate of return on capital	omega	-
ℓ_m	m=1,...,M.	M	Employment of labour by skill group	lambda(m)	-
n_j	j=1,...,h.	h	Use of agricultural land in each industry	n(j)	-
$x^{(0)}_{(r2)}$	r=1,...,g.	g	Aggregate imports by commodity	x0(r,"import")	-
m		1	Foreign currency value of imports	imp	-
e		1	Foreign currency value of exports	exp	-
ΔB		1	The balance of trade	delB	-

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.

TABLE 3 (continued)

VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$\xi(3)$		1	ORANI consumer price index	xi3	-
$\xi(2)$		1	Capital goods price index, for 'endogenous' investment industries	xiprinv	-
c		1	Aggregate household expenditure	c	-
c^R		1	Real aggregate household expenditure	cR	-
i_R		1	Total real investment by 'endogenous' investment industries	prinvr	-
i		1	Total investment expenditure, 'endogenous' investment industries	prinv	-
ℓ		1	Aggregate employment, based on person's weights	l+	-
k(0)		1	Aggregate capital stock, asset value weights	k0	-
f_R		1	The ratio of prinvr to cR	fR	-

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.
\+ The TABLO variable 'l' does not exactly correspond to the DPSV variable 'l'. The TABLO 'l' is aggregate employment, based on wage bill weights.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$f^{e}_{(il)}$	i=1,...,g.	g	Shifts in foreign export demands	fe(i)	-
$f^{(5)}_{(is)}$	i=1,...,g, s=1,2.	2g	Shift terms for "other" demands	f5(i,s)	-
$f^{(2)}_{j}$	j∉J.	h-j*	Exogenous investment terms. J* is number of members of J, the set of 'endogenous' investment industries	f2(j)+	-
$f^{(1)}_{(g+1,1)}$		1	General wage-shift variable. Can sometimes be interpreted as the change in the overall level of real wages	fwage	-
$f^{(1)}_{(g+1,1)j}$	j=1,...,h.	h	Variable used for simulating the effects of changes in the wages payable by particular industries	fwagei(j)	-
$f^{(1)}_{(g+1,1,m)}$	m=1,...,M.	M	Variable used in simulations involving changes in occupational wage relativities	fwageo(m)	-

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.
\+ In the TABLO implementation, 'j' runs over all industries (not just the exogenous investment industries).

TABLE 3 (continued)

VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$f^{(1)}_{(g+1,1,m)j}$	m=1,...,M, j=1,...,h.	Mh	Variable allowing changes in both occupational and industrial wage relativities	fwageoi(j,m)	-
$f^{(1)}_{g+2,j}$	j=1,...,h.	h	Shift terms for allowing for changes in the real price of "other cost" tickets	floct(j)	-
* a(j)	j=1,...,h.	h	Weighted sums of the technical-change terms affecting the production functions for each	* a(j)	GOODS
$a^{(1)}_j$	j=1,..,h.	h	Neutral-input-augmenting technical change (augments all inputs)	a1(j)	-
# $a^{(1)}_{ij}$	i=1,...,g. j=1,...,h.	gh	Input-i-augmenting technical change	# a1ci(i,j)	GOODS
$a^{(1)}_{ij}$	i=g+1 j=1,...,h.	h	All primary factor augmenting technical change	a1prim(j)	-
# $a^{(1)}_{ij}$	i=g+2 j=1,...,h.	h	'Other cost ticket' augmenting technical change	# a1oct(j)	GOODS
# $a^{(1)}_{(is)j}$	i=1,...,g, s=1,2, j=1,...,h.	2gh	Input-(is)-augmenting technical change	# a1csi(i,s,j)	GOODS

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
$a^{(1)}_{(g+1,s)j}$	s=1,2,3, j=1,...,h.	3h	Labour, capital- and agricultural-land-augmenting technical change	a1lab(j) a1cap(j) a1land(j)	- - -
# $a^{(1)}_{(g+1,1,q)j}$	q=1,...,M. j=1,...,h.	Mh	Specific-skill-augmenting technical change	# a1laboi(j,q)	GOODS, PRIMARY
# $a^{(0)}_{j}$	j=1,...,h.	h	Neutral output-augmenting technical change	# a0ind(j)	GOODS, JOINTP
# $a^{(0)}_{(r^*)j}$	r=1,...,N(j). j=1,...,n.	$\sum_{j=1}^{h} N(j)$	Composite-good-augmenting technical change	# a0ccom(r,j)*	GOODS, JOINTP
# $a^{(0)}_{(i1)j}$	i=1,...,g. j=1,...,h.	gh	Augmenting technical change with respect to commodity outputs	# a0ci(i,j)	JOINTP
# $a^{(2)}_{j}$	j=1,...,h.	h	Neutral input-augmenting technical change with respect to capital creation	# a2ind(j)	GOODS
# $a^{(2)}_{ij}$	i=1,...,g. j=1,...,h.	gh	Input-i-augmenting technical change with respect to capital creation	# a2ci(i,j)	GOODS

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.
* In the TABLO implementation, 'r' ranges over the set COMPCOM used to denote the (at most six) different composite commodities produced by any industry.

TABLE 3 (continued)

VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
# $a^{(2)}_{(is)j}$	i=1,...,g. s=1,2 j=1,...,h.	2gh	Input-(is)-augmenting technical change with respect to capital creation	# a2csi(i,s,j)	GOODS
# $a^{(3)}_{i}$	i=1,...,g.	g	Commodity-i-augmenting change in household preferences	# a3com(i)	HCON
# $a^{(3)}_{(is)}$	i=1,...,g. s=1,2.	2g	Commodity-(is)-augmenting change in household preferences	# a3cs(i,s)	HCON
# $a^{(is)jk}_{(r1)}$	r,i=1,...,g. s,k,=1,2, j=1,...,h.	$4g^2h$	Technical change associated with the use of services in facilitating input flows to industries for current production and capital creation	# a1marg(i,s,j,r)	GOODS
# $a^{(is)k}_{(r1)}$	r,i=1,...,g. s=1,2, k=3,5.	$4g^2$	Technical change associated with the use of services in facilitating commodity flows to households and "other" users	# a2marg(i,s,j,r) # a3marg(i,s,r)	GOODS GOODS, HCON
# $a^{(i1)4}_{(r1)}$	r,i=1,...,g.	g^2	Technical change associated with the use of services in facilitating the flow of exports from producers to the ports of exit	# a5marg(i,s,r) # a4marg(i,r)	GOODS EXPIMP, GOODS

* These variables are substituted out in the standard consensation of TABLO ORANI.
\# These variables are absorbed in the standard condensation of TABLO ORANI.

TABLE 3 (continued) VARIABLES OF DPSV AND THEIR TABLO COUNTERPARTS

DPSV Variable	Subscript Range	Number of components	Description	TABLO Variable	TABLO Input file for sub/abs
Note: The TABLO version of ORANI treats indirect taxes differently from DPSV. See Table 6 for a list of the new tax variables and Table 5 for a list of the new tax equations in the TABLO implementation of ORANI. These new variables and equations are discussed in Section 4.					
g(i2,0), t(i2,0), v(i2,0)	i=1,...,g.	g g g	The g's are the tariffs per unit of imports. The t's and v's are variables allowing tariffs to be modelled as ad valorem or specific		
g(i1,4) t(i1,4), v(i1,4)	i=1,...,g.	g g g	The g's are taxes per unit of exports. The t's and v's allow these taxes to be modelled as ad valorem or specific		
g(is,jk), t(is,jk), v(is,jk)	i=1,...,g, s,k=1,2, j=1,...,h.	4gh 4gh 4gh	The g's are taxes on the sales of inputs to industries for current production and capital creation. The t's and v's allow these taxes to be modelled as ad valorem or specific		
g(is,3), t(is,3), v(is,3)	i=1,...,g. s=1,2.	2g 2g 2g	The g's are taxes on the sales of commodities to households. The t's and v's allow these taxes to be modelled as ad valorem or specific		

$$\text{Total} = 8g^2h + 10g^2 + 28gh + 4Mh + 27h + 33g + 2M + 3\sum_{j=1}^{h} N(j) + 16 - j^*$$

(Adapted from Table 23.2 of DPSV)

TABLE 4 EQUATIONS IN ORANI TABLO INPUT FILES

TABLO Input file: GOODSTAB

TABLO Equation Name	Equation No.	Description
MKT_CLEAR_MARGINS	20.6	Demand equals supply for margin commodities
MKT_CLEAR_NOMARGINS	20.6	Demand equals supply for non margins
INT_INP_DEM	12.23	Demands for intermediate inputs
CAP_INP_DEM	13.4	Demands for inputs to capital
PUR_PRI_INT	18.18.1	Purchasers' prices - intermediate prod
PUR_PRI_CAP	18.18.2	Purchasers' prices - capital creation
POW_INT_TAX	NEG1	Power of tax on sales to intermediate
VAL_INT_TAX	NEG2	Ad valorem rate of tax on sales to intermediate
SPEC_INT_TAX	NEG3	Specific rate of tax on sales to intermediate
TAX_REV1	NEG4	Aggregate revenue, taxes on flows to intermediate
POW_CAP_TAX	NEG5	Power of tax on sales to investment
VAL_CAP_TAX	NEG6	Ad valorem tax on sales to investment
SPEC_CAP_TAX	NEG7	Specific rate on sales to investment
TAX_REV2	NEG8	Aggregate revenue, taxes levied on capital creation
OTH_DEM	16.1	Other demands
MARG_INT	17.2.1	Margins - to producers
MARG_CAP	17.2.2	Margins - to capital creation
MARG_HOUS	17.5.3	Margins - to households
MARG_OTH	17.5.5	Margins - to other users
MARG_EXP	17.6	Margins - to ports for exports
IMP_VOL	21.2	Import volumes
Z_PURE_PROF_OTH	NEG17	Zero pure profits in distribution of commodities to 'other'
POW_OTH_TAX	NEG9	Power of tax on sales to other
VAL_OTH_TAX	NEG10	Ad valorem tax on sales to other
SPEC_OTH_TAX	NEG11	Specific tax on sales to other
TAX_REV5	NEG12	Aggregate revenue, taxes levied on flows to 'other'
ZPP_INT	18.2	Zero pure profits in production
TECH_INT	18.3	Technical change by industry
ZPP_CAP	18.6	Zero pure profits in capital creation
EQ_XI5	NEG13	'Other' demands price index
OTH_REAL	NEG14	Aggregate real 'other' demands
OTH_NOM	NEG15	Aggregate nominal value of 'other' demands
PRI_OCT	22.7	Indexing of prices of 'other cost' tickets
DEM_OCT	12.25	Industry demands for 'other cost' tickets
OCT_REV	NEG16	Aggregate other cost ticket payments

TABLE 4 (continued) EQUATIONS IN ORANI TABLO INPUT FILES

TABLO Input file: JOINTPTAB

TABLO Equation Name	Equation No.	Description
SUPPCOMPCOM	12.81	Supplies of composite commodities by industries
SUPPCOMIND	12.83	Supplies of commodities by industry
PRCOMPCOM	12.84	Price of composite commodities
TOTCOMOUT	20.7	Total output of domestic commodities

TABLO Input file: PRIMARYTAB

TABLO Equation Name	Equation No.	Description
LABDEMOCC	12.56	Demand for labour by industry and skill group
FACDEM	12.64	Industry demands for primary factors
LABPRICE	12.66	Price to each industry of labour in general
M_CLEAR_LAB	20.8	Demand equals supply for labour of each skill
M_CLEAR_CAP	20.9	Demand equals supply for capital
M_CLEAR_LAND	20.10	Demand equals supply for agricultural land
MONEY_WAGES	22.6	Flexible setting of money wages
AGG_EMPLOYMENT	NEP7	Aggregate employment, wage bill weights
AGG_CAPITAL	NEP1	Aggregate usage of capital, wage bill weights
AGG_CAP_STOCK	22.4	Aggregate capital stock, asset value weights
LAB_REV	NEP2	Aggregate payments to labour
CAP_REV	NEP3	Aggregate payments to capital
LND_REV	NEP4	Aggregate payments to land
ZTOT	NEP5	Aggregate output: value-added weights
INDEMP	NEP6	Employment by industry

TABLE 4 (continued) EQUATIONS IN ORANI TABLO INPUT FILES

TABLO Input file: INVESTTAB

TABLO Equation Name	Equation No.	Description
RETURN_CAPITAL	19.7	Rates of return to capital
INVEST_INDUST_END	19.8	Equality of expected rates of return
FUT_CAP_STK	19.9	Effect of investment on future capital stocks
INVEST_INDUST_EXO	19.11	Investment by exogenous industries
PRIV_INVEST_BUDGET	19.10	Total private nominal investment budget
CAP_GOODS_PI	22.2	Private investment goods price index
PRIV_INV_EXPEND	19.12	Total real private investment
INV_REAL	NEI1	Total real investment
INV_PI	NEI2	Investment price index
INV_NOM	NEI3	Total nominal investment

TABLO Input file: EXPIMPTAB

TABLO Equation Name	Equation No.	Description
BAS_PRIC_IMP	18.10	Zero pure profits in importing
POW_IMP_TAX	NEE1	Power of tariff from the 'IAC' ad valorem rates
TAX_REVM	NEE2	Aggregate tariff revenue
FOR_EXP_PRIC	15.2	Export demand functions
EXP_BAS_PRICES	18.14	Zero pure profits in exporting
TAX_REV4	NEE3	Aggregate revenue from export taxes
IMP_VALUE	21.4	Foreign currency value of imports
XI_IMPORTS	NEE4	Imports price index
XI_IMP_DUTYPAID	NEE5	Duty paid imports price index
EXP_VALUE	21.6	Foreign currency value of exports
XI_EXPORTS	NEE6	Exports price index

TABLE 4 (continued) EQUATIONS IN ORANI TABLO INPUT FILES

TABLO Input file: HCONTAB

TABLO Equation Name	Equation No.	Description
HOUS_DEM_COM_SOURCE	14.21	Household demand for goods divided by source
HOUS_PRICE_COM	14.23	General price of commodities to households
HOUS_DEM_COM	14.24	Household demand for goods, all sources
Z_PURE_PROF_HOUS	18.19	ZPP in distribution of goods to households
POW_HOUS_TAX	NEH1	Power of tax on sales to households
VAL_HOUS_TAX	NEH2	Ad valorem tax on sales to households
SPEC_HOUS_TAX	NEH3	Specific tax on sales to households
TAX_REV3	NEH4	Aggregate revenue, taxes on flows to households
CPI	22.1	Consumer price index

TABLO Input file: MACROTAB

TABLO Equation Name	Equation No.	Description
BAL_TRADE	21.8	Balance of trade
IND_TAX	NEM1	Aggregate value of indirect taxes
GDP_INC	NEM2	Aggregate nominal GDP from income side
GDP_EXP	NEM3	Aggregate nominal GDP from expenditure side
GDP_PI	NEM4	Price index for GDP, expenditure side
GDP_REAL	NEM5	Real GDP, expenditure side
INVEST_EXPEND_RAT	22.5	Ratio, private investment to household consumption

TABLO Input file: VARIABLETAB

TABLO Equation Name	Equation No.	Description
HOUS_EXPEND	16.2	Real and nominal household consumption

TABLE 5 EQUATIONS WHICH ARE NEW OR REPLACE DPSV EQUATIONS

New Treatment of Taxes

TABLO Equation Name	Eq No.	TABLO file	Description
*POW_IMP_TAX	NEE1	EXPIMP	Power of tariff from the 'IAC' ad valorem rates (Replaces DPSV equation 18.11)
*POW_INT_TAX	NEG1	GOODS	Power of tax on sales to intermediate (Replaces DPSV equation 18.20)
*VAL_OTH_TAX	NEG10	GOODS	Ad valorem tax on sales to other
*SPEC_OTH_TAX	NEG11	GOODS	Specific tax on sales to other
*VAL_INT_TAX	NEG2	GOODS	Ad valorem rate of tax on sales to intermediate
*SPEC_INT_TAX	NEG3	GOODS	Specific rate of tax on sales to intermediate
*POW_CAP_TAX	NEG5	GOODS	Power of tax on sales to investment (Replaces DPSV equation 18.20)
*VAL_CAP_TAX	NEG6	GOODS	Ad valorem tax on sales to investment
*SPEC_CAP_TAX	NEG7	GOODS	Specific rate on sales to investment
*POW_OTH_TAX	NEG9	GOODS	Power of tax on sales to other
*POW_HOUS_TAX	NEH1	HCON	Power of tax on sales to households
*VAL_HOUS_TAX	NEH2	HCON	Ad valorem tax on sales to households
*SPEC_HOUS_TAX	NEH3	HCON	Specific tax on sales to households

* These equations are substituted out in the standard condensation.

TABLE 5 (cont) EQUATIONS WHICH ARE NEW OR REPLACE DPSV EQUATIONS

Definition of New Macros

TABLO Equation Name	Eq No.	TABLO file	Description
TAX_REVM	NEE2	EXPIMP	Aggregate tariff revenue
TAX_REV4	NEE3	EXPIMP	Aggregate revenue from export taxes
XI_IMPORTS	NEE4	EXPIMP	Imports price index
XI_IMP_DUTYPAID	NEE5	EXPIMP	Duty paid imports price index
XI_EXPORTS	NEE6	EXPIMP	Exports price index
TAX_REV5	NEG12	GOODS	Aggregate revenue from taxes on flows to 'other'
EQ_XI5	NEG13	GOODS	'Other' demands price index
OTH_REAL	NEG14	GOODS	Aggregate real 'other' demands
OTH_NOM	NEG15	GOODS	Aggregate nominal value of 'other' demands
OCT_REV	NEG16	GOODS	Aggregate 'other cost' ticket payments
TAX_REV1	NEG4	GOODS	Aggregate revenue, taxes on sales to intermediate
TAX_REV2	NEG8	GOODS	Aggregate revenue, taxes on sale to cap.creation
TAX_REV3	NEH4	HCON	Aggregate revenue, taxes on flows to households
INV_REAL	NEI1	INVEST	Total real investment
INV_PI	NEI2	INVEST	Investment price index
INV_NOM	NEI3	INVEST	Total nominal investment
IND_TAX	NEM1	MACRO	Aggregate value of indirect taxes
GDP_INC	NEM2	MACRO	Aggregate nominal GDP from income side
GDP_EXP	NEM3	MACRO	Aggregate nominal GDP from expenditure side
GDP_PI	NEM4	MACRO	Price index for GDP, expenditure side
GDP_REAL	NEM5	MACRO	Real GDP, expenditure side
AGG_CAPITAL	NEP1	PRIMARY	Aggregate usage of capital, wage bill weights
LAB_REV	NEP2	PRIMARY	Aggregate payments to labour
CAP_REV	NEP3	PRIMARY	Aggregate payments to capital
LND_REV	NEP4	PRIMARY	Aggregate payments to land
ZTOT	NEP5	PRIMARY	Aggregate output: value-added weights

TABLE 5 (cont) EQUATIONS WHICH ARE NEW OR REPLACE DPSV EQUATIONS

Employment by Industry

TABLO Equation Name	Eq No.	TABLO file	Description
INDEMP	NEP6	PRIMARY	Employment by industry

Zero Pure Profits 'other'

TABLO Equation Name	Eq No.	TABLO file	Description
*Z_PURE_PROF_OTH	NEG17	GOODS	Zero pure profits in distribution of commodities to 'other'

Aggregate Employment

TABLO Equation Name	Eq No.	TABLO file	Description
AGG_EMPLOYMENT	NEP7	PRIMARY	Aggregate employment, wage bill weights (Replaces DPSV equation 22.3)

* This equation is substituted out in the standard condensation.

TABLE 6 NEW VARIABLES NOT PRESENT IN DPSV

Macros

Variable Name	Description
caprev	Aggregate payments to capital
f5gen	Overall shift term for 'other' demands
gdpexp	Nominal gdp from expenditure side
gdpinc	Nominal gdp from income side
gdpreal	Real gdp from expenditure side
in	Aggregate nominal investment
iR	Aggregate real investment expenditure
kT	Aggregate capital, rental weights
l	Aggregate employment- wage bill weights (Replaces same named variable in DPSV, which was based on 'persons' weight)
labrev	Aggregate payments to labour
lndrev	Aggregate payments to land
octrev	Aggregate other cost ticket payments
othnom	Aggregate nominal value of 'other' demands
othreal	Aggregate real 'other' demands
taxind	Aggregate revenue from all indirect taxes
taxrate1	Uniform % in ad valorem taxes on intermediate
taxrate2	Uniform % change in ad valorem taxes on cap. creation
taxrate3	Uniform % change in ad valorem taxes on households
taxrate5	Uniform % change in ad valorem taxes on 'other'
taxrev1	Aggregate revenue from indirect taxes on intermediate
taxrev2	Aggregate revenue from indirect taxes on cap. creation
taxrev3	Aggregate revenue from indirect taxes on households
taxrev4	Aggregate revenue from indirect taxes on export
taxrev5	Aggregate revenue from indirect taxes on 'other'
taxrevm	Aggregate tariff revenue
xi2	Aggregate investment price index
xi4	Exports price index
xi5	'Other' demands price index
xigdp	GDP price index, expenditure side
xim	Imports price index
ximp0	Duty-paid imports price index
z_tot	Aggregate output: value-added weights

TABLE 6 (continued) NEW VARIABLES NOT PRESENT IN DPSV

Other new variables

Variable Name	Description
labind(j)	Employment by industry
*p5cs(i,s)	Purchasers prices paid for commodities (by source) by 'other'

Taxes (See Section 5 for a description of these tax variables which replace the original DPSV strategy for handling tax on individual flows.)

Variable Name	TABLO file	Description
*powtax1	GOODS	Power of tax on sales to intermediate
*powtax2	GOODS	Power of tax on sales to capital creation
*powtax3	HCON	Power of tax on sales to households
powtax4	EXPIMP	Power of the export tax
*powtax5	GOODS	Power of tax on sales to 'other'
*powtaxm	EXPIMP	Power of tariffs
*valtax1	GOODS	Ad valorem tax on sales to intermediate
*valtax2	GOODS	Ad valorem tax on sales to capital creation
*valtax3	HCON	Ad valorem tax on sales to households
*valtax5	GOODS	Ad valorem tax on sales to 'other'
*spectax1	GOODS	Specific tax on sales to intermediate
*spectax2	GOODS	Specific tax on sales to capital creation
*spectax3	HCON	Specific tax on sales to households
*spectax5	GOODS	Specific tax on sales to 'other'
iacrate(i)	EXPIMP	'IAC' ad valorem tariff rates

* These variables are substituted out in the standard condensation.

TABLE 7 VARIABLES REMAINING AFTER THE STANDARD CONDENSATION (IN PRINTING ORDER)

Macro Variables

Variable Name	Description
c	Nominal total household consumption
+ caprev	Aggregate payments to capital
cR	Real household consumption
delB	Balance of trade
exp	Foreign currency value of exports
+ f5gen	Overall shift term for 'other' demands
fR	Ratio, consumption to private investment
fwage	Overall wage shifter
+ gdpexp	Nominal gdp from expenditure side
+ gdpinc	Nominal gdp from income side
+ gdpreal	Real gdp from expenditure side
imp	Foreign currency value of imports
+ in	Aggregate nominal investment
+ iR	Aggregate real investment expenditure
kO	Aggregate capital stock, asset value weights
+ kT	Aggregate capital, rental weights
+ l	Aggregate employment- wage bill weights
+ labrev	Aggregate payments to labour
+ lndrev	Aggregate payments to land
+ octrev	Aggregate other cost ticket payments
omega	Economy wide expected rate of return
+ othnom	Aggregate nominal value of 'other' demands
+ othreal	Aggregate real 'other' demands
phi	Exchange rate
prinv	Aggregate nominal private investment expenditure
prinvr	Aggregate real private investment expenditure
q	Number of households
+ taxind	Aggregate revenue from all indirect taxes
+ taxrate1	Uniform % change in ad valorem taxes on intermediate
+ taxrate2	Uniform % change in ad valorem taxes on cap.creat
+ taxrate3	Uniform % change in ad valorem taxes on households
+ taxrate5	Uniform % change in ad valorem taxes on 'other'
+ taxrev1	Aggregate revenue from indirect taxes on intermediate
+ taxrev2	Aggregate revenue from indirect taxes on cap.creat
+ taxrev3	Aggregate revenue from indirect taxes on households
+ taxrev4	Aggregate revenue from indirect taxes on export
+ taxrev5	Aggregate revenue from indirect taxes on 'other'
+ taxrevm	Aggregate tariff revenue

Some of the variables remaining after the standard condensation of TABLO ORANI were not included in previous manually coded implementations of (condensed) ORANI. Those marked with a plus (+) are new variables in the TABLO implementation of ORANI.

TABLE 7 (continued) VARIABLES REMAINING AFTER THE STANDARD CONDENSATION (IN PRINTING ORDER)

Macro Variables (continued)

Variable Name	Description
+ xi2	Aggregate investment price index
xi3	Consumer price index
+ xi4	Exports price index
+ xi5	'Other' demands price index
+ xigdp	GDP price index, expenditure side
+ xim	Imports price index
+ ximp0	Duty-paid imports price index
xiprinv	ORANI private investment capital-goods price index
+ z_tot	Aggregate output: value-added weights

Variables indexed over commodities

Variable Name	Description
fe(i)	Shifts in foreign export demands
pe(i)	F.o.b.foreign currency export prices
pm(i)	C.i.f.foreign currency import prices
+ powtax4(i)	Power of export tax
+ iacrate(i)	'IAC' ad valorem tariff rates
x4(i)	Export volumes

Variables indexed over commodities and source

Variable Name	Description
f5(i,s)	Shift terms for 'other' demands
p0(i,s)	Basic price of good i, source s
x0(i,s)	Total supplies of goods
x3cs(i,s)	Household demand for goods

Some of the variables remaining after the standard condensation of TABLO ORANI were not included in previous manually coded implementations of (condensed) ORANI. Those marked with a plus (+) are new variables in the TABLO implementation of ORANI.

TABLE 7 (continued) VARIABLES REMAINING AFTER THE STANDARD CONDENSATION (IN PRINTING ORDER)

Variables indexed over industries

Variable Name	Description
! a1(j)	Neutral input augmenting technical change, industry j
! a1cap(j)	Capital augmenting technical change, industry j
! a1lab(j)	Labor augmenting technical change,industry j
! a1land(j)	Land augmenting tech.change,industry j
a1prim(j)	All primary factor augmenting technical change, industry j
curcap(j)	Current capital stock in industry j
f1oct(j)	Shifts in price of 'other cost' tickets,ind.j
f2(j)	Exogenous investment shift variable
fwagei(j)	Industry-specific wage shifter
+ labind(j)	Employment by industry
n(j)	Use of land in ind. j
p1cap(j)	Rental prices of capital
p1lab(j)	Price of labour in industry j
p1land(j)	Price of land paid by industry j
pi(j)	Costs of units of capital
r0(j)	Current rates of return on fixed capital
y(j)	Capital creation by using industry
z(j)	Activity in industry j

Variables indexed over occupations

Variable Name	Description
fwageo(m)	Occupation-specific wage shifter
lambda(m)	Employment in occupation m

Variables indexed over industries and occupations

Variable Name	Description
fwageoi(j,m)	Occ. and ind.-specific wage shifter
p1laboi(j,m)	Occ. and ind.-specific wages

Those variables marked with a plus (+) are new variables in the TABLO implementation of ORANI, while those marked with an exclamation (!) were previously substituted or absorbed out of (condensed) ORANI.

TABLE 8 NEW MACRO EQUATIONS AND THE VARIABLES THEY DEFINE

Investment

Eqn Id	Equation Name	Variable Name	Variable Description
NEI1	INV_REAL	iR	Total real investment
NEI2	INV_PI	xi2	Investment price index
NEI3	INV_NOM	in	Total nominal investment

'Other' demands

Eqn Id	Equation Name	Variable Name	Variable Description
NEG13	EQ_XI5	xi5	'Other' demands price index
NEG14	OTH_REAL	othreal	Aggregate real 'other' demands
NEG15	OTH_NOM	othnom	Aggregate nominal value of 'other' demands

Import and Export Prices

Eqn Id	Equation Name	Variable Name	Variable Description
NEE6	XI_EXPORTS	xi4	Exports price index
NEE4	XI_IMPORTS	xim	Imports price index
NEE5	XI_IMP_DUTYPAID	ximp0	Duty paid imports price index

GDP Expenditure

Eqn Id	Equation Name	Variable Name	Variable Description
NEM3	GDP_EXP	gdpexp	Aggregate nominal GDP from expenditure side
NEM4	GDP_PI	xigdp	Price index for GDP, expenditure side
NEM5	GDP_REAL	gdpreal	Real GDP, expenditure side

TABLE 8 (cont) NEW MACRO EQUATIONS AND THE VARIABLES THEY DEFINE

Tax Revenue

Eqn Id	Equation Name	Variable Name	Variable Description
NEG4	TAX_REV1	taxrev1	Aggregate revenue from indirect taxes on intermediate
NEG8	TAX_REV2	taxrev2	Aggregate revenue from indirect taxes on capital creation
NEH4	TAX_REV3	taxrev3	Aggregate revenue, indirect taxes on households
NEE3	TAX_REV4	taxrev4	Aggregate revenue from export taxes
NEG12	TAX_REV5	taxrev5	Aggregate revenue, indirect taxes on 'other' demands
NEE2	TAX_REVM	taxrevm	Aggregate tariff revenue
NEM1	IND_TAX	taxind	Aggregate value of indirect taxes

Primary Factor Payments

Eqn Id	Equation Name	Variable Name	Variable Description
NEP2	LAB_REV	labrev	Aggregate payments to labour
NEP3	CAP_REV	caprev	Aggregate payments to capital
NEP4	LND_REV	lndrev	Aggregate payments to land
NEG16	OCT_REV	octrev	Aggregate 'other cost' ticket payments

GDP Income

Eqn Id	Equation Name	Variable Name	Variable Description
NEM2	GDP_INC	gdpinc	Aggregate nominal GDP from income side

TABLE 8 (cont) NEW MACRO EQUATIONS AND THE VARIABLES THEY DEFINE

Real Factor Aggregates

Eqn Id	Equation Name	Variable Name	Variable Description
NEP5	ZTOT	z_tot	Aggregate output: value-added weights
NEP6	INDEMP	labind	Employment by industry
NEP7	AGG_EMPLOYMENT	l	Aggregate employment, wage bill rates
NEP1	AGG_CAPITAL	kT	Aggregate capital, rental weights

APPENDIX A

AGGREGATION LEVEL OF TABLO ORANI

The default* aggregation level (reflected by the dimensions of the arrays on the three data files and by the model specification - in particular but not only, by the SET statements -- on the eight TABLO Input files) is described below.

Commodities and Industries

There are the following 114 commodities and 112 industries:

Commodity Number	Industry Number	Label
1	N.A.	Wool
2	N.A.	Sheep
3	N.A.	Wheat
4	N.A.	Barley
5	N.A.	Other Grains
6	N.A.	Meat Cattle
N.A.	1	Pastoral Zone
N.A.	2	WheatSheep Zone
N.A.	3	High Rainfall Zone
N.A.	4	Nothern Beef
7	5	Milk Cattle and Pigs
8	6	Other Farm 1 (Sugar, Fruit and Nut)
9	7	Other Farm 2 (Veg, Cotton, Seeds, TOB)
10	8	Poultry
11	9	Agricultural Services
12	10	Forestry and Logging
13	11	Fishing and Hunting

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* If you wish to change this aggregation level, then you will almost certainly need to make non-trivial modifications to the data files and, depending on the type of aggregation change, varying degrees of modifications to the TABLO Input files. (TABLO Input file SET statements will require fairly straightforward modification. For many different aggregations, these will be the only modification needed.)

Commodity Number	Industry Number	Label
14	12	Ferrous Metal Ores
15	13	Non-ferrous Metal Ores
16	14	Black Coal
17	15	Oil, Gas and Brown Coal
18	16	Other Minerals
19	17	Services to Mining
20	18	Meat Products
21	18	Milk Products
22	20	Fruit and Vegetables
23	21	Margarine, Oils and Fats
24	22	Flour and Cereal Products
25	23	Bread Cakes and Biscuits
26	24	Confectionary and Cocoa
27	25	Other Food Products
28	26	Soft Drinks and Cordials
29	27	Beer and Malt
30	28	Other Alcoholic Drinks
31	29	Tabacco Products
32	30	Cotton Ginning Etc.
33	31	Man-Made Fibres, Yarns
34	32	Cotton Yarns and Fabrics
35	33	Worsted and Woollen Yarn
36	34	Textile Finishing
37	35	Textile Floor Overlays
38	36	Other Textile Products
39	37	Knitting Mills
40	38	Clothing
41	39	Footwear
42	40	Sawmill Products
43	41	Veneers and Boards
44	42	Joinery and Wood Nec
45	43	Furniture and Matresses
46	44	Pulp Paper Paerboard
47	45	Bags, Fibreboard Boxes
48	46	Paper Products Nec
49	47	Newspapers and Books
50	48	Commercial Printing
51	49	Chemical Fertilisers
52	50	Other Basic Chemicals
53	51	Paints, Varnishes
54	52	Pharmaceutical Goods
55	53	Soap and Detergents
56	54	Cosmetics and Toiletries
57	55	Other Chemical Goods
58	56	Petrol and Coal Products
59	57	Glass and Glass Products
60	58	Clay Products; Refract's
61	59	Cement
62	60	Ready Mixed Concrete
63	61	Concrete Products
64	62	Non-Metallic Ore Goods
65	63	Basic Iron and Steel

Commodity Number	Industry Number	Label
66	64	Other Basic Metals
67	65	Structural Metal Goods
68	66	Sheet Metal Products
69	67	Other Metal Products
70	68	Motor Vehicles and Parts
71	69	Ships and Boats
72	70	Locomotives
73	71	Aircraft
74	72	Scientific Equipment
75	73	Electronic Equipment
76	74	Household Apliances
77	75	Other Electrical Goods
78	76	Agricultural Machinery
79	77	Construction Machinery
80	78	Other Machinery and Plant
81	79	Leather Products
82	80	Rubber Products
83	81	Plastic Products, Etc.
84	82	Signs; Writing Gear
85	83	Other Manufacturing
86	84	Electricity
87	85	Gas
88	86	Water; Sewers and Drains
89	87	Residential Building
90	88	Other Construction
91	89	Wholesale Trade
92	90	Retail Trade
93	91	Mechanical Repairs
94	92	Other Repairs
95	93	Road Transport
96	94	Rail and Other Transport
97	95	Water Transport
98	96	Air Transport
99	97	Communication
100	98	Banking
101	99	Non Bank Finance
102	100	Investment and Services
103	101	Insurance and Services
104	102	Other Business Services
105	103	Ownership of Dwellings
106	104	Public Administration
107	105	Defence
108	106	Health
109	107	Education, Libraries
110	108	Welfare and Religious
111	109	Entertainment. Leisure
112	110	Restaurants, Hotels
113	111	Personal Services
114	112	Non-Competing Imports

Margins Commodities

The following 8 commodities are margins commodities:

91	Wholesale Trade
92	Retail Trade
95	Road Transport
96	Rail and Other Transport
97	Water Transport
98	Air Transport
103	Insurance and Services
112	Restaurants, Hotels

Composite Commodities

Apart from the first 9 commodities and the first 7 industries (which constitute the agricultural sector of the economy), all industries produce a single commodity and each commodity is produced by a single industry. For the agricultural commodities and industries, two considerations come into play. Firstly, these industries are (mainly) multi-product, and the commodities are produced by more than one industry. Secondly, available data is insufficient to allow the estimation of transformation elasticities between all pairs of commodities produced by a multi-product agricultural industry. For each of the three zonal industries, the minor commodities which contribute relatively little revenue in the zone concerned are bundled into composite commodities, the constituent elements of which are assumed to be produced in fixed proportions. In Industry 1 (the Pastoral zone), Wool and Sheep are (on technical grounds) combined into a composite. In Industry 5, the two commodities Milk Cattle and Pigs are treated as a single composite because of data deficiencies. Transformation elasticities have been estimated between different pairs of composite commodities for each multi-product industry.

The details of the composite commodities are described below :

Industry 1 - Pastoral Zone

Composite 1:	Wool and Sheep (commodities 1 and 2)
Composite 2:	Meat Cattle (commodity 5)
Composite 3:	Wheat, Barley, Other Grains, Milk Cattle, Other Farm 1 and Other Farm 2 (commodities 3,4,5,7,8 and 9)

Industry 2 - Wheat-Sheep Zone

Composite 1:	Wool (commodity 1)
Composite 2:	Sheep (commodity 2)
Composite 3:	Meat Cattle (commodity 6)
Composite 4:	Wheat (commodity 3)
Composite 5:	Barley (commodity 4)
Composite 6:	Other Grains, Milk Cattle, Other Farm 1 and Other Farm 2 (commodities 5,7,8 and 9)

Industry 3 - High Rainfall Zone

Composite 1: Wool (commodity 1)
Composite 2: Sheep (commodity 2)
Composite 3: Meat Cattle (commodity 6)
Composite 4: Wheat, Barley, Other Grains, Milk Cattle, Other Farm 1 and Other Farm 2 (commodities 3,4,5,7,8 and 9)

Industry 4 - Northern Beef

Composite 1: Meat Cattle (commodity 6)

Industry 5 - Milk Cattle and Pigs

Composite 1: Meat Cattle and Milk Cattle (commodities 6 and 7)

Exogenous Investment Industries

The equations for the investment in most industries is determined endogenously by the TABLO equation INVEST_INDUST_END (DPSV equation 19.8). However, the following 15 industries have their investment exogenously set, and are modelled by TABLO equation INVEST_INDUST_EXO (DPSV equation 19.11) :

10	Poultry
17	Oil, Gas and Brown Coal
84	Signs, Writing Gear
85	Other Manufacturing
86	Electricity
94	Other Repairs
97	Water Transport
103	Insurance and Services
104	Other Business Services
105	Ownership of Dwellings
106	Public Administration
107	Defence
108	Health
111	Entertainment, Leisure
112	Restaurants, Hotels

Occupations

There are the following 10 occupations :

1 Professional White Collar
2 Para Professional White Collar
3 Skilled White Collar
4 Semi- and Unskilled White Collar
5 Skilled Blue Collar (Metal and Electrical)
6 Skilled Blue Collar (Building)
7 Skilled Blue Collar (Other)
8 Semi- and Unskilled Blue Collar
9 Rural Workers
10 Armed Services

Primary Factors

There are three primary factors : labour, capital and land.

APPENDIX B

ORANI DATA FILE HEADERS

This Appendix lists the headers on the three data files required for the TABLO implementation of ORANI. For each header, this appendix also gives

- o the type of data,
- o the dimension of the data arrays,
- o if the header is a standard one for that file under the Impact/IAC agreement for ORANI data files,
- o a description of the data contained under that header, and
- o (for the FID file only) the matrix of the ORANI input-output data base (see DPSV, Figure 25.1, page 151) corresponding to the header.

Dimensions of Data Arrays

Note that the dimensions of the data arrays for each header will vary depending on the aggregation level chosen for a particular implementation of ORANI. The default aggregation level for the three data files is described in Appendix A.

Short-Run and Long-Run Versions of the Data Files

The actual data contained in the arrays on the data files may differ depending on whether an implementation of ORANI is a Short-Run or Long-Run version. See your GEMPACK Manager for details about the versions supported at your GEMPACK site.

Full Infinite Diagram (FID) ORANI data file

Header	Type of data	Dimensions of array	Standard	Description	Matrix from ORANI data base
F001	Real	114 x 112	Yes	Intermediate Usage (Domestic)	A
F002	Real	114 x 112	Yes	Intermediate Usage (Imports)	F
F003	Real	114 x 112	Yes	Supplies to Investment (Domestic)	B
F004	Real	114 x 112	Yes	Supplies to Investment (Imports)	G
F005	Real	114 x 1	Yes	Household Comsumption (Domestic)	C
F006	Real	114 x 1	Yes	Household Comsumption (Imports)	H
F007	Real	114 x 1	Yes	Exports	D
F008	Real	114 x 1	Yes	Other Usage (Domestic)	E
F009	Real	114 x 1	Yes	Other Usage (Imports)	J
F010	Real	10 x 112	Yes	Wage Bills	U
F011	Real	1 x 112	Yes	Returns to Fixed Capital	V
F012	Real	1 x 112	Yes	Returns to Land	W
F013	Real	1 x 112	Yes	Other Costs	-
F014	Real	9 x 7	Yes	Joint Production (Multi-Product) Outputs	Y
F015	Real	8 x 112	Yes	Aggregate Markups for Intermediate Usage	-
F016	Real	1 x 112	Yes	Aggregate Taxes for Intermediate Usage	-
F017	Real	8 x 112	Yes	Aggregate Markups for Investment	-
F018	Real	1 x 112	Yes	Aggregate Taxes for Investment	-

Full Infinite Diagram (FID) ORANI data file (continued)

eader	Type of data	Dimensions of array	Standard	Description	Matrix from ORANI data base
019	Real	114 x 8	Yes	Margins on Household Consumption (Domestic)	M + R
020	Real	114 x 8	Yes	Margins on Household Consumption (Imports)	M + R
021	Real	114 x 1	Yes	Commodity Taxes on Household Consumption (Domestic)	MT + RT
022	Real	114 x 1	Yes	Commodity Taxes on Household Consumption (Imports)	MT + RT
023	Real	114 x 8	Yes	Margins on Exports	N
024	Real	114 x 1	Yes	Commodity Taxes on Exports	NT
025	Real	114 x 8	Yes	Margins on Other Usage (Domestic)	O + T
026	Real	114 x 8	Yes	Margins on Other Usage (Imports)	O + T
027	Real	114 x 1	Yes	Commodity Taxes on Other Usage (Domestic)	OT + TT
028	Real	114 x 1	Yes	Commodity Taxes on Other Usage (Imports)	OT + TT
029	Real	114 x 1	Yes	Duty	Z
030	Real	10 x 112	Yes	Person-Hours (Millions)	-
031	Real	10 x 112	Yes	Persons (Thousands)	-
032	Real	1 x 112	Yes	Industry Capital Stocks	-
033	Real	1 x 112	Yes	Capital Stocks Shares	-
034	Integer	7 x 1	Yes	G,H,M,R,S,N,T	-
035	Integer	8 x 1	Yes	Specification ff Markup Commodities	-
051	Real	114 x 112	Yes	Commodity Taxes on Intermediate (Domestic)	KT + PT

Full Infinite Diagram (FID) ORANI data file (continued)

Header	Type of data	Dimensions of array	Standard	Description	Matrix from ORANI data base
F052	Real	114 x 112	Yes	Commodity Taxes on Intermediate (Imports)	KT + PT
F053	Real	114 x 112	Yes	Commodity Taxes on Investment (Domestic)	LT + QT
F054	Real	114 x 112	Yes	Commodity Taxes on Investment (Imports)	LT + QT
F055	Real	114 x 112	Yes	Margin 1 on Intermediate Usage (Domestic)	K1 + P1
F056	Real	114 x 112	Yes	Margin 1 on Intermediate Usage (Imports)	K1 + P1
F057	Real	114 x 112	Yes	Margin 1 on Investment (Domestic)	L1 + Q1
F058	Real	114 x 112	Yes	Margin 1 on Investment (Imports)	L1 + Q1
F059	Real	114 x 112	Yes	Margin 2 on Intermediate Usage (Domestic)	K2 + P2
F060	Real	114 x 112	Yes	Margin 2 on Intermediate Usage (Imports)	K2 + P2
F061	Real	114 x 112	Yes	Margin 2 on Investment (Domestic)	L2 + Q2
F062	Real	114 x 112	Yes	Margin 2 on Investment (Imports)	L2 + Q2
F063	Real	114 x 112	Yes	Margin 3 on Intermediate Usage (Domestic)	K3 + P3
F064	Real	114 x 112	Yes	Margin 3 on Intermediate Usage (Imports)	K3 + P3
F065	Real	114 x 112	Yes	Margin 3 on Investment (Domestic)	L3 + Q3
F066	Real	114 x 112	Yes	Margin 3 on Investment (Imports)	L3 + Q3
F067	Real	114 x 112	Yes	Margin 4 on Intermediate Usage (Domestic)	K4 + P4
F068	Real	114 x 112	Yes	Margin 4 on Intermediate Usage (Imports)	K4 + P4
F069	Real	114 x 112	Yes	Margin 4 on Investment (Domestic)	L4 + Q4
F070	Real	114 x 112	Yes	Margin 4 on Investment (Imports)	L4 + Q4

Full Infinite Diagram (FID) ORANI data file (continued)

Header	Type of data	Dimensions of array	Standard	Description	Matrix from ORANI data base
F071	Real	114 x 112	Yes	Margin 5 on Intermediate Usage (Domestic)	K5 + P5
F072	Real	114 x 112	Yes	Margin 5 on Intermediate Usage (Imports)	K5 + P5
F073	Real	114 x 112	Yes	Margin 5 on Investment (Domestic)	L5 + Q5
F074	Real	114 x 112	Yes	Margin 5 on Investment (Imports)	L5 + Q5
F075	Real	114 x 112	Yes	Margin 6 on Intermediate Usage (Domestic)	K6 + P6
F076	Real	114 x 112	Yes	Margin 6 on Intermediate Usage (Imports)	K6 + P6
F077	Real	114 x 112	Yes	Margin 6 on Investment (Domestic)	L6 + Q6
F078	Real	114 x 112	Yes	Margin 6 on Investment (Imports)	L6 + Q6
F079	Real	114 x 112	Yes	Margin 7 on Intermediate Usage (Domestic)	K7 + P7
F080	Real	114 x 112	Yes	Margin 7 on Intermediate Usage (Imports)	K7 + P7
F081	Real	114 x 112	Yes	Margin 7 on Investment (Domestic)	L7 + Q7
F082	Real	114 x 112	Yes	Margin 7 on Investment (Imports)	L7 + Q7
F083	Real	114 x 112	Yes	Margin 8 on Intermediate Usage (Domestic)	K8 + P8
F084	Real	114 x 112	Yes	Margin 8 on Intermediate Usage (Imports)	K8 + P8
F085	Real	114 x 112	Yes	Margin 8 on Investment (Domestic)	L8 + Q8
F086	Real	114 x 112	Yes	Margin 8 on Investment (Imports)	L8 + Q8

Full Infinite Diagram Parameter (FIDPAR) ORANI data file

Header	Type of data	Dimensions of array	Standard	Description
P001	Integer	11 x 1	Yes	G,H,M,R,S,N,L,NEX,NIN,NCRETH,T
P002	Integer	8 x 1	Yes	Markup Commodities
P004	Integer	17 x 1	Yes	Exogenous Investment Industries
P005	Integer	7 x 1	Yes	Land Using Industries
P014	Integer	1 x 1	Yes	Step Number
P015	Real	114 x 1	Yes	Sigma1(i)
P016	Real	114 x 1	Yes	Sigma2(i)
P017	Real	114 x 1	Yes	Sigma3(i)
P018	Real	114 x 1	Yes	Export Demand Elasticity
P021	Real	1 x 1	Yes	Frisch Parameter
P025	Real	112 x 1	Yes	Investment Parameters Beta(j)
P026	Real	112 x 1	Yes	Investment Parameters G(j)
P027	Real	112 x 1	Yes	Investment Parameters Q(j)
P028	Real	112 x 1	Yes	Cresh Parameter - Labour
P029	Real	112 x 1	Yes	Cresh Parameter - Fixed Capital
P030	Real	112 x 1	Yes	Cresh Parameter - Land
P031	Real	10 x 112	Yes	Cresh Parameter - Labour-Labour
P032	Integer	9 x 3	Yes	Specification of Composite Commodities Sets
P033	Real	9 x 3	Yes	Creth Parameters Phi(i,j)
P034	Real	10 x 112	Yes	Wage Indexation
P035	Real	112 x 1	Yes	Indexation of Other Costs
P036	Real	112 x 1	Yes	Indexation of Exog Investment

Full Infinite Diagram Parameter (FIDPAR) ORANI data file (continued)

Header	Type of data	Dimensions of array	Standard	Description
P037	Real	114 x 1	Yes	Indexation of Other Usage (Domestic)
P038	Real	114 x 1	Yes	Indexation of Other Usage (Imports)
P044	Real	114 x 1	Yes	Marginal Budget Share
PH01	Real	1 x 1	No	Horridge's Lambda
P019	Real	114 x 1	No	Ad Valorem IAC Tariff Rates

Special Production by Commodity and Industry (PROD) ORANI data file

Header	Type of data	Dimensions of array	Standard	Description
CC1	Real	114 x 112	No	Composite Commodity 1
CC2	Real	114 x 112	No	Composite Commodity 2
CC3	Real	114 x 112	No	Composite Commodity 3
CC4	Real	114 x 112	No	Composite Commodity 4
CC5	Real	114 x 112	No	Composite Commodity 5
CC6	Real	114 x 112	No	Composite Commodity 6
CRTH	Real	6 x 112	No	CRETH Parameters - between Composite Commodities in Same Industry
SP	Real	105 x 105	No	Diagonal Matrix for Singularly Produced Commodities
Y	Real	114 x 112	No	Full Matrix YTilde of Commodity Production by Industry

APPENDIX C

COUNTERPARTS OF DPSV VARIABLES

This Appendix gives the DPSV variables remaining after the standard condensation, together with the counterparts of these variables in both the TABLO and the manually-coded implementations of (condensed) ORANI.

The variables are listed in the order that they appear in Table 32.2 of DPSV. The manually-coded ORANI implementation referred to is that documented in Pearson (1986b). The DPSV 'b' variables (which correspond to the composite variables in the TABLO implementation) have been omitted from this list.

DPSV variable name	TABLO variable name	Manually-coded variable name
π_j	pi(j)	pi(j)
$p^{(0)}_{(i1)}$	p0(i,s)	pi(i)
$p^{(0)}_{(i2)}$		p2(i)
$\xi^{(3)}$	xi3	xi3
$p^{(1)}_{(g+1,1,m)j}$	p1laboi (j,m)	p(g+1,1) (j,m)
$p^{(1)}_{(g+1,2)j}$	p1cap (j)	p(g+1,2) (j)
$p^{(1)}_{(g+1,3)j}$	p1land (j)	p(g+1,3) (j)
$f^{(1)}_{g+2,j}$	f1oct (j)	f(g+2) (j)
y_j	y (j)	y (j)
$k_j(0)$	curcap (j)	kappa0 (j)
$r_j(0)$	r0 (j)	r0 (j)
ω	omega	omega
i_R	prinvr	iR
$f^{(2)}_j$	f2(j)	f2 (j)
$x^{(3)}_{(i1)}$	x3cs(i, "domestic")	x1j (i)

DPSV variable name	TABLO variable name	Manually-coded variable name
c	c	c
q	q	q
$x^{(3)}_{(i2)}$	x3cs(i, "imported")	x23 (i)
ℓ_m	lambda(m)	lambda (m)
z_j	z(j)	z (j)
n_j	n(j)	n (j)
$x^{(0)}_{(r1)}$	x0(r, "domestic")	x1 (i)
$x^{(4)}_{(i1)}$	x4(i)	x4 (i)
$f^{(5)}_{(i1)}$	f5(i,s)	f15 (i)
$f^{(5)}_{(i2)}$		f25 (i)
c_R	cR	cR
$x^{(0)}_{(r2)}$	x0(r, "import")	x2 (i)
m	imp	m
$p^m_{(i2)}$	pm (i)	pm (i)
e	exp	e
$p^e_{(i1)}$	pe (i)	pe (i)

... continued

DPSV variable name	TABLO variable name	Manually-coded variable name
ΔB	delB	delB
ϕ	phi	phi
t(i2, 0)	N.A.	t2 (i)
v(i1,4)	N.A.	v4 (i)
i	prinv	i
$\xi(2)$	xiprinv	xi2
$f^{(1)}_{(g+1,1)}$	fwage	f1
$f^{(1)}_{(g+1,1)j}$	fwagei(j)	find (j)
$f^{(1)}_{(g+1,1,m)}$	fwageo(m)	focc (m)
$f^{(1)}_{(g+1,1,m)j}$	fwageoi(j,m)	fo/i (j,m)
f_R	fR	fR
ℓ	l	l
k(0)	k0	k0
$f^{e}_{(i1)}$	fe(i)	fe (i)

APPENDIX D

ZERODIVIDE DEFAULTS

In many equations, application of the DPSV formulae for coefficient values lead to divisions of zero by zero. The TABLO program allows the modeller to assign any chosen value to such quotients. We took the view that any value had equal economic significance -- that is -- none. Usually, such coefficients describe the behaviour of a nullity, such as the demand for professional workers in the 'ownership of dwellings' industry. According to the ORANI data base, this industry employs no labour of any type. In most cases values were chosen which satisfied familiar homogeneity properties.

However, initial attempts to solve the TABLO version of ORANI were dogged by zerodivide problems. Although all equation coefficients were easily computed, the complete equation system was not invertible using normal closures of ORANI. Instead, unhelpful 'Singular Matrix' errors were generated by the SAGEM linear equation solution package.

We traced this problem by constructing a hypothetical ORANI data base which contained no zero flows. The number of nonzero entries in the final equation system coefficient matrix was increased by 30 per cent. Using this matrix, the equation system could be solved -- pointing to a zerodivide problem.

The problem was overcome by more or less random alterations to assigned zerodivide result values. A suspected culprit was the final, dummy ORANI industry (Non-Competing Imports), which has no sales or costs. Inappropriate choices for zerodivide values could result, in effect, in an industry supply schedule which was coincident with the demand schedule. Hence, output levels would be undefined.

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