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$TITLE: M8-3: Small open economy with a benchmark tariff

$ONTEXT
In this example, units are chosen such that all DOMESTIC prices
equal one initially.  Implied world price of import good
X2: P2 = 1/1.2

                 Production Sectors                        Consumer

Markets       |     X1       X2       E1       M2       W       CONS
--------------------------------------------------------------------
P1            |    150                -50              -100
P2            |              40                 60     -100
PL            |   -100      -20                                 120
PK            |    -50      -20                                  70
PW            |                                     200      -200
PFX           |                          50     -50
TARIFF        |                                 -10              10
--------------------------------------------------------------------
$OFFTEXT

PARAMETERS
        PE2     Export price of good 2
        PM1     Import price of good 1
        PE1     Export price of good 1
        PM2     Import price of good 2
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        TM2     Import tariff for good 2;

PE1     = 1;
PM2     = 1 / (1.2);
PE2     = PM2 * 0.99;
PM1     = 1.01;
TM2     = 0.2;


POSITIVE VARIABLES
        X1      Activity level for sector X1
        X2      Activity level for sector X2
        E1      Activity level for sector E1
        E2      Activity level for sector E2
        M1      Activity level for sector M1
        M2      Activity level for sector M2
        W       Activity level for sector W (Hicksian welfare index)
        P1      Price index for commodity X
        P2      Price index for commodity Y
        PL      Price index for primary factor L
        PK      Price index for primary factor K
        PW      Price index for welfare (expenditure function)
        PFX     Read exchange rate index
        CONS    Income definition for CONS;
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EQUATIONS
        PRF_X1  Zero profit for sector X1
        PRF_X2  Zero profit for sector X2
        PRF_E1  Zero profit for sector E1
        PRF_E2  Zero profit for sector E2
        PRF_M1  Zero profit for sector M1
        PRF_M2  Zero profit for sector M2
        PRF_W   Zero profit for sector W (Hicksian welfare index)

        MKT_X1  Supply-demand balance for commodity X1
        MKT_X2  Supply-demand balance for commodity X2
        MKT_PFX Supply-demand balance for commodity PFX
        MKT_L   Supply-demand balance for primary factor L
        MKT_K   Supply-demand balance for primary factor L
        MKT_W   Supply-demand balance for aggregate demand

        I_CONS  Income definition for CONS;

*       Zero profit conditions

PRF_X1..        150 * PL**(2/3) * PK**(1/3) =G= 150 * P1;

PRF_X2..        40  * PL**(0.5) * PK**(0.5) =G= 40  * P2;

PRF_E1..        50 * P1 =G= 50 * PFX * PE1;
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PRF_E2..        60 * P2 =G= 60 * PFX * PE2;

PRF_M1..        50 * PFX * PM1 =G= 50 * P1;

PRF_M2..        60 * PFX * PM2 *(1+TM2) =G= 60 * P2;

PRF_W..         200 * P1**0.5 * P2**0.5 =G= 200 * PW;

*       Market clearance conditions

MKT_X1..        150 * X1 + 50 * M1 =G=  50 * E1 + 100 * W *PW/P1;

MKT_X2..        40 * X2 + 60 * M2 =G= 60 * E2 + 100 *W *PW/P2 ;

MKT_PFX..       60 * E2 * PE2 + 50 * E1 * PE1 =G=
                60 * M2 * PM2 + 50 * PM1 * M1;

MKT_W..         200 * W =G= CONS / PW;

MKT_L..         120  =G= 100 * X1 * P1/PL + 20 * X2 * P2/PL;

MKT_K..         70 =G= 50 * X1 * P1/PK + 20 * X2 * P2/PK;

*       Income balance

I_CONS..        CONS =E= 120*PL + 70*PK + 60 * PFX * PM2 * M2 * TM2;
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MODEL SOETARIFF /PRF_X1.X1, PRF_X2.X2, PRF_E1.E1, PRF_E2.E2,
                 PRF_M1.M1, PRF_M2.M2, PRF_W.W,
                 MKT_X1.P1, MKT_X2.P2, MKT_PFX.PFX, MKT_L.PL,
                 MKT_K.PK, MKT_W.PW, I_CONS.CONS /;

*       Check the benchmark (again):

X1.L    =1;
X2.L    =1;
E2.L    =0;
M1.L    =0;
E1.L    =1;
M2.L    =1;
W.L     =1;

P1.L    =1;
P2.L    =1;
PFX.L   =1;
PK.L    =1;
PW.FX   =1;
PL.L    =1;

CONS.L  =200;

SOETARIFF.ITERLIM = 0;
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SOLVE SOETARIFF USING MCP;

SOETARIFF.ITERLIM = 2000;
SOLVE SOETARIFF USING MCP;

* ccounterfactual experiment: free trade

TM2  = 0 ;
SOLVE SOETARIFF USING MCP;
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