$TITLE: M10-5.GMS  CALIBRATION EXERCISE, FROM SHEET IO-2, M10-IOTABLE.XLS

*CALIBRATES MODEL TO SHEET IO-2 IN M10-IOTABLE.XLS
*assumes 10% of factors are sector specific to prevent "flats" problem
*assumes domestic and foreign goods are Armington substitutes, sigma = 5
*assume foreign goods only used for consumption, not intermediate usage
*aggregates household, government, and investment demand to single consumer

SETS
R     rows of the IO table     /1*8/
C     columns of the IO table  /1*11/;

SETS
RS(R) subset of rows for production sectors  /1*5/
CS(C) subset of columns for production sectors  /1*5/;

SETS
RV(R) subset of rows for value added  /6*7/
CD(C) subset of columns for final demand  /6*8/;

SETS
I     allows switching of rows and columns in sectors  /1*5/;

PARAMETERS
IO(RS,I) extracts intermediate use for $prod blocks
VA(RV,I) extracts factor requirements for $prod blocks
TAX(I) computes implied tax rates assuming output taxes
VALUE(I) value of sector I's output at consumer prices
PRODQ(I) output quantity = value (consumer prices = 1)
PRODP(I) producer prices calculated from consumer prices (=1)+ taxes
PRODR(I) producer revenue: prodp*prodq
COST(I) cost of all inputs to the sector: should equal prodr
DCONS(I) final demand (household + government + investment demand)
FCONS(I) foreign goods demand including tariffs (domestic prices = 1)
EX(I) exports of sector i
TAR(I) implied tariff rates on foreign goods
PIM(I) implied foreign prices: 1 = pim*(1+tar)
TBAL trade balance: exports minus imports
SHARE share of each factor in each sector that is sector specific;

SHARE = 0.1;

**TABLE** BENCH(*,*)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19.7</td>
<td>24.9</td>
<td>76.0</td>
<td>19.2</td>
<td>13.0</td>
</tr>
<tr>
<td>2</td>
<td>7.9</td>
<td>124.9</td>
<td>187.5</td>
<td>15.9</td>
<td>20.3</td>
</tr>
<tr>
<td>3</td>
<td>19.6</td>
<td>29.5</td>
<td>311.8</td>
<td>129.8</td>
<td>63.7</td>
</tr>
<tr>
<td>4</td>
<td>37.4</td>
<td>105.3</td>
<td>317.1</td>
<td>723.2</td>
<td>143.0</td>
</tr>
<tr>
<td>5</td>
<td>12.4</td>
<td>8.6</td>
<td>18.7</td>
<td>57.1</td>
<td>264.4</td>
</tr>
<tr>
<td>6</td>
<td>60.3</td>
<td>167.2</td>
<td>508.8</td>
<td>680.1</td>
<td>556.7</td>
</tr>
<tr>
<td>7</td>
<td>75.2</td>
<td>50.7</td>
<td>175.7</td>
<td>821.4</td>
<td>202.1</td>
</tr>
<tr>
<td>8</td>
<td>-10.3</td>
<td>4.7</td>
<td>8.7</td>
<td>26.4</td>
<td>-15.3</td>
</tr>
</tbody>
</table>
6           7           8           9          10         11
1        71.2        0.0         8.4        10.5        14.7        6.0
2        39.4        0.0        23.6       153.6        55.2        2.1
3       296.5        0.0       504.0       495.5       239.7        6.4
4      1002.3       21.4        87.6       141.0        75.0       30.2
5      188.7       755.8        7.2        4.4        36.9       32.5
6         0
7         0
8         0

; 

DISPLAY BENCH;

IO(RS, I) = BENCH(RS, I);
VA(RV, I) = BENCH(RV, I);

DISPLAY IO, VA;

VALUE(I) = SUM(RS, BENCH(RS, I)) + SUM(RV, BENCH(RV, I)) + BENCH("8", I);
TAX(I) = BENCH("8", I)/VALUE(I);

DISPLAY VALUE, TAX;

PRODQ(I) = VALUE(I);
PRODP(I) = 1 - TAX(I);
PRODR(I) = PRODQ(I)*PRODP(I);
COST(I) = SUM(RS, BENCH(RS, I)) + SUM(RV, BENCH(RV, I));

DISPLAY PRODQ, PRODP, PRODR, COST;

DCONS(I) = SUM(CD, BENCH(I, CD)) - BENCH(I,"10") - BENCH(I,"11");
FCONS(I) = BENCH(I, "10") + BENCH(I, "11");
EX(I) = BENCH(I, "9");

DISPLAY DCONS, FCONS, EX;

TAR(I) = BENCH(I, "11")[/FCONS(I)];
PIM(I) = 1/(1+TAR(I));
TBAL = SUM(I, EX(I) - (FCONS(I)*PIM(I)));

DISPLAY TAR, PIM;

$ONTEXT
$MODEL:IOCAL

$SECTORS:
X(I) !domestic production of good i
E(I) !exports of good i
M(I) !imports of good i
ARM(I) !Armington aggregator of domest (X) and foreign (M) good i
WEL !welfare
$COMMODITIES:
  PX(I)       !price of domestic good i
  PXF(I)      !price of foreign good i
  PFX         !price of "foreign exchange"
  PF(RV)      !price of factor rv (mobile factors)
  PFS(RV,I)   !price of specific factor rv in sector i
  PARM(I)     !price of the Armington aggregate good i
  PW          !real consumer price index

$CONSUMERS:
  CONS        !representative consumer

$PROD:X(I)  s:1
  O:PX(I)    Q:PRODQ(I)  P:PRODP(I)  A:CONS  T:TAX(I)
  I:PX(RS)   Q:IO(RS,I)  P:1
  I:PF(RV)   Q:(VA(RV,I)*(1-SHARE)) P:1
  I:PFS(RV,I) Q:(VA(RV,I)*SHARE)     P:1

$PROD:E(I)
  O:PFX      Q:EX(I)  P:1
  I:PX(I)    Q:EX(I)  P:1

$PROD:M(I)
  O:PXF(I) Q:FCONS(I)
  I:PFX    Q:(FCONS(I)*PIM(I))  A:CONS T:TAR(I)
$PROD:ARM(I) s:2
  O: PARM(I) Q: (DCONS(I) + FCONS(I))
  I: PX(I) Q: DCONS(I)
  I: PXF(I) Q: FCONS(I)

$PROD:WEL s:1
  O: PW Q: (SUM(I, DCONS(I) + FCONS(I)))
  I: PARM(I) Q: (DCONS(I) + FCONS(I))

$DEMAND:CONS
  D: PW Q: (SUM(I, DCONS(I) + FCONS(I)))
  E: PF(RV) Q: (SUM(I, VA(RV,I)) * (1-SHARE))
  E: PFS(RV,I) Q: (VA(RV,I) * (SHARE))
  E: PFX Q: (-TBAL)

$OFFTEXT

$SYSINCLUDE MPSGESET IOCAL

PW.FX = 1;

IOCAL.ITERLIM = 0;
$INCLUDE IOCAL.GEN
SOLVE IOCAL USING MCP;
*perturbation: check that calibrated solution is indeed an equilibrium

\[ X.L("2") = 2; \]

\[ ILOCAL.ITERLIM = 5000; \]
$\text{INCLUDE ILOCAL.GEN}$
\textbf{SOLVE ILOCAL USING MCP;}

*counterfactual: abolish all taxes

\[ \text{TAX(I)} = 0; \]
\[ \text{TAR(I)} = 0; \]

$\text{INCLUDE ILOCAL.GEN}$
\textbf{SOLVE ILOCAL USING MCP;}

\textbf{PARAMETER}
\textbf{OUT(I);} \\
\textbf{OUT(I)} = X.L(I);

\textbf{DISPLAY OUT;}
$\text{LIBINCLUDE XLDUMP OUT M10-IOTABLE.XLS SHEET4!A3}$