$TITLE M3-7.GMS: two households with different preferences
* and different endowments

$ONTEXT
Two household: differ in preferences and in endowments
Household A: well endowed with labor,
   preference for labor-int good Y
Household B: well endowed with capital,
   preference for capital-int good X
Allows for tax to be redistributed unevenly between households

<table>
<thead>
<tr>
<th>Markets</th>
<th>X</th>
<th>Y</th>
<th>WA</th>
<th>WB</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>PX</td>
<td>100</td>
<td>-40</td>
<td>-60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PY</td>
<td>100</td>
<td>-60</td>
<td>-40</td>
<td></td>
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<tr>
<td>PWA</td>
<td>100</td>
<td></td>
<td>-100</td>
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<tr>
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<td>100</td>
<td></td>
<td>-100</td>
<td></td>
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<tr>
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<td>-75</td>
<td></td>
<td>90</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>-75</td>
<td>-25</td>
<td></td>
<td>10</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>

The tax redistribution or sharing rule can also be interpreted
as the relative number of households in each group, with all
households getting an equal share of tax receipts

$OFFTEXT
PARAMETERS

TX  Ad-valorem tax rate for X sector inputs
SHA Share of tax revenue given back to household A
SHB share of tax revenue given back to household B;

TX  = 0;
SHA = 0.5;
SHB = 0.5;

NONNEGATIVE VARIABLES

X   Activity level for sector X
Y   Activity level for sector Y
WA  Activity level for sector WA
WB  Activity level for sector WB
PX  Price index for commodity X
PY  Price index for commodity Y
PK  Price index for primary factor K
PL  Price index for primary factor L
PWA Price index for welfare A(expenditure function)
PWB Price index for welfare B(expenditure function)

CONSA Income definition for CONSA
CONSB Income definition for CONSB;
EQUATIONS

PRF_X   Zero profit for sector X
PRF_Y   Zero profit for sector Y
PRF_WA  Zero profit for sector WA
PRF_WB  Zero profit for sector WB

MKT_X   Supply-demand balance for commodity X
MKT_Y   Supply-demand balance for commodity Y
MKT_L   Supply-demand balance for primary factor L
MKT_K   Supply-demand balance for primary factor K
MKT_WA  Supply-demand balance for consumer A
MKT_WB  Supply-demand balance for consumer B

I_CONSA Income definition for CONSA
I_CONSB Income definition for CONSB;

*       Zero profit conditions:

PRF_X..  100*(PL**0.25 * PK**0.75) * (1+TX) =G= 100*PX;
PRF_Y..  100*(PL**0.75 * PK**0.25) =G= 100*PY;
PRF_WA..  100*(PX**0.4 * PY**0.6) =G= 100*PWA;
PRF_WB..  100*(PX**0.6 * PY**0.4) =G= 100*PWB;
Market clearing conditions:

MKT_X..  100*X  =G=  40*WA*PWA/PX + 60*WB*PWB/PX;
MKT_Y..  100*Y  =G=  60*WA*PWA/PY + 40*WB*PWB/PY;
MKT_WA..  100*WA  =G=  CONSA/PWA;
MKT_WB..  100*WB  =G=  CONSB/PWB;
MKT_L..  90 + 10  =G=  25*X*(PX/(1+TX))/PL + 75*Y*PY/PL;
MKT_K..  10 + 90  =G=  75*X*(PX/(1+TX))/PK + 25*Y*PY/PK;

Income constraints:

I_CONSA..  CONSA  =E=  90*PL + 10*PK + SHA*TX*100*X*PX/(1+TX);
I_CONSB..  CONSB  =E=  10*PL + 90*PK + SHB*TX*100*X*PX/(1+TX);

MODEL TWOHOUSE /PRF_X.X, PRF_Y.Y, PRF_WA.WA, PRF_WB.WB,
           MKT_X.PX, MKT_Y.PY, MKT_L.PL,
           MKT_K.PK, MKT_WA.PWA, MKT_WB.PWB,
           I_CONSA.CONSA, I_CONSB.CONSB /;
*        Check the benchmark:

X.L     =1;
Y.L     =1;
WA.L    =1;
WB.L    =1;

PL.FX   =1;
PX.L    =1;
PY.L    =1;
PK.L    =1;
PWA.L   =1;
PWB.L   =1;

CONSA.L =100;
CONSB.L =100;

TX      =0;

TWOHOUSE.ITERLIM = 0;
SOLVE TWOHOUSE USING MCP;
TWOHOUSE.ITERLIM = 1000;
SOLVE TWOHOUSE USING MCP;

TX     = 0.50;
SOLVE TWOHOUSE USING MCP;
* counterfactual: give a larger share of tax to household B
* illustrates impossibility of making both types better off

\[
\begin{align*}
TX &= 0.50; \\
SHA &= 0.25; \\
SHB &= 0.75;
\end{align*}
\]

\textbf{SOLVE} TWOHOUSE USING MCP;

* suppose that 80\% of households are type A, 20\% type B
* and all individual households get an equal share
* of tax receipts

\[
\begin{align*}
TX &= 0.50; \\
SHA &= 0.80; \\
SHB &= 0.20;
\end{align*}
\]

\textbf{SOLVE} TWOHOUSE USING MCP;