

\$TITLE: M7-5.GMS: Small-Group Monopolistic Competition

* markup formula is $1/(\sigma - (1/(1+N))(\sigma - 1))$

* to calibrate to the same data, $\sigma = 5$, $N = 1$, a fudge-factor

* of 0.6 is used in the markup formula to reproduce the benchmark

* $markup = 0.6/(\sigma - (1/(1+N))(\sigma - 1)) = 0.20$

\$ONTEXT

Markets	/	XC	Production Sectors			/	Consumers	
			N	Y	W		CONS	ENTR
PX	/	100			-100	/		
PY	/			100	-100	/		
PN	/		20			/		-20
PW	/				200	/	-200	
PL	/	-80	-20	-100		/	200	
MK	/	-20				/		20

\$OFFTEXT

PARAMETERS

SI SIGMA: elasticity of substitution among varieties
 FC parameter setting the level of fixed costs
 ENDOWL endowment of labor
 MODELSTAT statistic indicating model solved: 0 = solved;

SI = 5;
FC = 20;
ENDOWL = 200;

NONNEGATIVE VARIABLES

X Activity level for X (output per firm)
XC Composite X (utility value of agg X sector output)
N Number of X sector firms (variety measure)
Y Activity level of Y output
W Activity level for welfare

PX Price of an individual X variety
PE Price index (unit expenditure function): cost of XC = 1
PN Price of fixed costs (price of entering)
PY Price of Y

PL Price of labor
PW Price index for utility (consumer price index)

MK Markup

CONS Income of the representative consumer;

EQUATIONS

PRICEX	MR = MC in X (associated with X output per firm)
PINDEX	Price index for X sector goods
PRICEN	Zero profits - free entry in X (associated with N)
PRICEY	Zero profit condition for Y (PY = MC)
PRICEW	Zero profit condition for W (PW = MC of utility)
DX	Supply-demand balance for X (individual variety)
DXC	Supply-demand balance for XC
DN	Supply-demand for firms N: markup rev = fixed cost
DY	Supply-demand balance for Y
DW	Supply-demand balance for utility W (welfare)
LAB	Supply-demand balance for unskilled labor
MARKUP	Markup equation
INCOME	National income;
PRICEX..	$PL = G = PX * (1 - MK);$
PINDEX..	$(N * PX ** (1 - SI)) ** (1 / (1 - SI)) = G = PE;$
PRICEN..	$PL = G = PN;$

PRICEY.. PL =G= PY;

PRICEW.. (PE**0.5)*(PY**0.5) =G= PW;

DX.. X*80 =G= PX**(-SI)*(PE**(SI-1))*CONS/2;

DXC.. XC =G= N**(SI/(SI-1))*X;

DN.. N*FC =G= (PX*MK)*X*80*N/PN;

DY.. Y*100 =G= CONS/(2*PY);

DW.. 200*W =G= (1.25**0.5)*CONS/PW;

LAB.. ENDOWL =E= Y*100 + N*X*80 + N*FC;

MARKUP.. MK =E= 0.6/(SI - 1/(N+1)*(SI - 1));

INCOME.. CONS =E= PL*ENDOWL;

MODEL M62 /PRICEX.X, PRICEY.Y, PRICEW.W, PRICEN.N, PINDEX.XC,
DX.PX, DXC.PE, DN.PN, DY.PY, DW.PW,
LAB.PL, MARKUP.MK, INCOME.CONS/;

* *set benchmark values:*

PE.L = 1.25;

CONS.L = 200;

X.L = 1;

XC.L = 1;

Y.L = 1;

N.L = 1;

W.L = 1;

PX.L = 1.25;

PN.L = 1;

PY.L = 1;

PL.L = 1;

PW.L = 1.25**0.5;

MK.L = 0.20;

* *choose the price of good Y as numeraire*

PY.FX = 1;

* *check for calibration and starting-value errors*

M62.ITERLIM = 0;

SOLVE M62 USING MCP;

M62.ITERLIM = 1000;

SOLVE M62 USING MCP;

MODELSTAT = M62.MODELSTAT - 1.;

DISPLAY MODELSTAT;

** Counterfactual: expand the size of the economy*

**ENDOWL = 400;*

**SOLVE M62 USING MCP;*

** show welfare as a function of the economy's size*

SETS J scenario 1 = small-group mc 2 = large-group /J1*J2/;

SETS I indexes 25 different size levels /I1*I25/;

PARAMETERS

SIZE(I)

WELFARE(I,J)

WELFCAP(I,J)

MARKUPS(I,J)

NUMBERF(I,J)

RESULTS(I,*);

```
MK.L = 0.2;
```

```
LOOP(I,  
LOOP(J,
```

```
SIZE(I) = 5.2 - 0.2*ORD(I);  
ENDOWL = 200*SIZE(I);
```

```
MK.UP = +INF;  
MK.LO = 0;  
MK.FX$(ORD(J) EQ 2) = 0.20;
```

```
SOLVE M62 USING MCP;
```

```
WELFARE(I,J) = W.L;  
WELFCAP(I,J) = WELFARE(I,J)/SIZE(I);  
MARKUPS(I,J) = MK.L;  
NUMBERF(I,J) = N.L;
```

```
);  
);
```

```
RESULTS(I, "SIZE") = SIZE(I);  
RESULTS(I, "WELFCAP-L") = WELFCAP(I, "J2");  
RESULTS(I, "WELFCAP-S") = WELFCAP(I, "J1");
```

```
RESULTS(I, "NUMBERF-L") = NUMBERF(I, "J2");  
RESULTS(I, "NUMBERF-S") = NUMBERF(I, "J1");  
RESULTS(I, "MARKUP-S") = MARKUPS(I, "J1");
```

DISPLAY RESULTS;

** Write parameter RESULTS to an Excel file MCOMP2.XLS,
* starting in Sheet1, cell A3*

Execute_Unload 'M7.gdx' RESULTS

execute 'gdxxrw.exe M7.gdx par=RESULTS rng=SHEET4!A3'