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%Calculates optimal taxes in 'Factor Income Taxation in a Horizontal
%Innovation Model' as a function of alpha
%The figure is drawn changing alpha only, given benchmark configuration(BC)
%the file here also allows for changes in BC. For meaning of symbols see
%table123.m
clear all
disp('New')

INTMratiob=0.45; %benchmark
%INTMratio=0.5;alternative
ab = INTMratiob^0.5;
n=ab-0.05:0.0001:ab+0.049;%range of alpha
gammab=0.02; %benchmark
%gamma=0.02;%alternative
rhob=0.04;%benchmark
%rho=0.03;%alternative
TransferstoGDPb = 0.25;% benchmark
%TransferstoGDP=0;% alternative
GOVEXPToGDPb = 0.1;%benchmark
%GOVEXPToGDP = 0.2; %alternative
Tb=(1-INTMratiob)*TransferstoGDPb;%benchmark
%T=(1-INTMratiob)*TransferstoGDP;%alternative
gb = (1-INTMratiob)*GOVEXPToGDPb;%benchmark
%g= (1-INTMratiob)*GOVEXPToGDP;%alternative

sb =1.5;%benchmark
%s=2%alternative

%%%%%%%%this is to calculate chib and etab
tk0b=0.25;%
tw0b = -ab*tk0b+(gb+Tb)/(1-ab); % eq. 22
r0b=(sb*gammab+rhob)/(1-tk0b);% eq.27
L0b=0.17;%
C1b=r0b/L0b;% eq.18
etab=(1-ab)*ab^((1+ab)/(1-ab))/C1b;% eq.19
chilb=sb*(sb-1)*(1-L0b)*(1-tw0b)/ab;
chi2b=rhob/C1b+L0b*(tk0b-1+sb+sb/ab-sb*gb/(ab*(1-ab)));
chib=1+chilb/chi2b; %eq.45

numvec=[];
for a=ab-0.05:0.0001:ab+0.049;
%defines range for alpha
ab=a; %gives new value to alpha, recalculates other variables accordingly
Tb=(1-ab^2)*TransferstoGDPb;
gb = (1-ab^2)*GOVEXPToGDPb;
tw0b = -ab*tk0b+(gb+Tb)/(1-ab);% eq.22
%%%Calculates new initial labor, eq.45

LN=sb*(1-tw0b)*(sb-1)*(ab*(chib-1))^(-1)- rhob/C1b;
LD=sb*(1-tw0b)*(sb-1)*(ab*(chib-1))^(-1)+sb-1+tk0b+(sb/ab)*(1-gb/(1-ab));
L0=LN./LD; %
%%%
gamma0=((1-tk0b)*C1b*L0-rhob)/sb;%calculates new initial gamma
Frisch=(1-L0)*sb/(L0*(sb+chib-1));%calculates new initial Fr

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t=-0.1:0.0001:0.9;%defines range for tax on capital
tw=-ab*t+(gb+Tb)/(1-ab);% eq. 22
%%%%Calculates labor for each value of the tax rates(eq.45)
LN=sb*(1-tw)*(sb-1)*(ab*(chib-1))^(1)- rhob/C1b;
LD=sb*(1-tw)*(sb-1)*(ab*(chib-1))^(1)+sb-1+t+(sb/ab)*(1-gb/(1-ab));
L=LN./LD;%
%%%
r=C1b*L;% calculates r for each value of the tax rates (eq.18)
%%%calculating the LHS of inequality in proposition 11
V1=(2-sb-chib)./(1-sb).*(1-L)-C1b*(1-t)./(C1b*L.*(1-t)*(sb-1)+rhob);
V2=sb*(sb-1)*(1-L)/(1-chib)+L;
V3=(sb/ab)*(1-sb)*(1-tw)/(1-chib)-1+t+sb+(sb/ab)*(1-gb/(1-ab));
V4= ab./(1-tw);
V5=-r./(r.*(1-t)*(sb-1)+rhob);
D=V1.*V2.*V3.^(-1)+V4+V5;
%%%
%%%calculating capital tax that equates to 0 LHS of inequality in prop.11
[v,i]=min (abs(D));
topt=t (i);%optimal capital tax
twopt=-ab*topt+(gb+Tb)/(1-ab);% optimal labor tax
numvec =[numvec,topt];
end
%%%Draws figure
plot(n, numvec)
xlabel ('\alpha')
ylabel ('\tau_{ro}')

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