

\$TITLE M6-5.GMS: Public intermediate good with optimal provision  
 \* *technique for modeling infrastructure for example*

\$ONTEXT

	<i>Production Sectors</i>				<i>Consumers</i>	
<i>Markets/</i>	<i>X</i>	<i>Y</i>	<i>G</i>	<i>W1</i>	<i>CONS1</i>	<i>GOVT</i>
<i>PX</i> /	100			-100		
<i>PY</i> /		100		-100		
<i>PG</i> /			50			-50
<i>PL</i> /	-80	-80	-40		200	
<i>TAX</i> /	-20	-20	-10			50
<i>PW</i> /				200	-200	
<i>X = ALPHA * F(L)    ALPHA = F(G)    ALPHA viewed as exogenous by firms</i>						

\$OFFTEXT

### PARAMETERS

SHX, SHY, shares of X and Y in consumer's utility

INFPROD productivity parameter of the public good in X output;

SHX = 0.5;

SHY = 0.5;

INFPROD = 0;

**POSITIVE VARIABLES**

X            Activity level for sector X  
Y            Activity level for sector Y  
W            Activity level for sector W  
G            Activity level for government sector

PX           Price index for commodity X  
PY           Price index for commodity Y  
PG           Private valuation of the public good  
PL           Price index for primary factor L  
PW           Price index for welfare 1(expenditure function)

GOVT        Budget restriction for government  
CONS        Income definition for CONS

TAX         Uniform value-added tax rate  
ALPHA       Public intermediary good multiplier;

**EQUATIONS**

PRF\_X       Zero profit for sector X  
PRF\_Y       Zero profit for sector Y  
PRF\_W       Zero profit for sector W1  
PRF\_G       Zero profit in government sector

MKT\_X       Supply-demand balance for commodity X

MKT\_Y     Supply-demand balance for commodity Y  
 MKT\_G     Supply-demand balance for commodity G  
 MKT\_L     Supply-demand balance for primary factor L  
 MKT\_W     Supply-demand balance for consumer 1  
  
 I\_G        Budget restriction for government  
 I\_CONS    Income definition for CONS  
  
 A\_TAX     Auxiliary for government provision  
 INFRA     Auxiliary for public intermediate good multiplier calculation»

;

\*        *Zero profit conditions:*

PRF\_X..   80\*PL \* (1+TAX)/ALPHA =G= 100\*PX;

PRF\_Y..   80\*PL \* (1+TAX) =G= 100\*PY;

PRF\_W ..  200\*PX\*\*(SHX) \* PY\*\*(SHY) =E= 200\*PW;

PRF\_G..   40\*PL \* (1+TAX) =G= 50\*PG;

\*        *Market clearing conditions:*

MKT\_X..   100\*X =G= 200\*SHX\*W\*PW/PX;

MKT\_Y.. 100\*Y =G= 200\*SHY\*W\*PW/PY;

MKT\_G.. 50\*G =G= GOVT/ PG;

MKT\_L.. 200 =G= (80\*X/ALPHA + 80\*Y + 40\*G);

MKT\_W.. 200\*W =G= CONS/PW;

\* *Income constraints:*

I\_G.. GOVT =G= PL\*(80\*X/ALPHA + 80\*Y + 40\*G)\*TAX;

I\_CONS.. CONS =E= 200\*PL;

\* *Auxiliary constraints:*

A\_TAX.. PG =E= PX\*INFPROD;

INFRA.. ALPHA =E= 1 + INFPROD\*G;

**MODEL** PUBINT /PRF\_X.X, PRF\_Y.Y, PRF\_W.W, PRF\_G.G,  
MKT\_X.PX, MKT\_Y.PY, MKT\_L.PL, MKT\_W.PW, MKT\_G.PG,  
I\_G.GOV, I\_CONS.CON, /  
A\_TAX.TAX, INFRA.ALPHA /;

```
X.L      =1;  
Y.L      =1;  
W.L      =1;  
G.L      =1;  
PL.FX    =1;  
PX.L     =1;  
PY.L     =1;  
PG.L     =1;  
PW.L     =1;  
CONS.L   =200;  
GOVT.L   =50;  
ALPHA.L  = 1;  
TAX.L    = .25;
```

```
PUBINT.ITERLIM = 0;  
SOLVE PUBINT USING MCP;
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*\* with INFPROD = 0 initially, the optimal tax should be zero  
\* check and see*

```
PUBINT.ITERLIM = 2000;  
SOLVE PUBINT USING MCP;
```

*\* now set INFPROD = 2, optimal tax and provision should be positive*

```
INFPROD = 2;
```

```
TAX.L = 0.25; G.L = 1;  
SOLVE PUBINT USING MCP;
```