

The macroeconomics of fiscal consolidations in a Monetary Union: the case of Italy

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Abstract

This paper lays down a dynamic stochastic general equilibrium model with the aim of analyzing the effects of fiscal consolidation in one country of the Euro area. In particular we focus on Italy, the country with the highest level of debt. For this purpose we use the IEAM (Italy and Euro Area Model), a two-region currency union model, calibrated to Italy and to the rest of the Euro area. The IEAM is extended to account for distortionary taxation on labor, capital income and consumption, while expenditures are detailed into purchases of goods and services, compensations for public employees, transfers to households and public investment.

Our main results are: (1) reducing tax distortions would entail significant welfare gains; (2) among expenditures, it is preferable to cut purchases of good and services or public employment than transfers to households; (3) from a normative viewpoint, it is preferable to cut taxes and expenditures at the same time: tax cuts more than compensate for the welfare costs of reducing expenditures; (4) cutting taxes immediately rather than with a delay entails only a negligible slowdown in the pace of public debt reduction and might deliver a higher level of welfare during the transition.

1 Introduction

In this paper we present a Dynamic Stochastic General Equilibrium model of the Italian economy to study the macroeconomic and welfare implications of different fiscal consolidation scenarios. The model, referred to as the IEAM (Italy and Euro Area Model), is a two-region currency-union dynamic stochastic general equilibrium (DSGE) model, calibrated to Italy and to the rest of the Euro area¹. The basic structure of the model is akin to the Global Economy Model (GEM) developed at the IMF². It allows for monopolistic competition in the goods and labor markets. The model also includes real and nominal frictions to match the persistence usually found in the data as well as a feedback rule for the central bank. A detailed description of the IEAM can be found in Gerali, Forni and Pisani (2007).

*Bank of Italy, Modelling and Forecasting Division. Preliminary and incomplete. Please do not circulate.

¹The choice of modelling Italy as a part of the Euro area allows to properly take into account spillovers from (and to) the rest of the area.

²See Bayoumi (2004) for a non-technical description of the GEM. Several central banks have developed DSGE models for policy analysis. Among the others, the Fed has developed SIGMA (see Erceg et al (2006)), the European Central Bank the New Euro Area Wide Model (see Coenen et al (2007)).

In this paper we enrich the basic structure of the IEAM to analyze specifically fiscal policy issues. We break down the Ricardian equivalence by introducing distortionary taxes on labor income, capital income and consumption, allowing for a more realistic treatment of fiscal policy. Moreover, we distinguish between public spending on consumption of goods and services, public employment, transfer to families and investment. We believe that decomposing public expenditures in its main components is important, as each one has different macroeconomic implications.

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2 The setup

There are two regions, Italy and rest of the Euro area, having different sizes and sharing the same currency. In each region there are households and firms. Each household consumes a final composite good made of non-tradable and tradable goods, the latter produced both at home and abroad. Households participate in financial markets and smooth consumption by trading a short-term nominal riskless bond. They also own domestic firms and capital stock, which is rented to domestic firms in a perfectly competitive market. All households supply differentiated labor services to domestic firms and act as wage setters in monopolistically competitive markets by charging a markup over their marginal rate of substitution.

On the production side, there are perfectly competitive firms that produce the final goods and monopolistic firms that produce the intermediate goods. The three final goods (a private consumption, a private investment and a public consumption good) are produced combining all available intermediate goods using a constant-elasticity-of-substitution (CES) production function. Tradable and non tradable intermediate goods are produced combining capital and labor in the same way. Tradable intermediate goods are split in domestically-consumed and export goods. Because intermediate goods are differentiated, firms have market power and restrict output to create excess profits. The law of one price does not hold³. Hence, each firm producing a tradable good sets two prices, one for the domestic market and the other for the export market. Since the firm faces the same marginal cost regardless of the scale of production in each market, the different price-setting problems are independent of each other.

To capture the empirical persistence of the aggregate data and generate realistic dynamics, we include adjustment costs on real and nominal variables, ensuring that, in response to a shock, consumption and production do not immediately jump to a new long-term equilibrium. On the real side, quadratic costs prolong the adjustment of the capital stock. On the nominal side, they

³Fabiani et al (2005) provide empirical evidence for pricing-to-market in the Euro Area.

make wages and prices sticky⁴.

3 Fiscal policy

Fiscal policy is set at the country level. The government budget constraint is:

$$\left[\frac{B_{t+1}}{R_t} - B_t \right] = C_t^g + W_t L_t^g + Tr_t + I_t^g - T_t \quad (1)$$

where B_t is nominal public debt, C_t^g is nominal government purchases of goods and services⁵, $w_t l_t^g$ is compensation for public employees (in the National Accounts $C_t^g + W_t L_t^g = G_t$), Tr_t are transfers to households and I_t^g is public investment. Total government revenues T_t are given by the following identity:

$$T_t = \tau_t^w W_t L_t + \frac{\tau_t^c}{1 + \tau_t^c} [P_t c_t + C_t^g] + \tau_t^k [R_t^k k_t + D_t] \quad (2)$$

where the τ are tax rates on labor income (τ_t^w), capital income (τ_t^k) and consumption (τ_t^c), L_t is total employment (including public employment), R_t^k is the capital rental rate and D_t stands for dividends.

Public employees together with purchases of goods and services (and an exogenously given stock of public capital, mainly representing building and land) are combined (using a CES production function) to produce public goods (on a per-capita terms) Y^g (as health, education, security, justice...):

$$Y_t^g = \left[\gamma_{kg}^{\frac{1}{\alpha_N}} K g^{\frac{\alpha_N-1}{\alpha_N}} + \gamma_{Cg}^{\frac{1}{\alpha_N}} C g^{\frac{\alpha_N-1}{\alpha_N}} + (1 - \gamma_{kg} - \gamma_{Cg})^{\frac{1}{\alpha_N}} L g^{\frac{\alpha_N-1}{\alpha_N}} \right]^{\frac{\alpha_N}{\alpha_N-1}}$$

Public goods enter the utility function, delivering utility to households. The expected value of household j lifetime utility is given by:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\frac{[\tilde{C}_t(j)]^{(1-\sigma)}}{(1-\sigma)} - \frac{\kappa}{\tau} L_t(j)^\tau \right] \right\} \quad (3)$$

where

$$\tilde{C}_t(j) = \left[\omega^{\frac{1}{\theta}} C_t(j)^{\frac{\theta-1}{\theta}} + (1-\omega)^{\frac{1}{\theta}} Y_t^g \frac{\theta-1}{\theta} \right]^{\frac{\theta}{\theta-1}}$$

where θ measures the degree of substitutability between private and public goods and ω the weight of the private good in the consumption bundle. When $\omega = 1$, the level of public goods does not alter private consumption decisions.⁶

Fiscal policy affect the economy in many different ways. Purchases of good and services are a demand component in the goods market, public employment is a demand component in the labor market and government investment I^g is used

⁴See Rotemberg (1982).

⁵We assume that C^g has the same composition as that of private consumption.

⁶When $\theta = 0$, we have a "Leontief" aggregator, i.e. C_t and Y_t^g become perfect complements. When $\theta = 1$, we have a "Cobb-Douglas" aggregator of the form $\tilde{C}_t(j) = C_t(j)^\omega Y_t^g(1-\omega)$. As θ goes to infinity, the aggregator becomes of the form $\tilde{C}_t(j) = \omega C_t(j) + (1-\omega)Y_t^g$ and the two goods are perfect substitutes.

to build up public capital (typically infrastructures) that enters the production function of private goods (both tradeables and non tradables). Most of the effects can be appreciated through the budget constraint of a single agent:

$$\begin{aligned} & (1 - \tau_t^w)W_t(L_t + L_t^g) + (1 - \tau_t^k) [R_t^k \bar{k}_t u_t + D_t] + B_t + Tr_t + P_t I_t \\ = & (1 + \tau_t^c)P_t C_t^R + P_t I_t + \frac{B_{t+1}}{R_t} \end{aligned}$$

where for simplicity we have abstracted from adjustment costs. The above budget shows how taxes enter the agents decisions, as well as public employment and transfers to households.

Although in a stylized way, the model is able to take into account the diverse implications for the economy related to the different expenditure items. This is essential in order to better understand the macroeconomic effects of changing expenditure components. For an earlier work along these lines see Forni, Monteforte and Sessa (2007).

4 Calibration

The model is calibrated on a quarterly basis. We choose parameter values to get steady-state ratios that are consistent with national accounts data and that are commonly used in the literature. Table 1 contains parameters that regulate preferences and technology. We assume that discount rates and elasticities of substitution have the same value across the two regions. The discount factor β is set to 0.9875, so that the steady state real interest rate is equal to 5 per cent on an annual basis. The value for the intertemporal elasticity of substitution, $1/\sigma$, is 1. The Frisch labor elasticity is set to 2. The weight of the private good ω in the utility function is 0.9. The depreciation rate of capital is set to 2.5 per cent on a quarterly basis. In the production functions of tradables and non-tradables the elasticity of substitution between labor, private and public capital is set respectively to 0.85 and 0.79. The biases towards private capital, labor and public capital are set to 0.75, 0.21 and 0.04 in the tradable sector; 0.7, 0.26 and 0.04 in the non tradable sector. In the production function of the public sector the elasticity of substitution between inputs (labor, fixed stock of capital and intermediate goods) is equal to 0.79, the biases towards capital, labor and intermediate goods are respectively equal to 0.7, 0.2 and 0.1.

In the final non tradable consumption and investment goods the elasticity of substitution between domestic and imported tradable is set to 1.5, while the elasticity of substitution between tradables and non tradables to 0.5. The bias for the domestically produced tradable good (0.3 in Italy and 0.7 in the rest of the Euro area) and that for the composite tradable good (a_T equal to 0.5 in both regions) are chosen to match the Italy-Euro area import and export to gross domestic product ratios. The population size of Italy (we normalize the whole Euro area population to 1) is set to 0.2. Table 2 contains parameters that regulate the dynamics. Adjustment costs on capital are set to 1. Both nominal wage and price quadratic adjustment costs are set to 60, which corresponds to an average frequency of wage and price adjustment roughly equal to 4 quarters. Gross sector markups of Italy and rest of the Euro Area are all set to 1.2. The parameters ϕ_{b1} and ϕ_{b2} , regulating the adjustment cost paid by the Italian

private agents on their net financial position, are set to 0.01. This cost is introduced to make the model stationary.

Tax rates are calibrated using effective average tax rates estimates from Eurostat (2007): τ^w is set to 43.1 in Italy and to 38.7 in the rest of the Euro area; τ^k to 29.0 and 30.1, while τ^c to 16.9 in Italy and to 19.2 in the rest of the euro area. The level of public debt is calibrated to the official 2006 values: 106.8 for Italy and to 60.7 for the rest of the euro area.

Parameterization of systematic feedback rule followed by the monetary authority is reported in Table 3. The central bank of the Euro area targets the contemporaneous Euro-area wide consumer price inflation (the corresponding parameter is set to 1.7)⁷. Interest rate is set in an inertial way and hence its previous-period value enters in the rule with a weight equal to 0.9).

Table 4 reports model-based and actual steady-state great ratios under our baseline calibration. Private consumption, bilateral imports and exports match the data rather well, while private investment in Italy is somehow underestimated. As for fiscal policy variables, it must be noted that some expenditure items (as purchases C^g and investment I^g) are perfectly matched as they are exogenous. For other items, as the public wage bill and the interest expenditure, we calibrate quantities (i.e. the share of public employees over the total number of employees and the level of public debt to GDP) to replicate the actual data; as the wage and interest rates are endogenous, however, we were not able to exactly match exactly the corresponding expenditure components.

Most importantly, as in steady state the budget is balanced, the model is forced to produce steady state values for the revenues higher than in actual data. While in the case of Italy the overestimation is evenly distributed across labor and capital income taxes, for the rest of the euro area the model produces a strong overestimation of capital income tax revenues while at the same time labor income tax revenues are underestimated [on this we have to do more work].

5 The cost of tax (and expenditure) distortions

First of all, we will try to understand the role of the distortionary tax rates in our model. Table 5 reports percentage changes with respect to the initial steady state levels for a selection of variables including the main macroeconomic ones, the term of trade, and output and consumption in the rest of the euro area. We report also two welfare measures. Both are expressed in term of consumption equivalents, that is the constant percentage change in consumption level that would deliver the same utility as the one achieved in the consolidation scenario. Two such welfare measures are reported: the first one (steady state) is simply a comparison of the level of utility in the pre-consolidation and after-consolidation steady states; the second one expresses utility in present discounted value terms (using the agents' discount factor) and includes also the transition phase to the new steady state.

The first three columns of the table show the long-run effects (i.e. steady state effects) of reducing tax distortion by 1 per cent of GDP. This is obtained by reducing transfers to households (Tr) by 1 per cent of GDP and compensating this expenditure reduction with tax reductions, either on labor income tax rate,

⁷The Euro Area-wide consumer price inflation rate is a weighted (by sizes of the two regions) geometric average of regional inflation rates.

capital income tax rate or consumption taxes. Since transfers are lump sum, the exercise exactly produces the effects of reducing tax distortions, where the reduction of the different tax rates is calibrated as to generate a reduction in tax revenues of 1 per cent of GDP, while leaving the debt level unchanged.

The table shows that eliminating tax distortions by 1 per cent of GDP produces an increase in welfare between 0.5 and 1.3 per cent. The highest welfare improvement is associated with a reduction in labor income tax rates, as it induces a decrease in labor costs while at the same time a substantial increase in after-tax real wages, employment and consumption. The increase in employment brings about also an increase in investment. In the other two cases, the reduction in tax distortions is less welfare improving. In the case of the capital income tax, the increase in investment is the main determinant of the increase in output, but the change in consumption is moderate. Analogously, the reduction in consumption taxes leads to a reduction in effective labour costs and to an increase in employment; however, the latter is mild as the increase in the demand component and in output is limited.

We next, in the fourth and fifth column of table 1, propose a similar exercise on the expenditure side. We reduce jointly the level of transfer by 1 per cent of GDP and either public employment or purchases of good and services in order to leave unchanged the steady state level of debt. In both cases welfare decreases, as the cut in transfers has a negative wealth effect: it brings about a reduction in disposable income and consumption, while at the same time an increase in employment. The long-run welfare cost is not trivial, between 0.8 and 1 per cent.

6 Consolidation scenarios

The baseline scenario that we consider is borrowed from the Economic and Financial Planning Document (DPEF) presented by the Italian government in July 2007. The document sets a planned path for the debt to GDP ratio, that should decrease by more than 10 percentage points in five years, from 106.8 in 2006 to 95 in 2011.

It must be stressed that in our model the debt level affects the economic environment mainly affecting the level of interest expenditure. This effect in our baseline scenario is not very significant, as the reduction we assume for the public debt does not entail a sizeable decline in interest expenditure (around 0.5 per cent of GDP). The model does not consider spreads or threshold effects related to the debt level (as a country risk premium). For this reason, we hold the above mentioned reduction in the debt to GDP ratio unchanged across the different scenarios.

How to achieve the goal for the reduction of debt level? There are many possibilities, ranging from adjusting only tax rates to changing only expenditure components. As we have six fiscal instruments (three tax rates and three expenditure items⁸) there are many combinations.

In order to generate expenditures and tax rate paths consistent with the

⁸Among expenditures, we do not consider cuts in the investment level, as this has been heavily reduced in the past to very low levels by historical standards and any further reduction is not a realistic option. Moreover, changes in public investment generate larger fiscal multipliers, as they not only decrease aggregate demand but also aggregate supply.

target level for the debt to GDP ratio, we assume a policy rule that use a single instrument among the three tax rates and the three expenditure items to bring the debt close to the target level (b^*). In particular we assume the following rule:

$$\frac{i_t}{i_{t-1}} = \left(\frac{b_t}{b^*}\right)^{\phi_1} \left(\frac{b_t}{b_{t-1}}\right)^{\phi_2} \quad (4)$$

where i_t is either an expenditure item expressed as a percent of GDP (in the public employment case the rule is defined on the level of public employment) or a tax rate, b is the debt level as a ratio to GDP; ϕ_1 and ϕ_2 are coefficients lower than zero when the rule is defined on an expenditure item (calling for a reduction in expenditures whenever the debt level is above target, and for a larger reduction the higher the increase in the debt to GDP ratio), greater than zero when the rule is on tax rates. We stress again that the rule is imposed to one fiscal instrument at a time, leaving the path of the other instruments exogenously defined.

In the following we consider fully credible and fully anticipated reduction in the debt target b^* and run perfect-foresight simulations. We first compare the steady states before and after the consolidation and then study the adjustment path of endogenous variables towards the new steady state level.

7 Results

7.1 Steady state comparisons

We start by comparing steady states in Table 6. The first three columns - the ones labelled (B, τ^w) , (B, τ^k) and (B, τ^c) - assume that the consolidation is achieved adjusting one tax rate at a time (respectively, on labor income, capital income or consumption), leaving expenditures (as a ratio to GDP) unchanged. The columns from the fourth to sixth, instead, assume unchanged tax rates and that a single expenditure item is adjusted to attain the target level of debt. Focusing on these first six columns, we immediately note that the consolidation leads to an increase in the main macro variables, especially in the case where the action is on the tax rates. In this latter case, tax rates initially increase in order to reduce the level of debt and then - once the debt target is achieved and interest expenditure is reduced - can stabilize to a level below the initial one. In the scenarios where there are not changes in tax rates, expenditures are initially cut but eventually end up to a level above the initial one, as the lower interest outlays leaves room for increases in expenditures. It must be stressed, however, that in all these six cases the consolidation is essentially not welfare improving when including in the measure of welfare the effects of the transition phase.

The columns after the sixth consider scenarios where both expenditures and taxes are adjusted. Columns (7)-(9) assume an exogenous reduction in labor income taxes of 5 percentage points over five years and the policy rule (4) defined on one single expenditure item at a time. Columns (10)-(12) are analogous, with the only difference that now is the capital income tax rate to be reduced by the same 5 percentage points. Finally, in the last three columns labor and capital income taxes are both exogenously and simultaneously reduced by 5 percentage points. The results show that tax cuts more than compensate for the welfare costs of reducing expenditures. In particular, the negative effects on welfare of

the additional reductions in expenditures (on top of the ones needed to reduce the debt level) necessary to compensate for the tax rates reductions are more than compensated by the positive effects coming from the reduction of tax rates. The welfare measure that includes the effects of the transition increase by 1.8 to 5 per cent. When acting only on tax rates (in the first two columns) taxes had initially to increase in order to reduce the debt level. This induced a significant welfare loss during the transition, although a significant welfare gain in the new steady state. In all columns from the sixth to the last both welfare measures are positive.

Finally, it can be noticed that - among the scenarios with expenditures cuts - the ones entailing the higher levels of welfare are those where expenditures cut are concentrated on purchases of goods and services or on public employment. We have already commented on the fact that cuts in transfers have a stronger negative effect on welfare. We will come back to this point in the section that discusses the transition dynamics.

7.2 Robustness

We perform robustness exercises on two aspects of the model, both related to the role of public expenditure items and their effects on welfare. Specifically, we will first play with the parameters of the utility function, in order to give more weight to the utility agents receive from the public good would alter our results. Secondly, we will introduce non-Ricardian (or rule-of-thumb) agents, that is agents that don't participate in the financial markets and therefore consume their current (labor plus government transfers) net income. In both cases the modifications are meant to increase the negative welfare effects of cutting expenditures and see whether for realistic calibration of these parameters our main result (that the positive effects due to tax cuts more than compensate the negative effects coming from expenditures cuts) can be overturned.

The first three columns of table 7 report our baseline scenario (reported in the last three columns of table 6), while the other six replicate the same baseline scenario either assuming $\omega = 0.5$ (instead of 0.9) or introducing a share on non-Ricardian agents equal to 35 per cent of all agents.

In both cases consequences are very limited, both on the macroeconomic variables and on the welfare levels. This suggests, in accordance with the theory, a limited role for non Ricardian agents in determining the long run levels of the variables.

7.3 Transition dynamics

In the previous section we have seen that joint reductions of taxes and expenditures achieve a higher level of welfare. In this section we will therefore restrict our attention to the scenarios where both taxes and expenditures are being cut (in particular to those of the columns (13)-(15) of table 6). We will try to deepen our understanding of the macroeconomics effects of using different instruments focusing on the transition. We will consider also the issue of timing, that is whether an immediate tax reduction is preferable to a delayed tax reduction. As the amount and speed of the debt reduction is given, the former will entail stronger expenditures cuts in the short run.

We consider a total of six scenarios: the tax reductions may be *immediate* –starting in period 1– or *delayed* –starting after five years–; such reductions may be achieved by reducing one of the three different expenditure items: transfers –*scenario* Tr –, purchases of goods and services –*scenario* C_g –, or public employment –*scenario* L_g –. In all cases we assume that the tax rates on labor and capital income decrease over five years by 5 percentage points and remain stable at the new value value thereafter.

We start by comparing the three scenarios under the assumption that the reduction in tax rates is *delayed*. The behavior of deficit, debt and expenditures is very similar in all scenarios (Fig. 1). The budget balance reaches a surplus above 0.5 per cent of GDP after five years and remains in surplus, although progressively smaller, until the debt level achieves the target value (95 per cent of GDP), which takes approximately eight years. The dynamics of revenues differ across scenarios. In particular, in the *scenario* L_g the fall in labor income revenues (as a ratio to GDP) is the largest. In fact, overall labor demand falls and brings about a decline in real wages. This, in turn, results in lower employment and hence disposable income, leading to a contraction of output, while it favors private sector employment and investment (Figs. 2 and 3). The dynamics of the main variables is also affected by the cut in tax rates, although delayed. In particular, investment start to increase – although mildly – from the start of the consolidation period while employment mainly after the first five years; the dynamics of investment and employment is reflected in the one of output.

We have already noticed that *scenario* L_g and *scenario* C_g achieve the highest level of welfare. The intuition for this result is that the reduction in C_g or L_g , while reducing either the demand for goods or the one for labor, affect less strongly than a cut in transfers the agents’ disposable income. Therefore, private consumption and consequently output and employment are less affected.

We consider next the same three scenarios under the assumption that tax rate cuts take place *immediately* (Figs. 5-8)⁹. There are three main differences with respect to the *delayed reduction* scenarios: (i) the target level of debt is now achieved with only a small delay (Fig. 5); (ii) the cut of expenditure items (as a percentage of GDP) must be slightly larger during the consolidation phase, to make up for the lower fiscal revenues; (iii) there is an immediate increase in real activity; (iv) the welfare level, including the effects of the transition, improves.

8 Concluding remarks

We have simulated a DSGE-type model – calibrated to replicate the main Italian and euro area macroeconomic and fiscal policy aggregates – to analyze the macroeconomic and welfare effects of alternative fiscal consolidation strategies in Italy. In all scenarios considered we assumed a reduction of the debt to GDP ratio of 10 percentage points over five years. Our main results are: (1) reducing tax distortions would entail significant welfare gains; (2) among expenditures,

⁹It is worth remarking that, while the choice regarding which expenditure item or tax rate to cut affects the steady state equilibrium, the timing of the tax reduction does not. Therefore, in comparing the delayed and immediate tax reduction scenarios, we may focus on the transition periods only, as the long run effects are identical in both scenarios.

it is preferable to cut purchases of good and services or public employment than transfers to households; (3) it is preferable to cut taxes and expenditures at the same time: tax cuts more than compensate for the welfare costs of reducing expenditures; (4) cutting taxes immediately rather than with a delay entails only a negligible slowdown in the pace of public debt reduction and might deliver a higher level of welfare during the transition.

Table 1. Parameterization of Italy and the rest of the Euro Area
(Base-Case Parameters)

Parameter	Italy	Rest of the Euro Area
Rate of time preference $(1/\beta^4 - 1) * 100$	5.0	5.0
Depreciation rate δ	0.025	0.025
Intertemporal elasticity of substitution $1/\sigma$	1.0	1.0
Frisch elasticity of labor $1/(\tau - 1)$	2.0	2.0
Tradable Intermediate Goods		
Substitution between factors of production	0.85	0.9
Bias towards capital	0.75	0.7
Non tradable Intermediate Goods		
Substitution between factors of production	0.79	0.95
Bias towards capital	0.7	0.7
Final consumption goods		
Substitution between domestic and imported goods	1.5	1.5
Bias towards domestic tradable goods	0.3	0.7
Substitution between domestic tradables and non tradables	0.5	0.5
Bias towards tradable goods	0.55	0.5
Final investment goods		
Substitution between domestic and imported goods	1.5	1.5
Bias towards domestic tradable goods	0.3	0.7
Substitution between domestic tradables and non tradables	0.50	0.50
Bias towards tradable goods	0.55	0.50
Size	0.20	0.80

Table 2. Real and Nominal Adjustment Costs (Base-Case Parameters)

Parameter (“*” refers to rest of the Euro area)	Italy	Rest of the Euro Area
Real Adjustment Costs		
Capital accumulation ϕ_K, ϕ_K^*	1.00	1.00
Nominal Adjustment Costs		
Wages κ_W, κ_W^*	60	60
Price of domestically-produced tradables κ_H, κ_F^*	60	60
Price of non tradables κ_N, κ_N^*	60	60
Price of imported intermediate goods κ_F, κ_H^*	60	60

Table 3. Euro Area Monetary Rule

Parameter	Value
Lagged interest rate at t-1 ρ_i	0.9
Inflation ρ_Π	1.7
GDP growth ρ_{GDP}	0.4

Table 4. Steady-state National Accounts Decomposition
(Base-Case Parameters)

	Italy		Rest of the Euro Area	
Ratio of GDP	data	model	data	model
<i>MACRO VARIABLES</i>				
Private consumption	59.7	56.8	57.1	59.5
Private Investment	20.7	14.2	21.1	19.8
Export	25.8	23.6	-	-
Imports	25.9	23.6	-	-
<i>FISCAL VARIABLES</i>				
Public purchases C_g	9.3	9.3	10.3	10.3
Transfer to households	17.1	16.7	16.1	18.3
Wage bill (wl_g)	11.0	11.9	10.1	10.1
Public Investment I_g	2.3	2.3	2.6	2.6
Primary total expenditures	39.7	40.2	39.1	41.3
Interests	4.6	5.3	2.5	3.0
Total expenditures	44.3	45.6	41.6	44.3
Labor income revenues	20.4	23.1	20.8	15.6
Capital income revenues	10.1	13.0	8.6	17.3
Consumption revenues	10.1	9.6	10.7	11.4
Sum of the above revenues	40.6	45.7	40.1	44.3

Data sources: National Account data for the macroeconomic variables (averages 1999-2006).

For the fiscal variables: expenditure figures are from AMECO database for 2006 (Bank of Italy 2007); revenues data are from Eurostat (2007) and refer to 2005 .

Table 5. Steady state comparisons

	No change in expenditures		No change in taxes		Reduction in labor taxes			Reduction in capital taxes			Reduction in both taxes			
	$[B, \tau_w]$ (1)	$[B, \tau_k]$ (2)	$[B, C_g]$ (3)	$[B, L_g]$ (4)	$[B, Tr]$ (5)	$[B, C_g]$ (6)	$[B, L_g]$ (7)	$[B, Tr]$ (8)	$[B, C_g]$ (9)	$[B, L_g]$ (10)	$[B, Tr]$ (11)	$[B, C_g]$ (12)	$[B, L_g]$ (13)	$[B, Tr]$ (14)
Italy														
Output	1.0	0.9	0.4	0.5	0.1	2.4	2.0	3.3	2.1	1.5	3.1	4.1	3.1	6.5
Consumption	2.1	1.5	0.5	0.5	1.0	6.4	6.0	4.9	4.1	3.7	2.5	10.3	9.5	6.5
Investment	0.9	2.0	0.2	-0.8	-0.3	2.7	5.2	3.9	7.2	9.9	8.5	9.9	16.6	13.1
Export	0.7	0.7	0.5	0.2	0.4	0.7	0.9	0.8	0.8	0.8	0.8	1.0	1.5	1.2
Import	-0.4	-0.5	-1.3	-2.3	-1.8	1.8	4.9	3.3	1.5	4.8	3.1	4.7	12.5	8.5
Hours worked	0.8	-0.2	0.1	0.8	-0.3	2.6	0.7	3.9	-0.9	-3.0	0.3	1.6	-3.0	4.6
Effective labour cost	0.3	1.4	0.5	0.8	0.6	-0.5	-1.5	-1.0	4.0	2.9	3.5	3.0	0.6	1.8
Ater-tax real wage	8.0	1.4	0.5	0.8	0.6	7.1	6.1	6.6	4.0	2.9	3.5	10.9	8.4	9.6
Terms of trade	-0.6	-0.6	-1.0	-1.5	-1.3	1.1	3.1	2.1	0.8	3.1	1.9	2.9	7.9	5.4
Welfare: steady state	1.9	1.5	0.4	0.3	1.1	5.6	5.7	3.4	4.3	4.5	2.1	9.6	10.1	4.3
Welfare: with transition	0.0	0.1	0.1	0.0	0.0	3.2	3.1	1.2	2.1	1.9	0.0	5.3	5.0	1.1
									(6.6)			(6.1)	(1.3)	(1.3)
Rest of the Euro area														
Output	0.4	0.4	0.1	-0.2	-0.1	0.7	1.3	1.0	0.7	1.3	0.9	1.3	2.7	2.0
Consumption	0.1	0.0	-0.4	-0.6	-0.4	0.3	1.0	0.7	0.2	0.9	0.7	0.9	2.6	1.7

Table 6. Robustness

	Baseline			$\omega = 0.0$			$\lambda = 0.0$		
	$[B, C_g]$ (1)	$[B, L_g]$ (2)	$[B, Tr]$ (3)	$[B, C_g]$ (4)	$[B, L_g]$ (5)	$[B, Tr]$ (6)	$[B, C_g]$ (7)	$[B, L_g]$ (8)	$[B, Tr]$ (9)
Italy									
Output	4.1	3.1	6.5	4.0	2.9	6.4	4.0	3.7	6.9
Consumption	10.3	9.5	6.5	10.1	9.3	6.4	10.3	10.0	6.9
Investment	9.9	16.6	13.1	9.7	16.4	13.0	9.7	17.2	13.6
Export	1.0	1.5	1.2	0.9	1.4	1.1	0.9	1.6	1.2
Import	4.7	12.5	8.5	4.6	12.3	8.3	4.6	13.2	9.0
Hours worked	1.6	-3.0	4.6	1.5	-3.3	4.5	1.5	-2.5	5.2
Effective labour cost	3.0	0.6	1.8	3.0	0.7	1.8	3.0	0.4	1.6
Ater-tax real wage	10.9	8.4	9.6	10.9	8.4	9.7	10.9	8.2	9.4
Terms of trade	2.9	7.9	5.4	2.8	7.8	5.3	2.9	8.4	5.8
Welfare: steady state	9.6	10.1	4.3	9.6	10.1	4.2	9.6	11.0	4.5
Welfare: with transition	5.3	5.0	1.1	5.3	5.1	1.0	5.3	5.6	1.1
Rest of the Euro area									
Output	1.3	2.7	2.0	1.2	2.6	1.9	1.2	2.8	2.0
Consumption	0.9	2.6	1.7	0.8	2.4	1.6	0.8	2.7	1.8

Figure 1. DELAYED reduction in tax rates

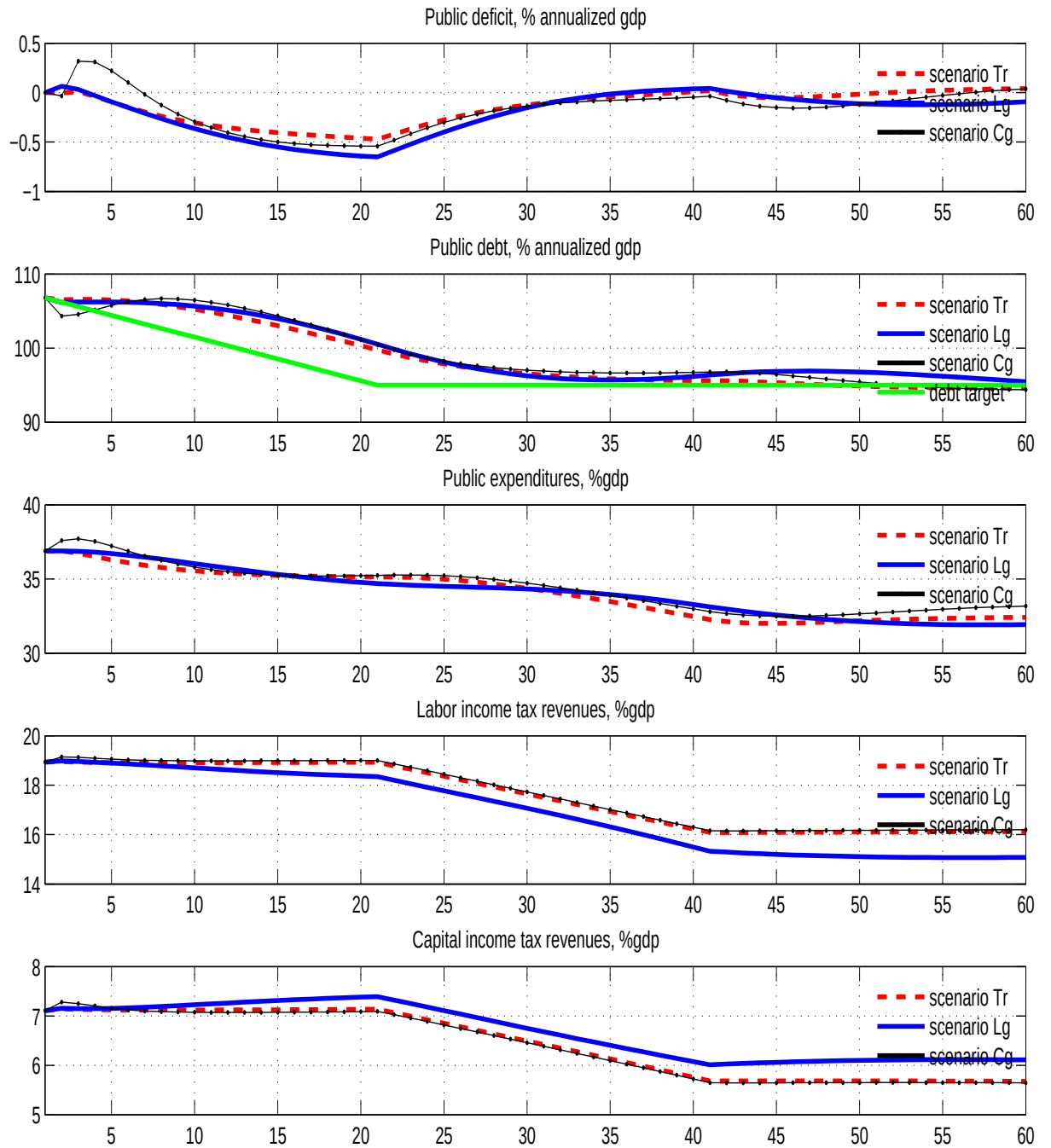


Figure 2. DELAYED reduction in tax rates

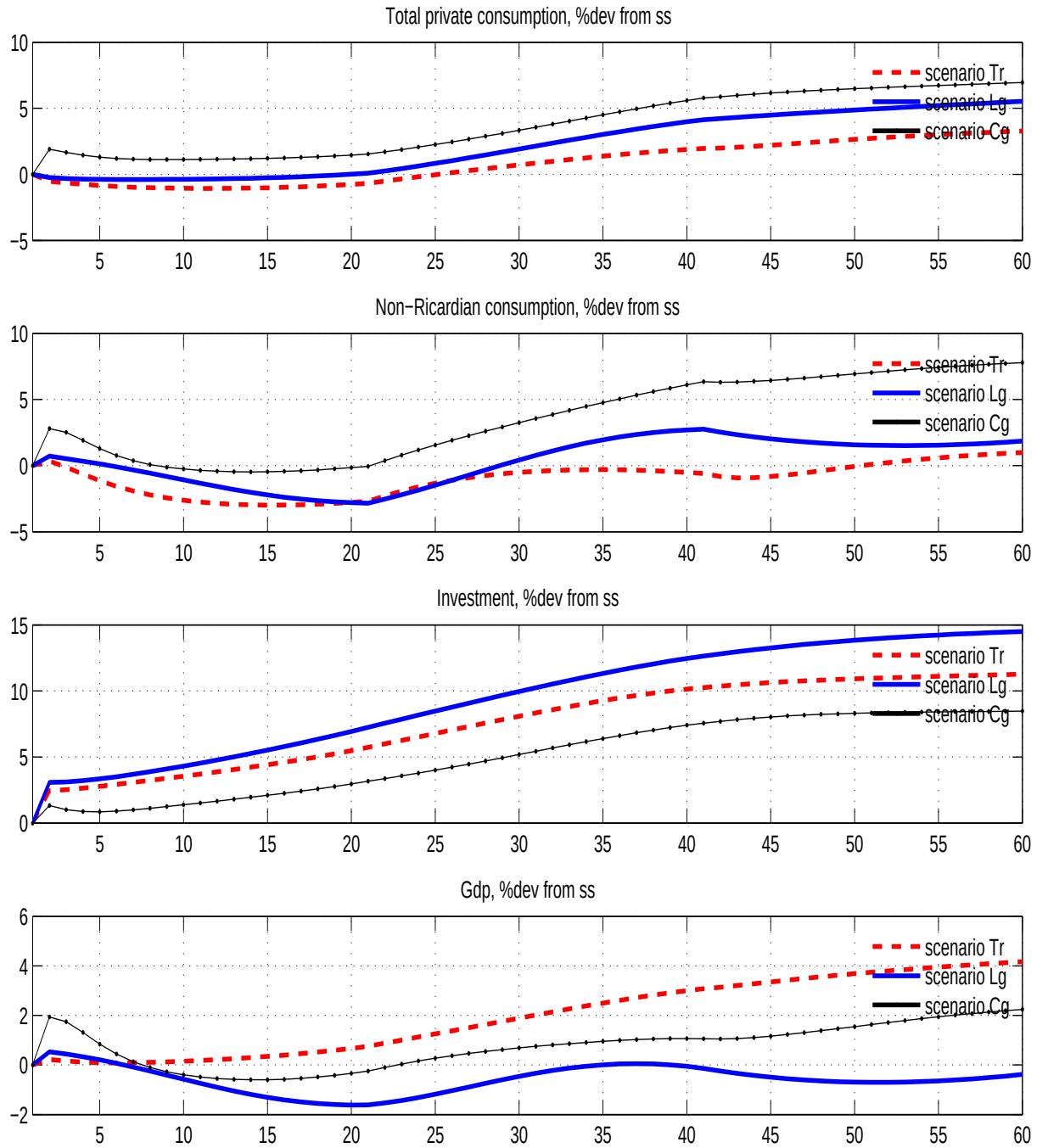


Figure 3. DELAYED reduction in tax rates

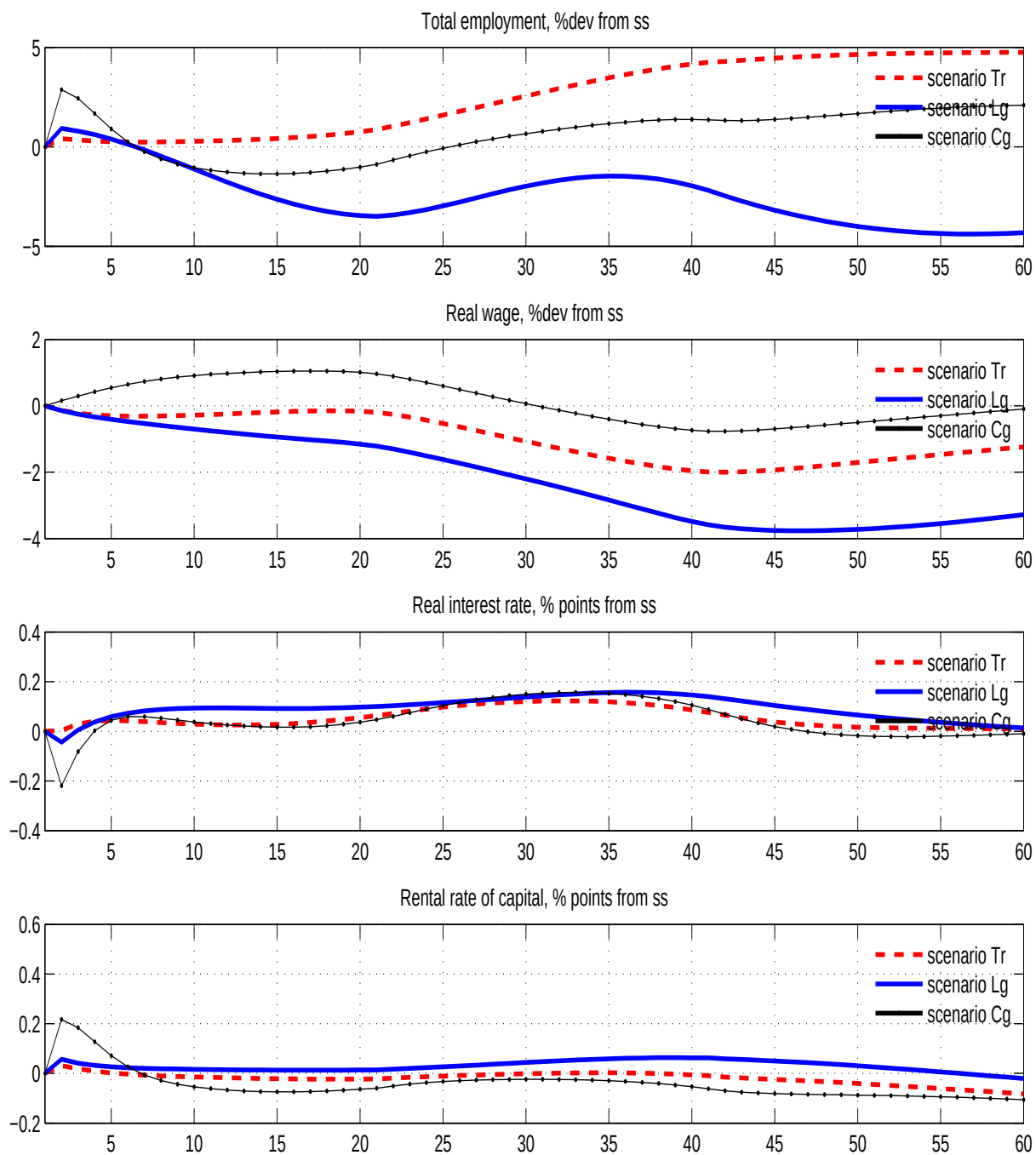


Figure 4. DELAYED reduction in tax rates

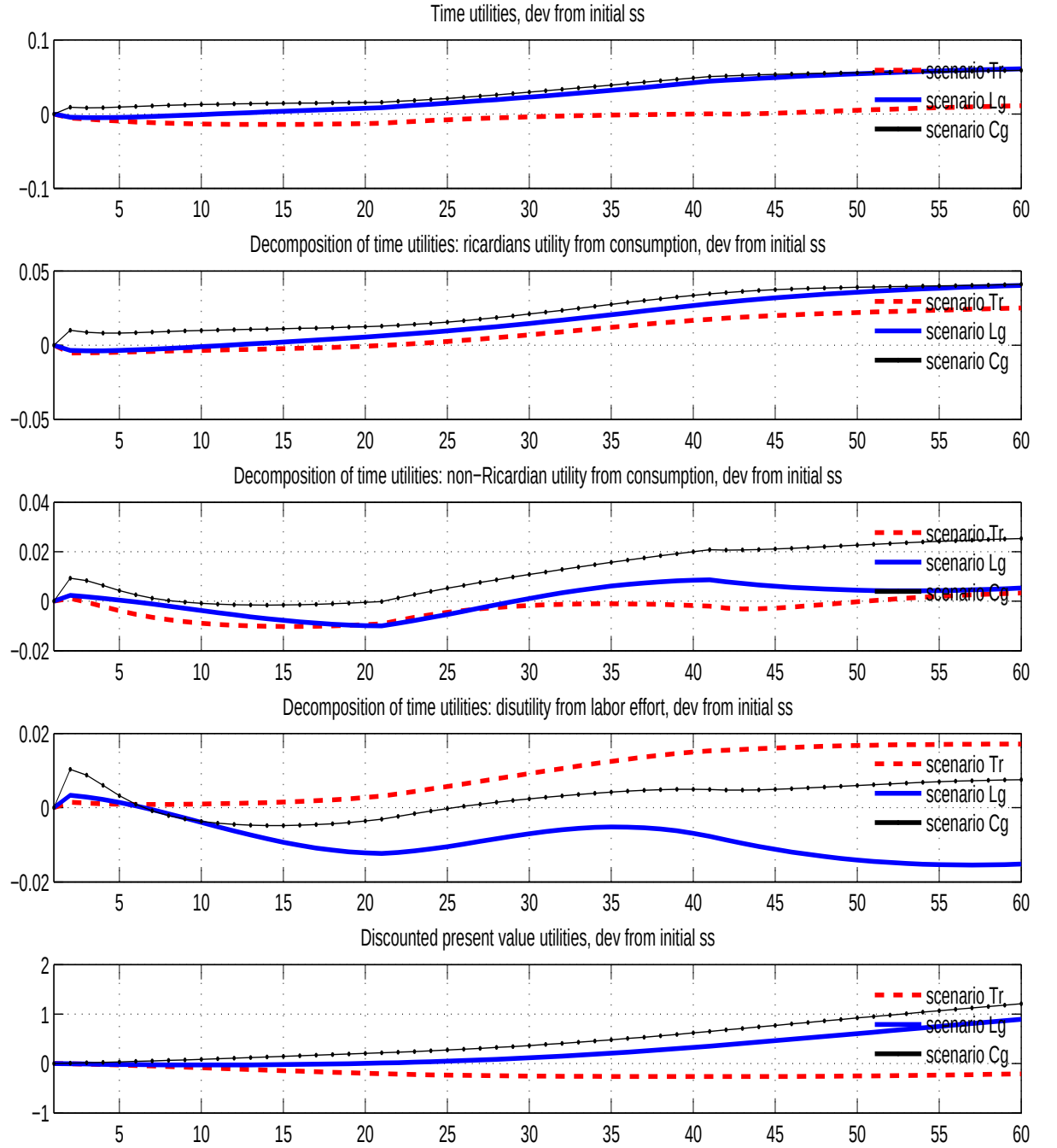


Figure 5. IMMEDIATE reduction in tax rates

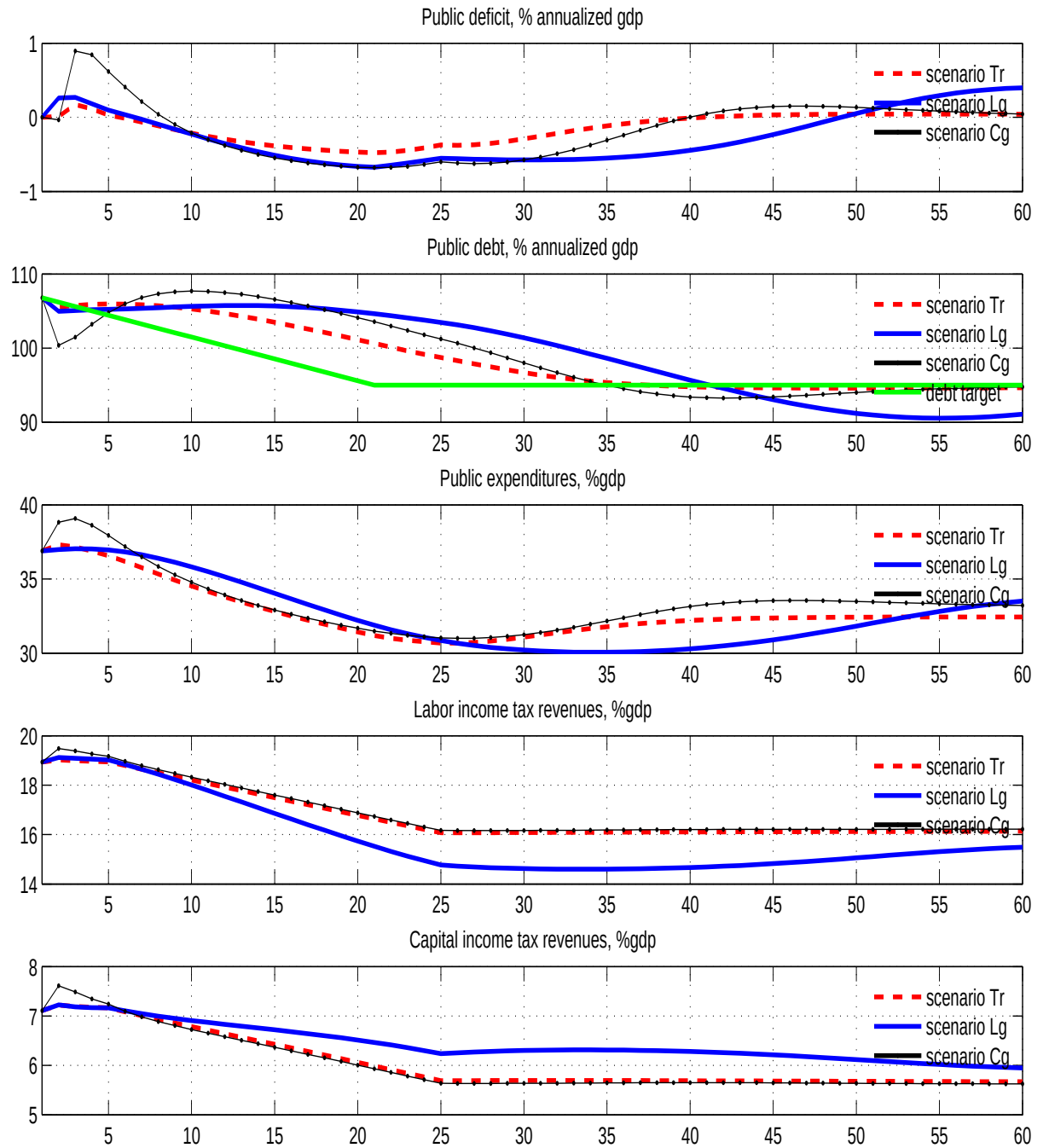


Figure 6. IMMEDIATE reduction in tax rates

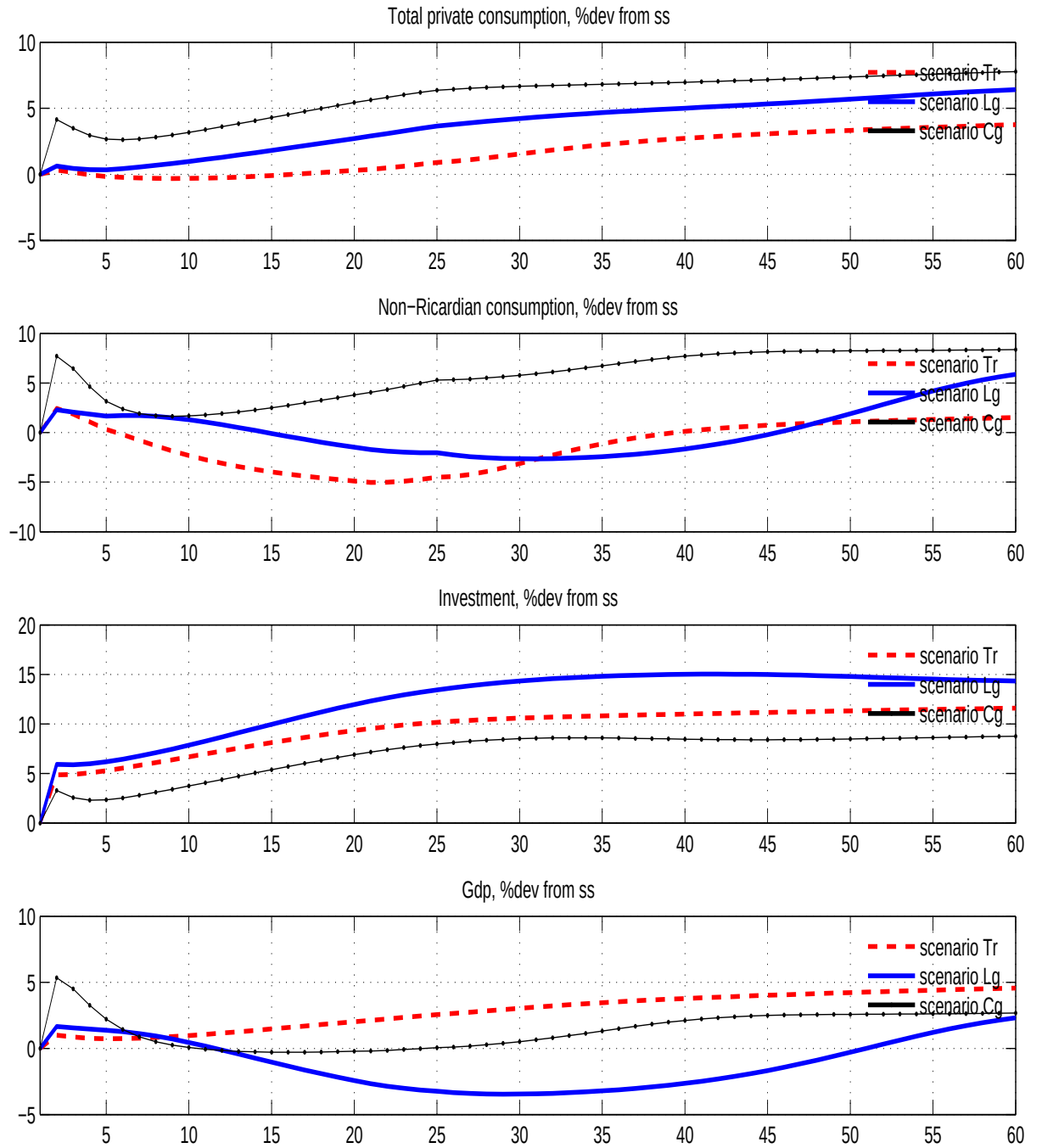


Figure 7. IMMEDIATE reduction in tax rates

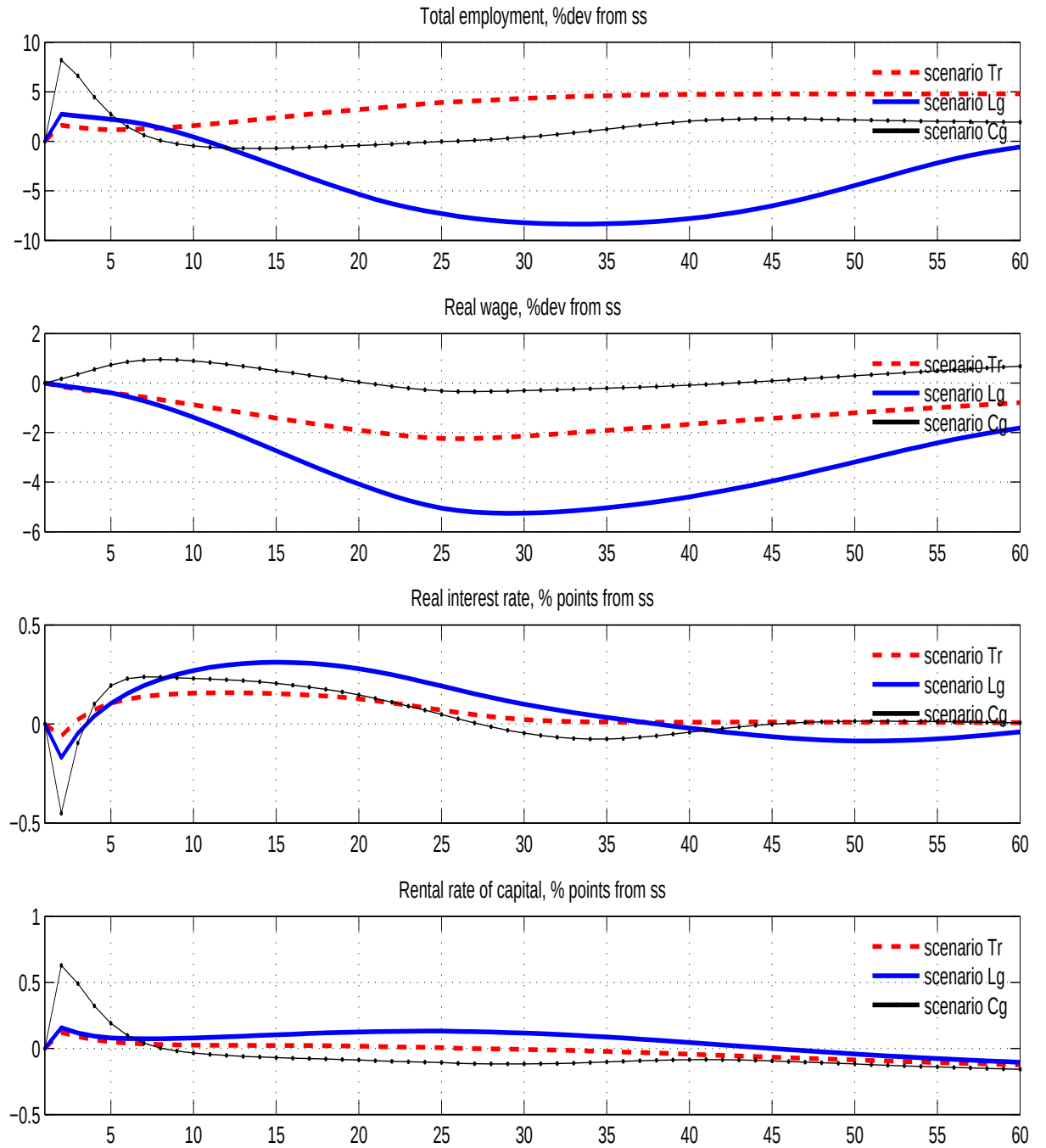


Figure 8. IMMEDIATE reduction in tax rates

