

The Effect of Tax Policy under Alternative Fiscal Financing Schemes on Income Distribution and Growth: A Savers-Spenders Model Perspective

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Basic Question

- Question 1: What kind of tax reforms would the policy maker prefer if his objectives are both growth and distributional equality?
 - * You need growth to expand your tax base so that you can service your debt in case of a tax cut
 - * You need distributional considerations to pass your tax reform bill.
- Question 2: What kind of tax structure would allow you to achieve both objectives?
 - * Regressive, Progressive or Proportional?
- Question 3: Would your choice of tax reform today depend on your choice of fiscal adjustments in future?
 - * The imposition of intertemporal budget constraint will force you consider alternative future fiscal adjustments. *You cannot escape this.*

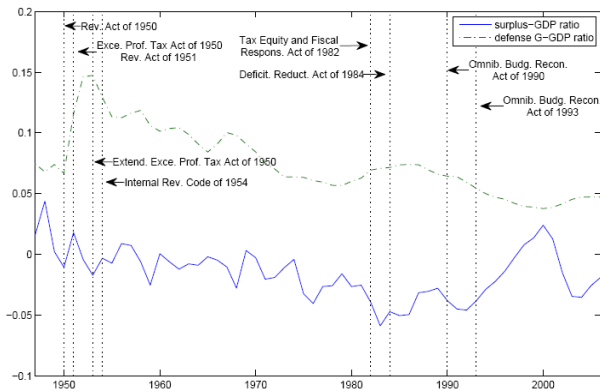
Plan of Action

- I will undertake a Positive analysis of the effect of group specific tax and financing reform on
 - ① Income distribution
 - ② Output:Growth of Output/Tax base.
 - ③ Revenue
- Start with looking at data:
 - * Look at nature of the existing tax structure and evaluate their progressivity(or regressivity).
 - * Look at the government spending and transfers structure and evaluate their progressivity(or regressivity).
- Develop a Heterogenous agent model of previous presentation
- Compare simulation results of various alternative group specific tax experiments with alternative financing schemes.
- Try to reconcile my results with existing theoretical and (very few) empirical works

Why study group specific tax reform?

- Most of the tax reforms in the last 60 years have been targeted to specific income groups(Yang, 2007):
 - 1 Revenue Act of 1948: More tax incentives to married and family with more children(mainly middle class).
 - 2 Revenue Act of 1950: raise corporate tax, introduce excess profit tax(entirely targeted to the rich).
 - 3 Excess Profits Tax Act of 1950: Well, the name speaks for itself.
 - 4 Tax Reduction Act of 1975: Allowed tax credit for dependents, increased low income allowance.
 - 5 Revenue Act of 1978: Reduced corporate tax, increased deduction of capital gains from tax.
 - 6 Tax Reform Act of 1986: Again reduced corporate tax, increased deduction of capital gains from tax.
 - 7 Omnibus Budget Reconciliation Act of 1990: Increased highest income tax rate.
 - 8 Working Families Tax Relief Act of 2003: Name speaks for itself.

Do government care about budget deficit/surplus?



Source: Yang(2007)

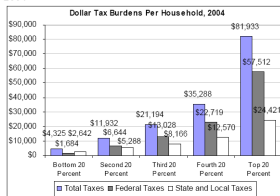
Operational definition of Progressive tax and transfer(Chamberlain and Prante,2007)

- The tax is progressive if the effective tax rate-the burden as a % of household income , rises as we move from a lower-income to a higher income group.
- The transfers are progressive if the opposite is true.

Motivation 3: Is US tax structure Regressive, Progressive or Proportional?

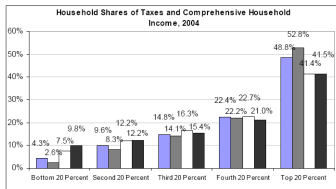
Income tax (Chamberlain and Prante, 2007)

Figure 1. Federal, State and Local Dollar Tax Burdens Per Household, Calendar Year 2004



Source: Tax Foundation

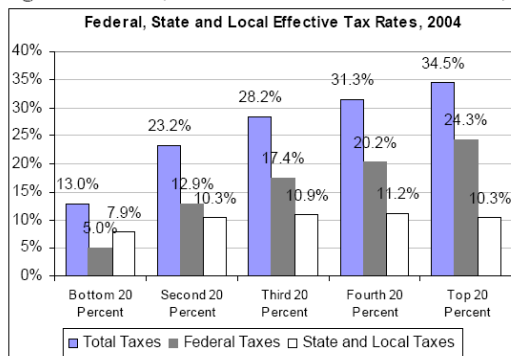
Figure 2. Share of Taxes Compared with Share of Comprehensive Household Income, Calendar Year 2004



Motivation 3: Is US tax structure Regressive, Progressive or Proportional?

Income tax: Continued (Chamberlain and Prante, 2007)

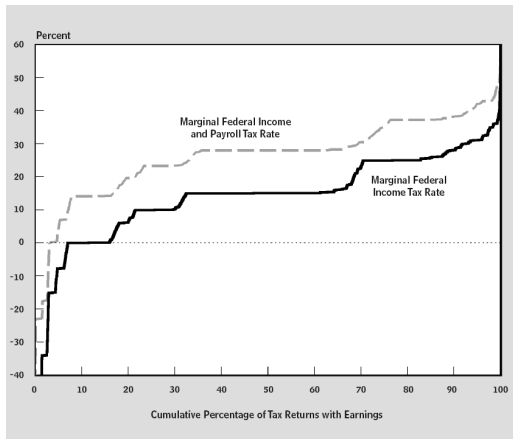
Figure 3. Federal, State and Local Effective Tax Rates, Calendar Year 2004



Source: Tax Foundation

Motivation 3: Is US tax structure Regressive, Progressive or Proportional?

Labor/Payroll tax(CBO)



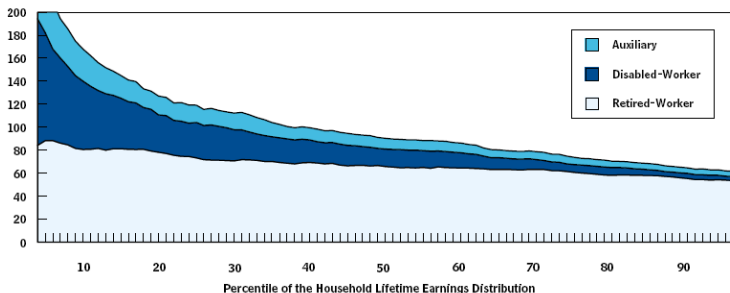
Motivation 3: Is US tax structure Regressive, Progressive or Proportional?

Labor/Payroll tax: Continued(CBO)

Figure 2.

Lifetime Social Security Benefit-to-Tax Ratio by Type of Benefit for the 1960s Birth Cohort

(Percent)



Source: Congressional Budget Office.

Motivation 3: Is US tax structure Regressive, Progressive or Proportional?

Labor/Payroll tax: Continued (Chamberlain and Prante, 2007)

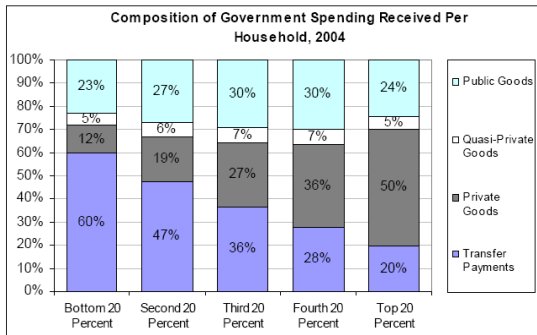
Table 19. Fraction of Each Quintile's Total Tax Burden Accounted for By Each Type Tax, Calendar Year 2004

	Quintiles of Household Cash Money Income, Calendar Year 2004				
	Bottom 20 Percent	Second 20 Percent	Third 20 Percent	Fourth 20 Percent	Top 20 Percent
Total Tax Burden	100%	100%	100%	100%	100%
Federal Taxes					
Income	4.0%	12.0%	17.6%	22.6%	35.7%
Payroll	21.2%	30.6%	32.0%	30.4%	22.5%
Corporate Income	6.3%	8.4%	8.2%	8.2%	8.1%
Gasoline	1.6%	1.2%	1.0%	0.8%	0.6%
Alcoholic Beverages	0.8%	0.4%	0.4%	0.3%	0.2%
Tobacco	1.2%	0.6%	0.3%	0.2%	0.1%
Diesel Fuel	0.2%	0.3%	0.3%	0.3%	0.3%
Air Transport	0.5%	0.4%	0.4%	0.4%	0.4%
Other Excise	1.0%	0.6%	0.4%	0.4%	0.2%
Customs, Duties, etc.	2.2%	1.2%	0.9%	0.8%	0.5%
Estate & Gift	0.0%	0.0%	0.0%	0.0%	1.7%
Total Federal Taxes	38.9%	55.7%	61.5%	64.4%	70.2%
State and Local Taxes					
Income	1.7%	4.9%	6.3%	7.4%	8.8%
Corporate Income	1.1%	1.5%	1.4%	1.4%	1.4%
Personal Property	0.4%	0.3%	0.2%	0.2%	0.1%
Motor Vehicle License	1.5%	0.9%	0.6%	0.4%	0.2%
Other Personal Taxes	0.2%	0.2%	0.1%	0.1%	0.1%
General Sales	19.7%	12.6%	10.3%	9.1%	5.6%
Gasoline	2.2%	1.6%	1.3%	1.1%	0.8%
Alcoholic Beverages	0.4%	0.2%	0.2%	0.2%	0.1%
Tobacco	2.0%	1.0%	0.6%	0.3%	0.1%
Public Utilities	2.8%	1.4%	0.9%	0.7%	0.3%
Insurance Receipts	1.5%	0.9%	0.6%	0.5%	0.3%
Other Selective Sales	2.8%	1.6%	1.2%	1.0%	0.6%
Motor Vehicle (Biz)	0.2%	0.3%	0.3%	0.3%	0.3%
Severance	0.5%	0.3%	0.3%	0.2%	0.2%
Property	22.2%	14.9%	12.2%	10.9%	8.7%
Special Assessments	0.4%	0.3%	0.2%	0.2%	0.2%
Other Production Taxes	1.2%	1.7%	1.6%	1.6%	1.6%
Estate & Gift	0.0%	0.0%	0.0%	0.0%	0.4%
Total State and Local Taxes	61.1%	44.3%	38.5%	35.6%	29.8%

Source: Tax Foundation

Motivation 4: Are Government Spending/Transfers Regressive or Progressive?

Figure 15. Composition of Total Government Spending Received Per Household, Calendar Year 2004



Source: Tax Foundation

Summary of empirical Observation

- Most of the tax reforms are group targeted.
- Government do care about deficit and surplus.
- Whenever the government has deficit or needs to increase its spending, it increases tax.
 - * Most of the times the rich bear the burden of a higher tax in bad times.
 - * In good times, the government does improve tax measure for the rich.
- The US income tax ,payroll tax and capital tax are all clearly progressive.
- The US transfer payments are clearly Progressive too.
- The regular government spending on public goods is more or less proportional for the lowest and uppermost quantiles.
- Government's own private consumption seems to have a regressive in nature.

Lessons learnt from data

- With increasing transfers payments channelled to the poor, the distributional effect of any tax system should also consider the nature of the transfer.
 - The tax system is mildly progressive and the transfer/spending is sharply progressive
- ① As a result, the overall tax/transfer could be more progressive for the economy than tax system could alone indicate.
 - ② Hence, the overall effect of a tax reform will depend on:
 - ① Who is paying more/less tax.
 - ② Who gets more/less transfer.
 - ③ Who is getting effected by government's own private(and also quasi-private) spending.

How do tax reforms effect growth and inequality?

Literature Review

- Existing literature is divided in this issue.
 - There is a clear consensus that both growth and inequality are important.
 - There is ambiguity about how they are related.
 - There is ambiguity about how to separate the growth and distributional effect of tax reform.
 - * The introduction of dynamic general equilibrium setup makes it even harder.
 - ** Once alternative financing schemes are considered, the issue becomes much more difficult.

Literature Review:Contd

- Musgrave(1953, AER)
 - ① Argues incidence(effect on distribution) and output effect are difficult and sometimes meaningless to distinguish in a general equilibrium setup.
 - ② If also considers alternative financing like changing transfers or government spending then:
 - ① There would be additional Expenditure Incidence.
 - ② It would be impossible to separate the incidence and output effect of tax reform.
- Danziger, Haveman,Plotnick(1981, JEL)
 - ① Focus on effect of transfers and their effect on savings, income and distribution.
 - ② Argues transfers reduce labor supply, reduce inequality but hamper growth.

- Persson and Tabellini(1994, AER)
- ① Argues reduction of inequality promotes economic growth.
- Perotti(1992,AER, 1996, JEG)
- ① Finds empirical evidence of positive relationships between growth and equality.
- Bassett, Burkett and Putterman(1999, EJPE)
- ① Also finds similar empirical evidence like Perotti but shows that the relationships are much weaker

- Floden(2001,JME)
 - 1 Argues that debt and transfers both increase risk sharing, but transfer improve welfare while debt reduces it.
 - 2 Debt could increase welfare if transfers are less than optimal
- Yang(2007)
 - 1 Uses a sophisticated version of the Mankiw(2000) model.
 - 2 Takes a normative standpoint and argues that growth does trickle down.
 - 3 Does not talk about distributional consequences of fiscal reform

Model: Optimization by the Savers

$$\text{Max}_{\{C_t^a, K_t^a, L_t^a\}} : E_t \sum_{t=0}^{\infty} \beta_1^t \left[\frac{(C_t^{*a})^{1-\gamma_1} - 1}{1-\gamma_1} + \chi^a \frac{(1-L_t^a)^{1-\theta_1}}{1-\theta_1} \right]$$

St:

$$C_t^a + I_t^a + B_t^a \leq (1 - \tau_t^k) r_t K_{t-1}^a + (1 - \tau_t^{L^a}) W_t L_t^a + R_{t-1}^b B_{t-1}^a + tr_t^a$$

Where:

$$C_t^{*a} = C_t^a - b_1 C_{t-1}^a$$

and where the law of motion for capital has the following form:

$$K_t^a = (1 - \delta) K_{t-1}^a + I_t^a$$

Model: First Order Condition of the Savers

$$(C_t^{*a})^{-\gamma_1} - E_t \beta_1 b_1 (C_{t+1}^{*a})^{-\gamma_1} = \lambda_t^a$$

$$\chi^a (1 - L_t^a)^{-\theta_1} = \lambda_t^a (1 - \tau_t^{L^a}) W_t$$

$$\lambda_t^a = E_t \beta_1 \lambda_{t+1}^a \left\{ (1 - \tau_{t+1}^k) r_{t+1} + (1 - \delta) \right\}$$

$$\lambda_t^a = E_t \beta_1 \lambda_{t+1}^a R_t^b$$

Define,

$$R_t^k = (1 - \tau_t^k) r_t + (1 - \delta)$$

Then the first order condition for K_t^a could be written as:

$$\lambda_t^a = E_t \beta_1 \lambda_{t+1}^a R_{t+1}^k$$

Model: Optimization by the Spenders

$$\text{Max}_{\{C_t^P, L_t^P\}} : E_t \sum_{t=0}^{\infty} \beta_2^t \left[\frac{(C_t^{*P})^{1-\gamma_2} - 1}{1-\gamma_2} + \chi^P \frac{(1-L_t^P)^{1-\theta_2}}{1-\theta_2} \right]$$

subject to the budget constraint:

$$C_t^P \leq (1 - \tau_t^{L^P}) W_t L_t^P + tr_t^P$$

Where:

$$C_t^{*P} = C_t^P - b_2 C_{t-1}^P$$

The first order conditions are as follows:

$$(C_t^{*P})^{-\gamma_2} - E_t \beta_2 b_2 (C_{t+1}^{*P})^{-\gamma_2} = \lambda_t^P$$

$$\chi^P (1 - L_t^P)^{-\theta_2} = \lambda_t^P (1 - \tau_t^{L^P}) W_t$$

Model: Firms Problem

$$\underset{\{K_t, L_t\}}{\text{Max}} : K_t^\alpha L_t^{1-\alpha} - W_t L_t - r_t K_{t-1}$$

Where:

$$Y_t = K_{t-1}^\alpha L_t^{1-\alpha}$$

The first order conditions for the firm determines the wage and the rental rate:

$$W_t = (1 - \alpha) \frac{Y_t}{L_t}$$

$$r_t = \alpha \frac{Y_t}{K_{t-1}}$$

Model: The Government

GBC looks like

$$R_{t-1}^b B_{t-1} + TR_t + G_t = T_t + B_t$$

$$T_t = T_t^l + T_t^k$$

$$T_t^l = F * \tau_t^{L^a} W_t L_t^a + (1 - F) * \tau_t^{L^p} W_t L_t^p, T_t^k = \tau_t^k r_t K_{t-1}$$

$$TR_t = TR_t^a + TR_t^p$$

The intertemporal GBC:

$$\frac{B_t}{Y_t} = s_t^B = \sum_{j=0}^{\infty} d_{t,t+j} \left[(1 - \alpha) \tau_{t+j}^{L^a} \frac{FL_{t+j}^a}{L_{t+j}} + (1 - \alpha) \tau_{t+j}^{L^p} \frac{(1-F)L_{t+j}^p}{L_{t+j}} + \alpha \tau_{t+j}^k - s_{t+j}^G - s_{t+j}^{TR^a} - s_{t+j}^{TR^p} \right]$$

Fiscal Policy Rules: Leeper and Yang(2006)

$$\ln \left(\frac{s_t^{TR^a}}{s^{TR^a}} \right) = q_{TR} \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_{TR^a} \leq 0$$

$$\ln \left(\frac{s_t^{TR^p}}{s^{TR^p}} \right) = q_{TR} \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_{TR^p} \leq 0$$

$$\ln \left(\frac{s_t^G}{s^G} \right) = q_G \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_G \leq 0$$

$$\ln \left(\frac{\tau_t^{L_a}}{\tau^{L_a}} \right) = q_L \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_{L_a} \geq 0$$

$$\ln \left(\frac{\tau_t^{L_p}}{\tau^{L_p}} \right) = q_L \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_{L_p} \geq 0$$

$$\ln \left(\frac{\tau_t^K}{\tau^K} \right) = q_K \ln \left(\frac{s_{t-1}^B}{s^B} \right), q_K \geq 0$$

Measuring Distributional effect

Define variable similar to a Gini-coefficient:

$$GC_t = \frac{\frac{(1-F)YD_t^p}{F*YD_t^a + (1-F)*YD_t^p}}{\frac{(1-F)}{F+(1-F)}}$$

Where:

- 1 $F * YD_t^a = AYD_t^a$ = Aggregate Disposable income of the Saver = $(1 - \tau_t^k)r_t K_{t-1}^a + (1 - \tau_t^{L^a})W_t F * L_t^a + R_{t-1}^b B_{t-1}^a + TR_t^a$
- 2 $(1 - F) * YD_t^p = AYD_t^p$ = Aggregate Disposable income of the Spender = $(1 - \tau_t^{L^p})W_t(1 - F) * L_t^p + TR_t^p$

Define, $AYD_t = AYD_t^a + AYD_t^p$

We can therefore, conveniently define the inequality measure as:

$$GC_t = \frac{AYD_t^p}{(1-F)AYD_t}$$

Notice:

If $GC_t = 1$, there is perfect equality

if $GC_t \succ 1$, there is inequality in favour of the spender, against the saver

if $GC_t \prec 1$, there is inequality in favour of the saver, against the spender

Table 2.

CBO's Mid-Level Assumptions About Labor-Supply Elasticities, by Earnings Group

	Income Elasticity	Substitution Elasticity	Total Wage Elasticity
All Earners			
Person-weighted	-0.101	0.229	0.129
Earnings-weighted	-0.062	0.141	0.079
Primary Earners			
Person-weighted	-0.070	0.140	0.070
Earnings-weighted	-0.038	0.076	0.038
By earnings group^a			
Lowest decile	-0.168	0.336	0.168
Second decile	-0.126	0.252	0.126
Third and fourth deciles	-0.084	0.168	0.084
Fifth and sixth deciles	-0.063	0.126	0.063
Top four deciles	-0.028	0.056	0.028
Secondary Earners	-0.250	0.650	0.400

Source: Congressional Budget Office.

Parameters for Calibration

Table 0: Parameter for Baseline Calibration

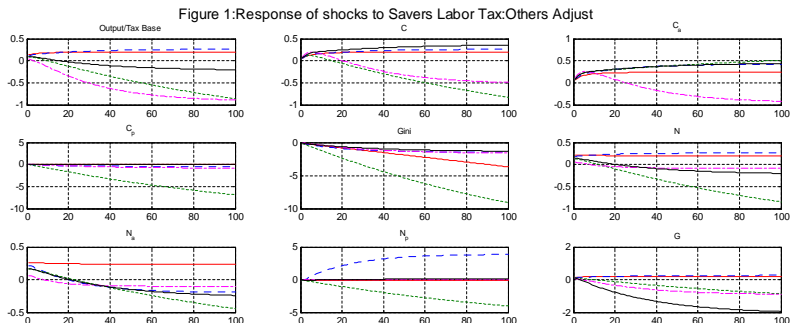
Parameter	Value	Source	Parameter	Value	Source	Parameter	Value	Source
α	0.36	Leeper and Yang(2006)	S^{TR}	0.07	Leeper and Yang(2006)	b_1	0.6	BEF(2004)
β_1	0.96	Leeper and Yang(2006)	S^{TR}_a	$0.7 \cdot S^{TR}$	JCT(2006)	b_2	0.6	BEF(2004)
β_2	0.96	Leeper and Yang(2006)	S^{TR}_p	$0.3 \cdot S^{TR}$	JCT(2006)	τ^L_a	0.253	Yang(2007)
γ_1	1	Leeper and Yang(2006)	S^G	0.2	Leeper and Yang(2006)	τ^L_p	0.096	Yang(2007)
γ_2	1	Leeper and Yang(2006)	S^C	0.63	Leeper and Yang(2006)	τ^K	0.39	Yang(2007)
θ_1	1	Leeper and Yang(2006)	S^B	0.17	Leeper and Yang(2006)	F	0.6	JCT(2006)
θ_2	2	Yang(2007)	L	0.2	Leeper and Yang(2006)	χ^a	2.721	Yang(2007)
δ	0.06	Yang(2007)	L^a/L^p	0.36	CBO	χ^p	2.543	Yang(2007)

- Log-Linearized the model around its steady.
- Use *Gensys* to generate impulse response function for various tax shocks under alternative financing schemes.

Simulation 1: Objectives

- Consider an unanticipated 1% permanent decline in the labor tax of the saver where the financing is done by:
 - ① Decline in the transfer to the saver: Less Progressive tax and More Progressive Transfer
 - ② Decline in the transfer to the saver: Less Progressive tax and Less Progressive Transfer
 - ③ Increase in the labor tax on the spender: Regressive Tax system
 - ④ Increase in capital tax = Tax Substitution
 - ⑤ Decline in government spending: Non-distortionary adjustment

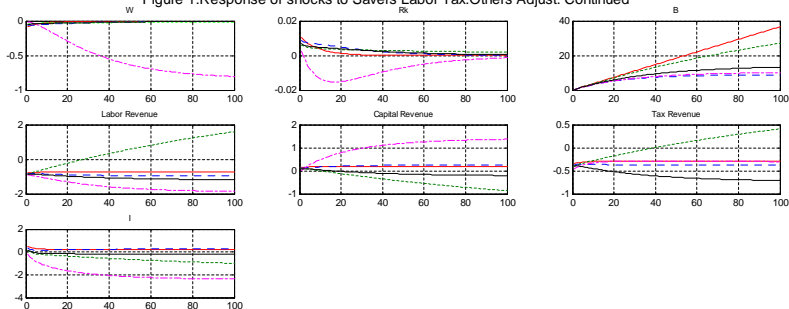
Simulation 1: Impulse response of a permanent cut in Savers Labor Tax



Red line: Transfer to Savers Adjust, Blue Line: Transfer to spenders adjust, Green line: Labor tax to Spenders adjust, Mahogany: Capital Tax Adjust, Blackline: Government Spending Adjust

Simulation 1:Continued

Figure 1:Response of shocks to Savers Labor Tax:Others Adjust: Continued

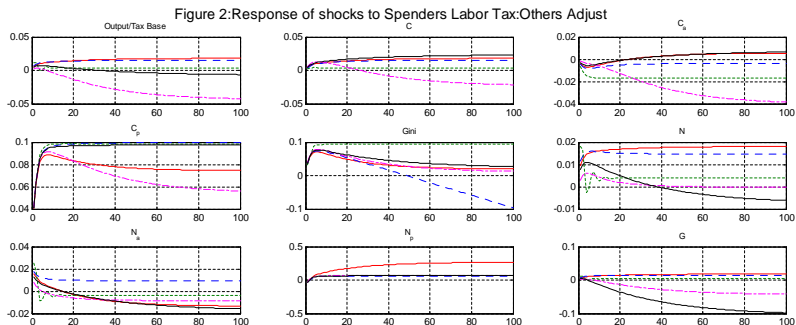


Redline: Transfer to Savers Adjust, Blue Line: Transfer to spenders adjust,
Green line: Labor tax to Spenders adjust, Mahogany: Capital Tax Adjust,
Blackline: Government Spending Adjust

Simulation 2: Objectives

- Consider an unanticipated 1% permanent decline in the labor tax of the spender where the financing is done by:
 - 1 Decline in the transfer to the spender: more Progressive tax and less Progressive Transfer
 - 2 Decline in the transfer to the saver: more Progressive tax and more Progressive Transfer
 - 3 Increase in the labor tax on the saver: more Progressive Tax system
 - 4 Increase in capital tax = Tax Substitution
 - 5 Decline in government spending: Non-distortionary adjustment

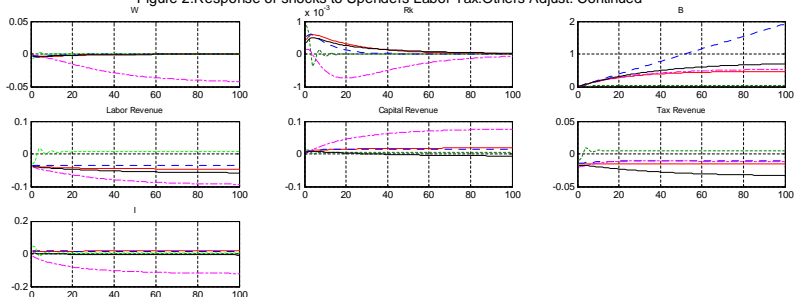
Simulation 2: Impulse response of a permanent cut in Spenders Labor Tax



Redline: Transfer to Spenders Adjust, Blue Line: Transfer to Savers adjust, Green line: Labor tax to Savers adjust, Mahogany: Capital Tax Adjust, Blackline: Government Spending Adjust

Simulation 2:Continued

Figure 2:Response of shocks to Spenders Labor Tax:Others Adjust: Continued

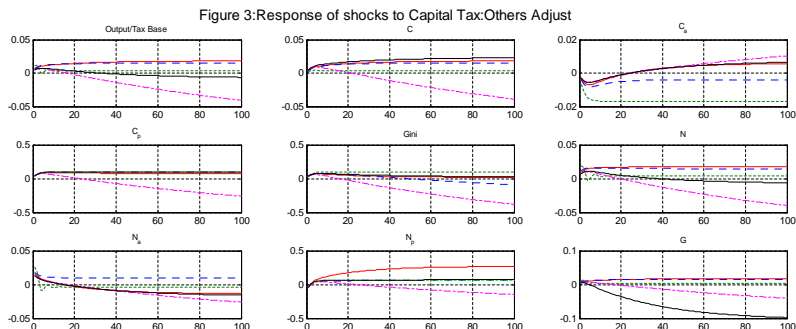


Redline: Transfer to Spenders Adjust, Blue Line: Transfer to Savers adjust, Green line: Labor tax to Savers adjust, Mahogany: Capital Tax Adjust, Blackline: Government Spending Adjust

Simulation 3: Objectives

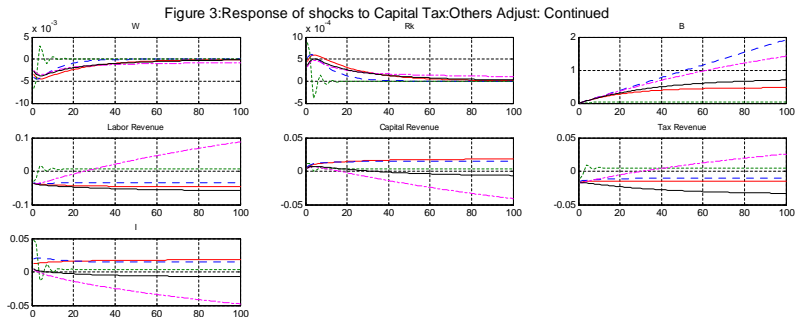
- Consider an unanticipated 1% permanent decline in the capital tax where the financing is done by:
 - 1 Decline in the transfer to the spender: more Progressive Transfer
 - 2 Decline in the transfer to the saver: less Progressive Transfer
 - 3 Increase in the labor tax on the saver: Tax Substitution
 - 4 Increase in the labor tax on the spender = Tax Substitution
 - 5 Decline in government spending: Non-distortionary adjustment

Simulation 3: Impulse response of a permanent cut in Capital Tax



Redline: Transfer to Spenders Adjust, Blue Line: Transfer to Savers adjust, Green line: Labor tax to Savers adjust, Mahogany: Labor tax to Spenders Adjust, Blackline: Government Spending Adjust

Simulation 3:Continued



Redline: Transfer to Spenders Adjust, Blue Line: Transfer to Savers adjust, Green line: Labor tax to Savers adjust, Mahogany: Labor tax to Spenders, Blackline: Government Spending Adjust

Key features of the simulation results

- When cutting labor tax on saver:
 - ① adjusting transfer to the spender has the most favourable effect on output/tax base and Gini coefficient
 - ② adjusting labor tax to spender has the most favorable effect on tax revenue
- When cutting labor tax on spender:
 - ① adjusting transfer to the spender has the most favourable effect on output.
 - ② adjusting labor tax on saver has the most favourable effect on Gini-coefficient and tax revenue
- When cutting capital tax:
 - ① adjusting transfer to the spender has the most favourable effect on output.
 - ② adjusting labor tax on saver has the most favourable effect on Gini-coefficient