PROJECTIONS BASED ON LONG-RUN MACROECONOMIC MODEL OF SLOVAKIA

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Reconciling public finances and
old-age social security

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A brief description of the model

- The projection of future evolution of Slovak pension system as well as of the entire economy is generated by Long-run macroeconomic model of Slovakia (SLMM)

- The model is based on so-called Long-run Macroeconomic Model of the Austrian Economy, created by Baumgartner et al. (2004)

- The model is supply side oriented and relies heavily on assumptions of neoclassical economic theory (production technology meeting constant returns to scale, factor demand based on first order optimality conditions, etc.)

- It currently consists of 165 equations and 562 variables (165 endogenous and 397 exogenous)

- Thematically similar equations are grouped into 7 interconnected blocks

Structure of the model

- 7 blocks of SLMM:
  - Block of private sector or firms
  - Block of final consumption or households
  - Block of labor market
    - Labor demand
    - Labor supply
  - Block of household income
  - Block of public sector
  - Block of social system
    - Second pillar of Slovak pension system
    - Third pillar of Slovak pension system
  - Block of the rest of the world

The parametrization and used data

- The model is calibrated based on historical data for the Slovak Republic (Slovak statistical office, National social insurance company, National health insurance company, Infostat, NBS, Institute for fiscal policy, Institute for health policy, Eurostat)

- Used are time series for macroeconomic indicators on national level, the longest of which cover period 1995-2017; however, in case of number of indicators only the period 2000-2013 was used for calibration, due to insufficiency of data

- The population is within the model disaggregated by sex and age (using 14 age cohorts of length of 5 years for both males and females)

- Out-of-sample solution is driven by demographic projections for Slovakia up to year 2200 (Boris Vaňo, Infostat) as well as the information about the expected development of the II. pension pillar based on DYNREG (Ján Šebo)

The generation of projections and the solution of model

- The majority of exogenous variables and parameters is kept fixed when projecting the development of endogenous variables during the period 2003-2100

- The projections are generated as dynamic, deterministic simulations using Eviews environment, with build-in Gauss-Siedel Solution algorithm with constant growth rates of endogenous variables as terminal conditions (maximum number of iterations = 100 000, convergence criterion = 0.01)

- Generated projections should in no sense be regarded as forecasts of the future (the most likely outcome or state of the economy in the future)

- Since the used economic theory is not verified within the modelling process and the time horizons are rather long, the contribution of the model lies in the possibility to generate and compare variant scenarios, keeping in mind that differences are for the described abstraction of reality and not actual difference that might be observed in reality

Scenarios and policy measures

- Baseline scenario
- Demographic effects
  - Very low population scenario
  - Low population scenario
  - Medium population scenario
  - High population scenario
  - Very high population scenario
- Statutory retirement age (SRA) changes
  - SRA fixed at 64 years
  - Increase in the SRA with unadjusted 33.4% of change in life expectancy
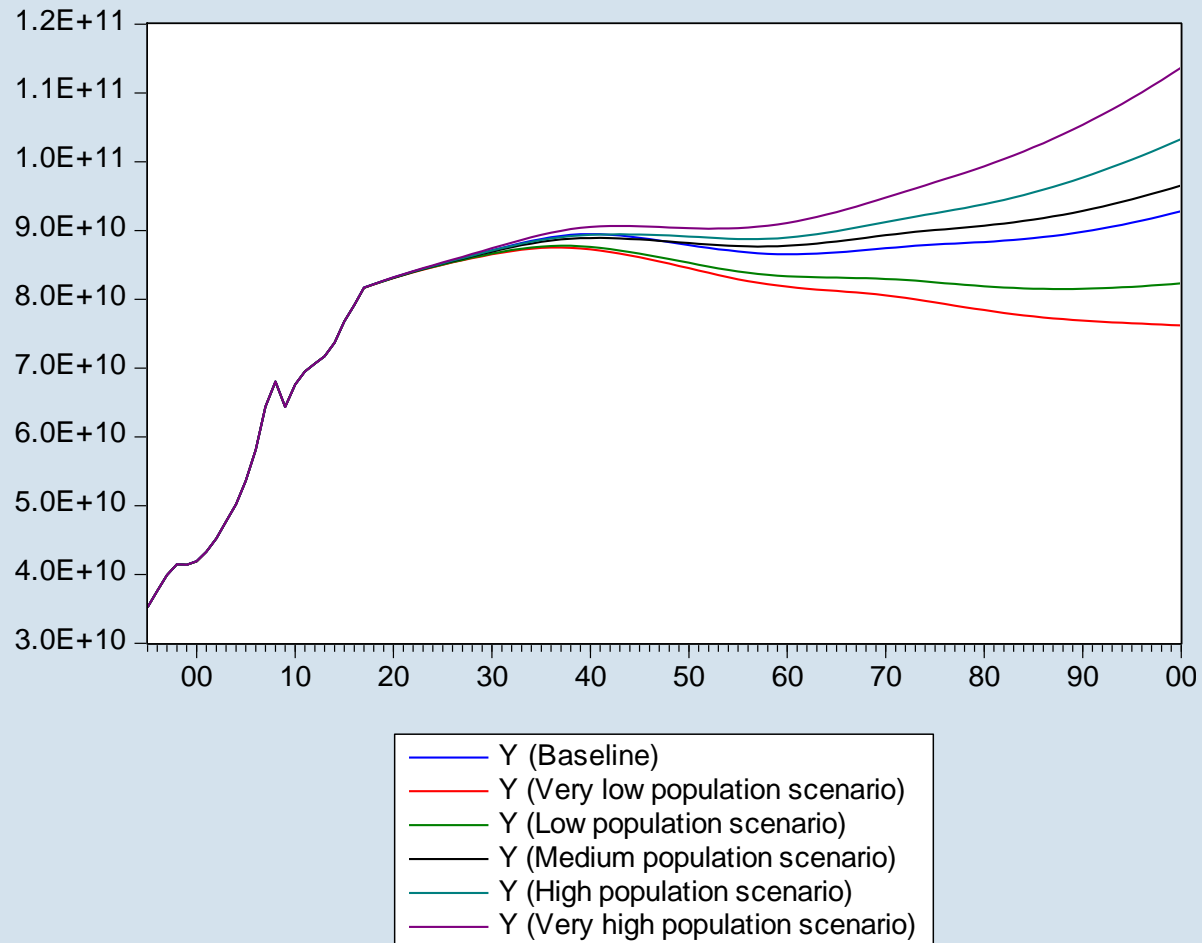 - Increase in the SRA with unadjusted 50.0% of change in life expectancy
  - Increase in the SRA with unadjusted 66.6% of change in life expectancy

Scenarios and policy measures

- Effect of second pension pillar
  - Dismantling of the second pillar in 2025
  - Contra-factual scenario with no second pillar
  - Growth oriented investment rules for the second pillar
- Different multi-pillar setting
  - Distribution of contributions between first and second pillar are fixed at 9:9
  - Distribution of contributions between first and second pillar are fixed at 4:14
  - Distribution of contributions between first and second pillar are fixed at 12:6
- Additional pension-system sources
  - Corporate tax which directly funds the first pillar from 2020

Demographic effects – Real GDP

Demographic effects – Real Income
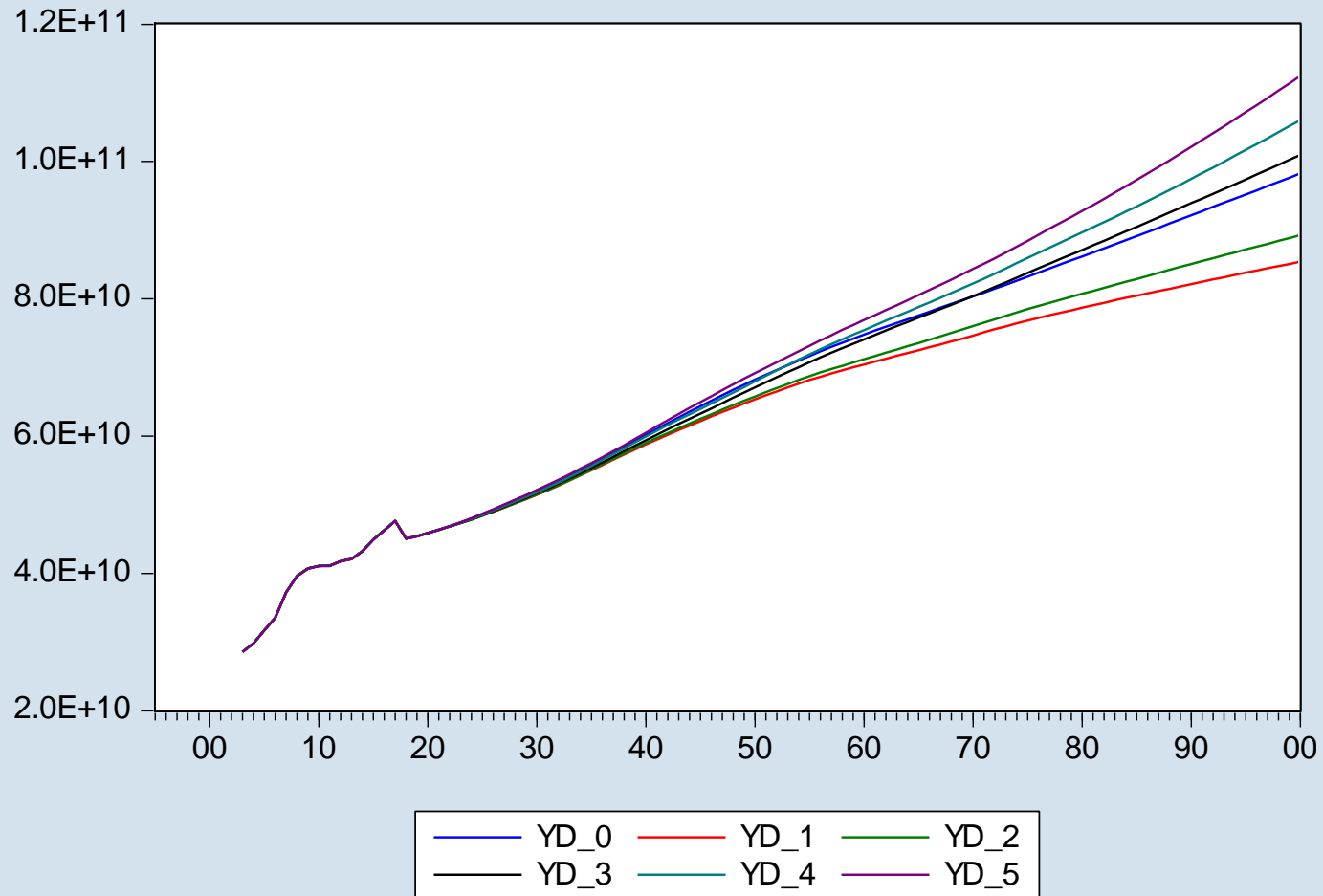
Demographic effects – Real Consumption
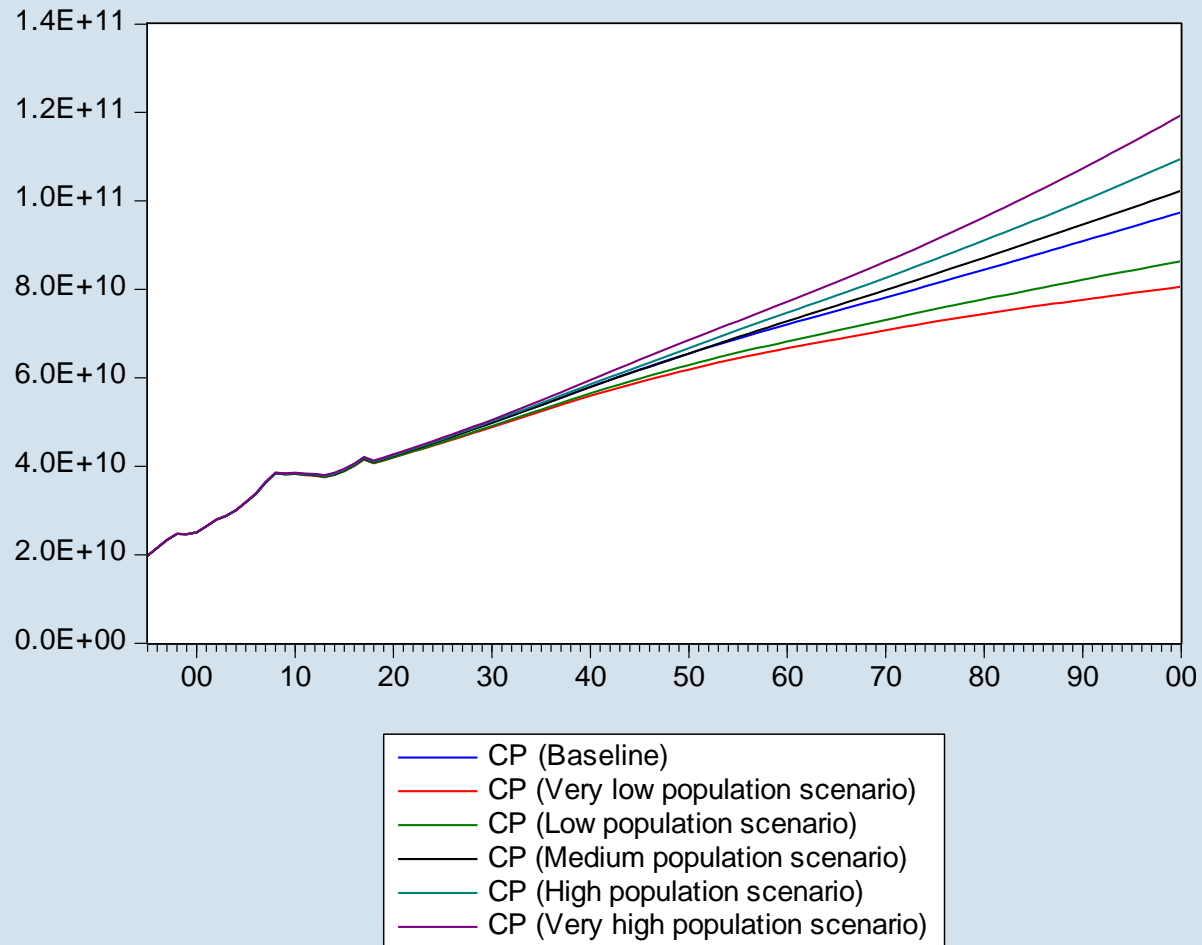
Demographic effects – Government Debt

GD_Y (Baseline)
GD_Y (Very low population scenario)
GD_Y (Low population scenario)
GD_Y (Medium population scenario)
GD_Y (High population scenario)
GD_Y (Very high population scenario)
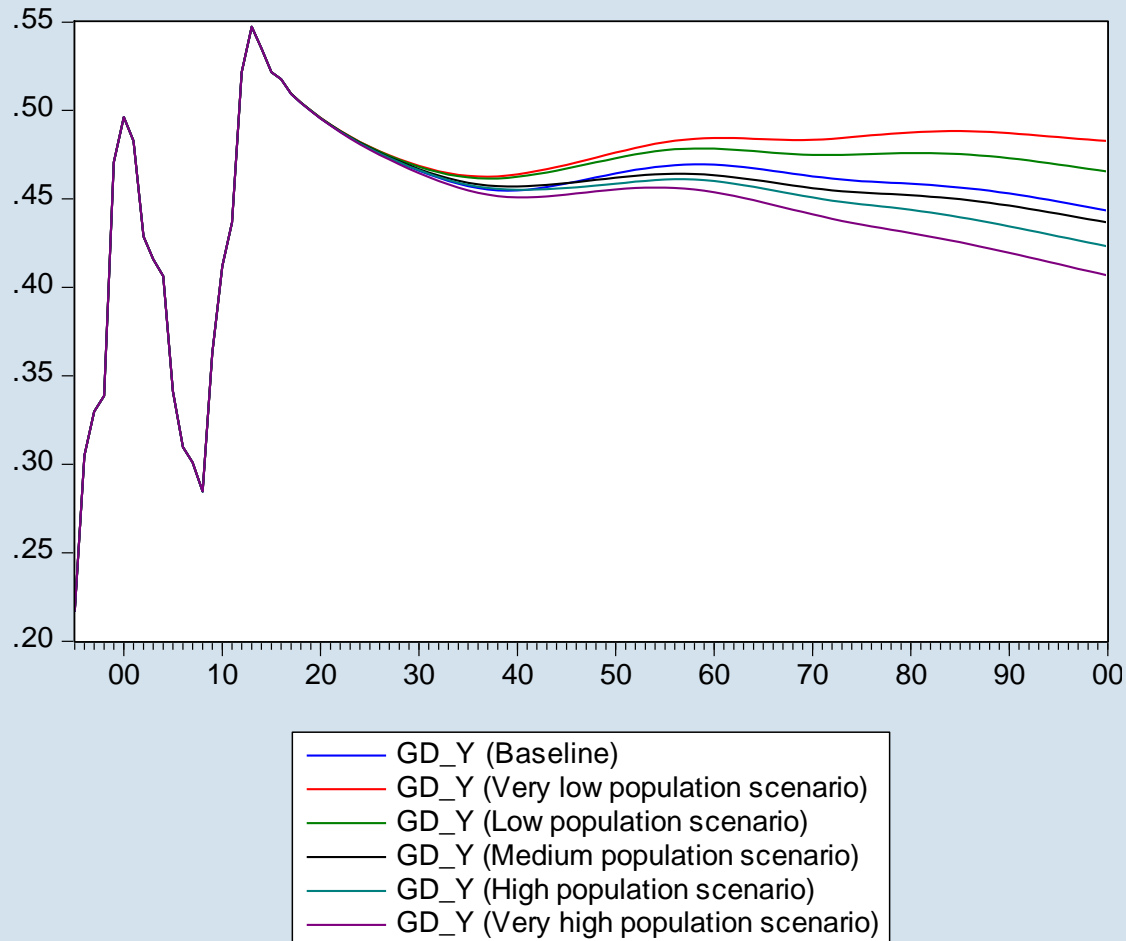
Demographic effects – Public Sector Expenditures

Legend:
- PSE_0/(Y_0*P)
- PSE_1/(Y_1*P)
- PSE_2/(Y_2*P)
- PSE_3/(Y_3*P)
- PSE_4/(Y_4*P)
- PSE_5/(Y_5*P)
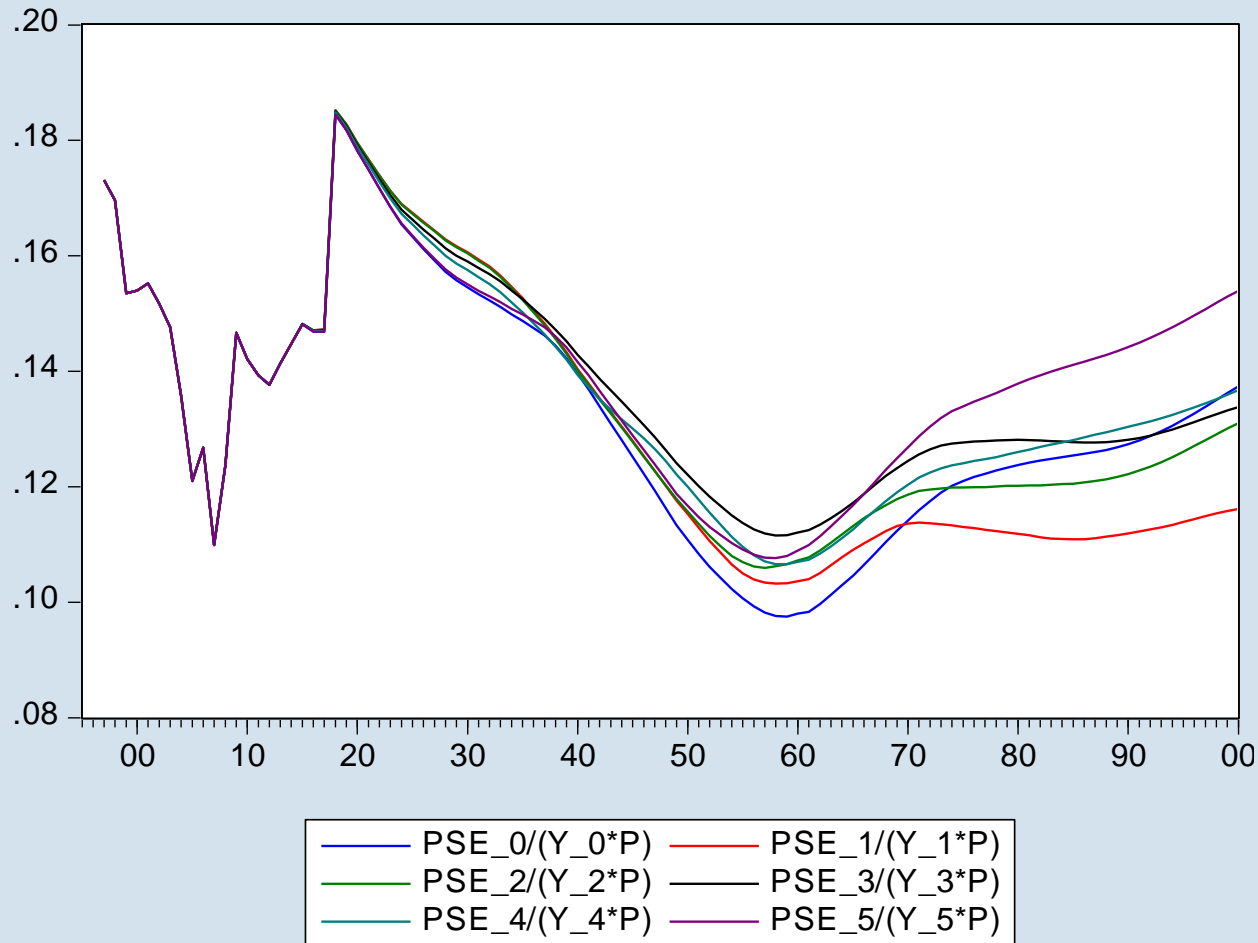
Demographic effects – First Pension Pillar Balance

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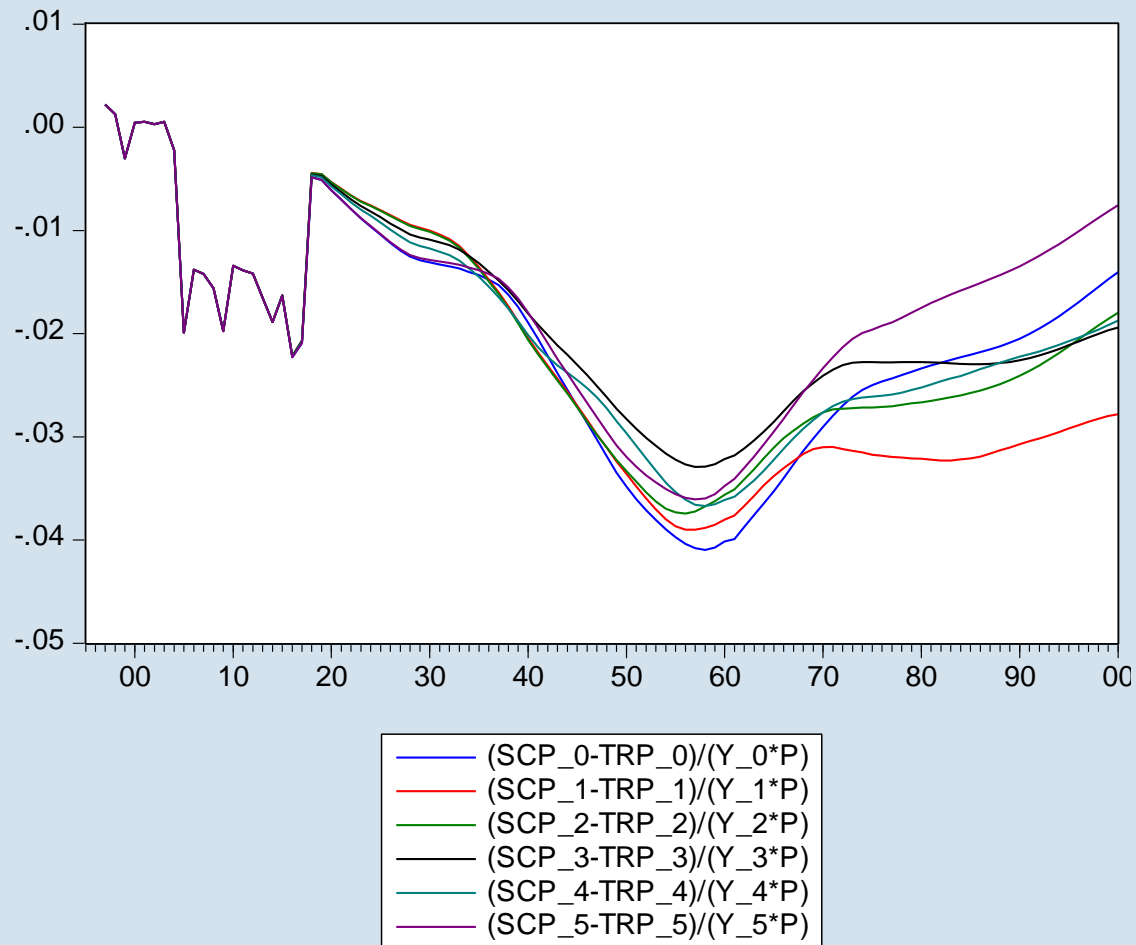
Statutory Retirement Age – Real GDP
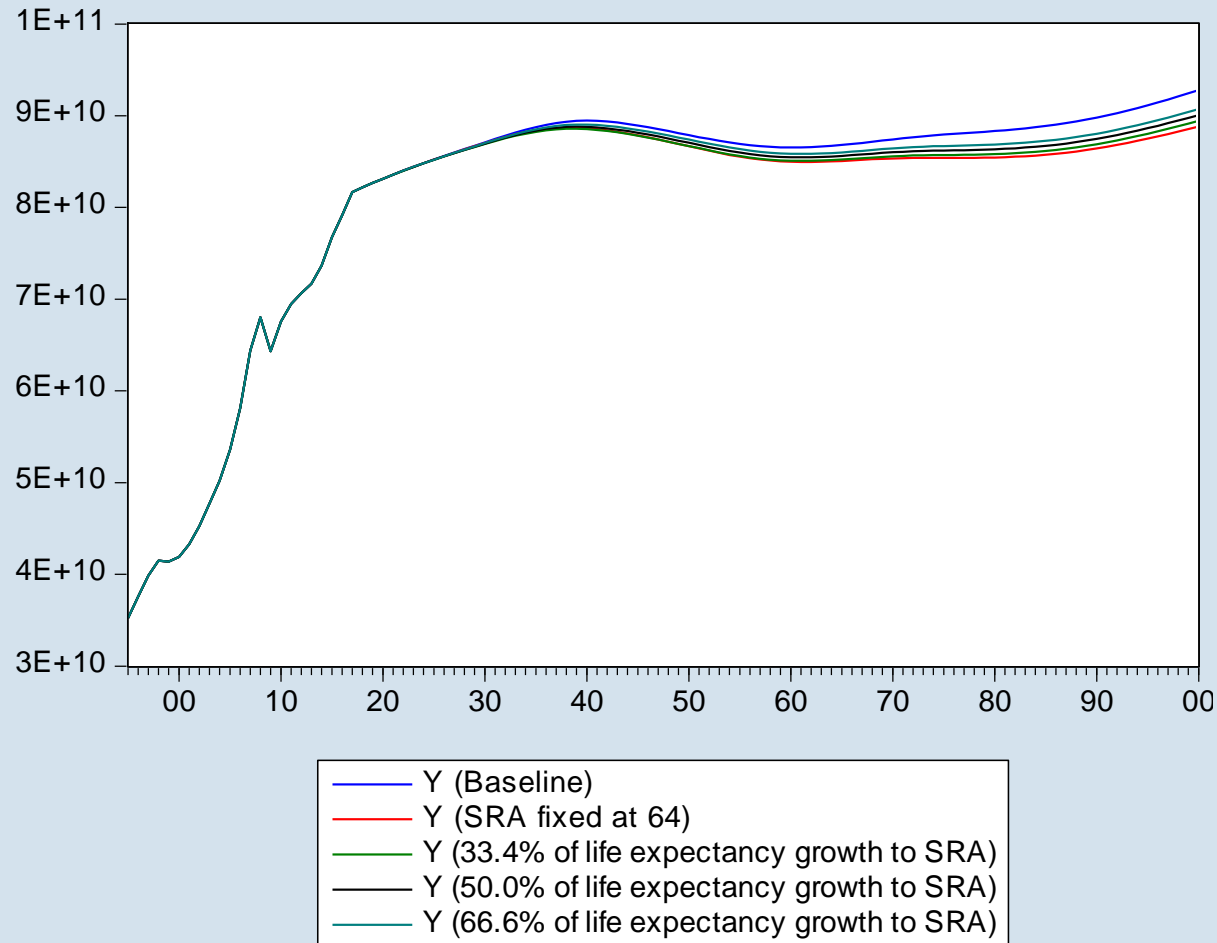
Statutory Retirement Age – Real Income
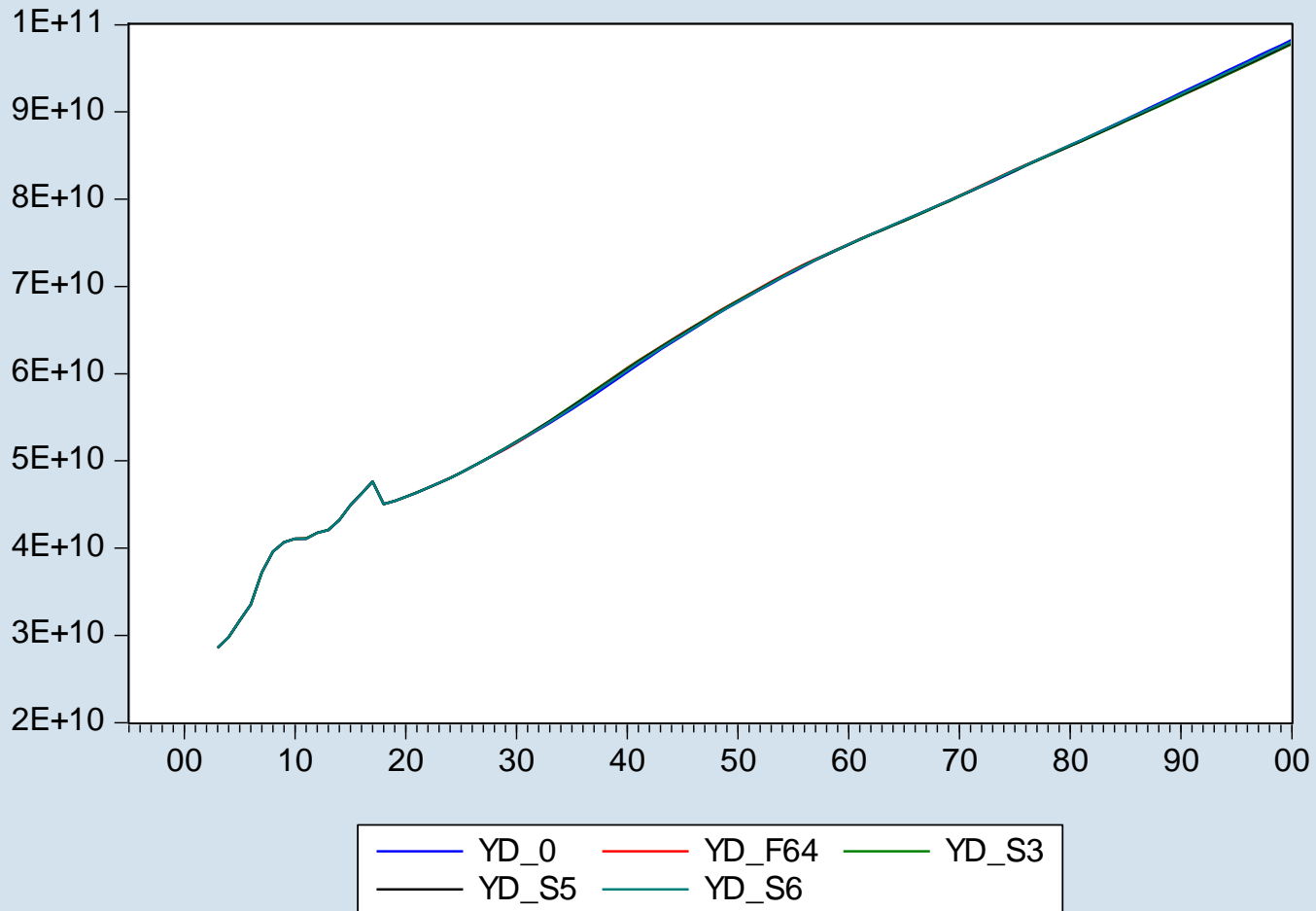
Statutory Retirement Age – Real Consumption
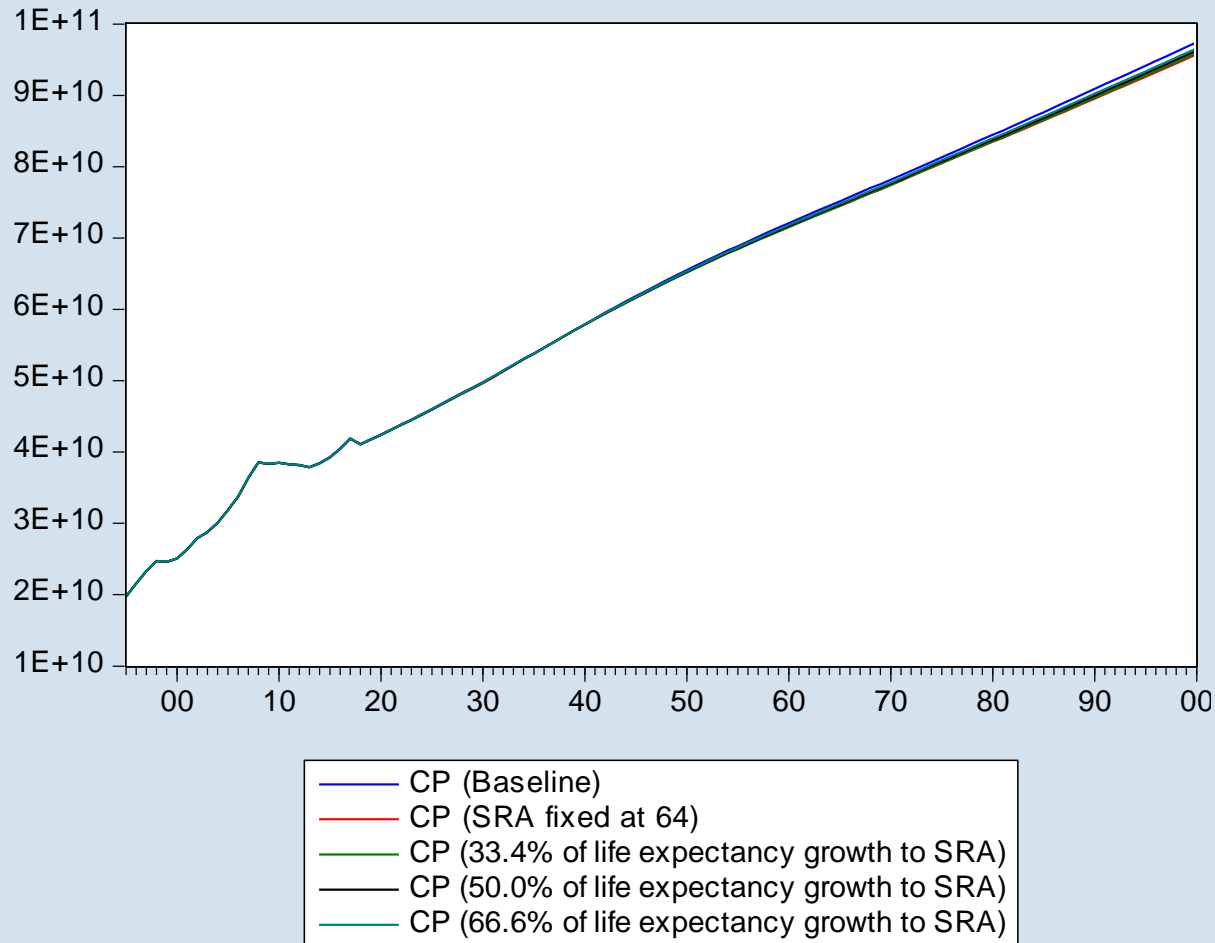
Statutory Retirement Age – Government Debt
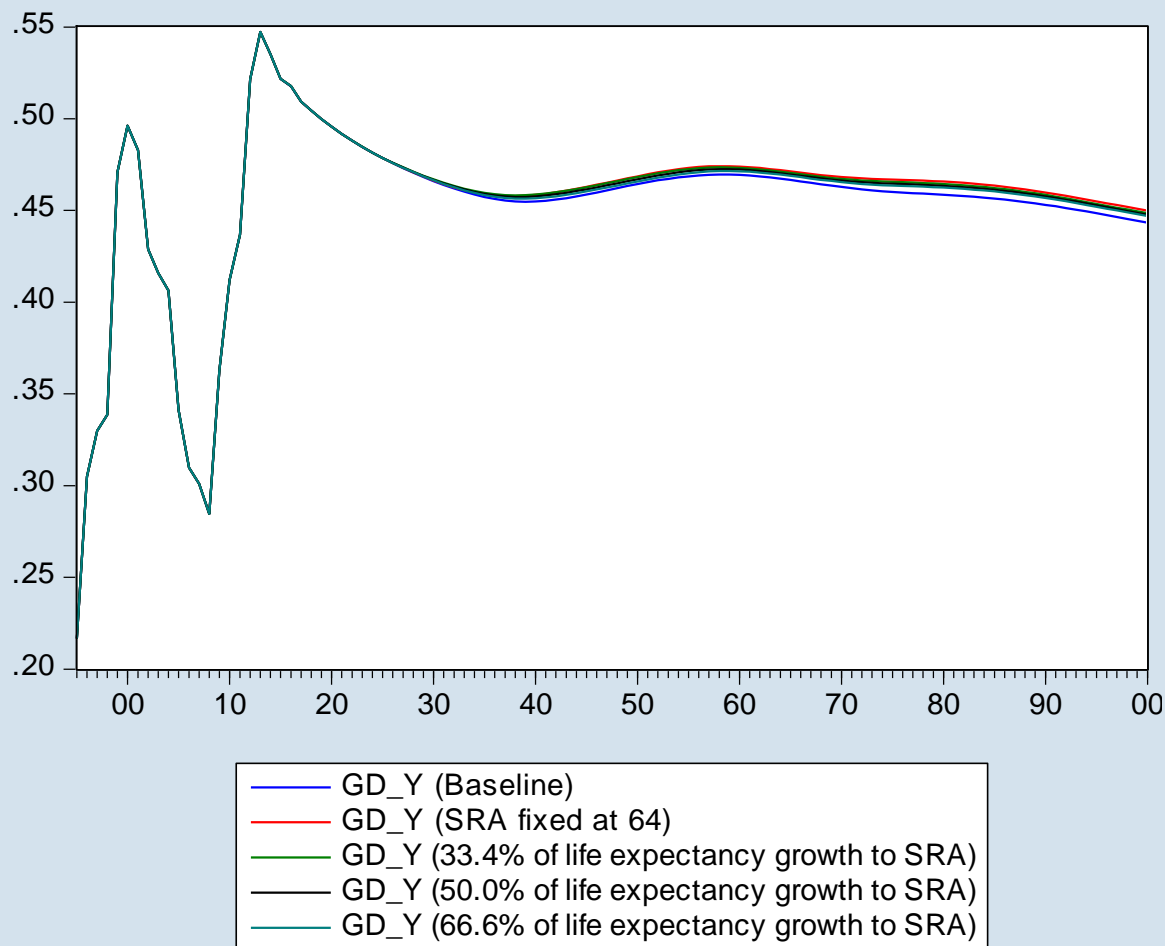
Statutory Retirement Age – Public Sector Expenditures
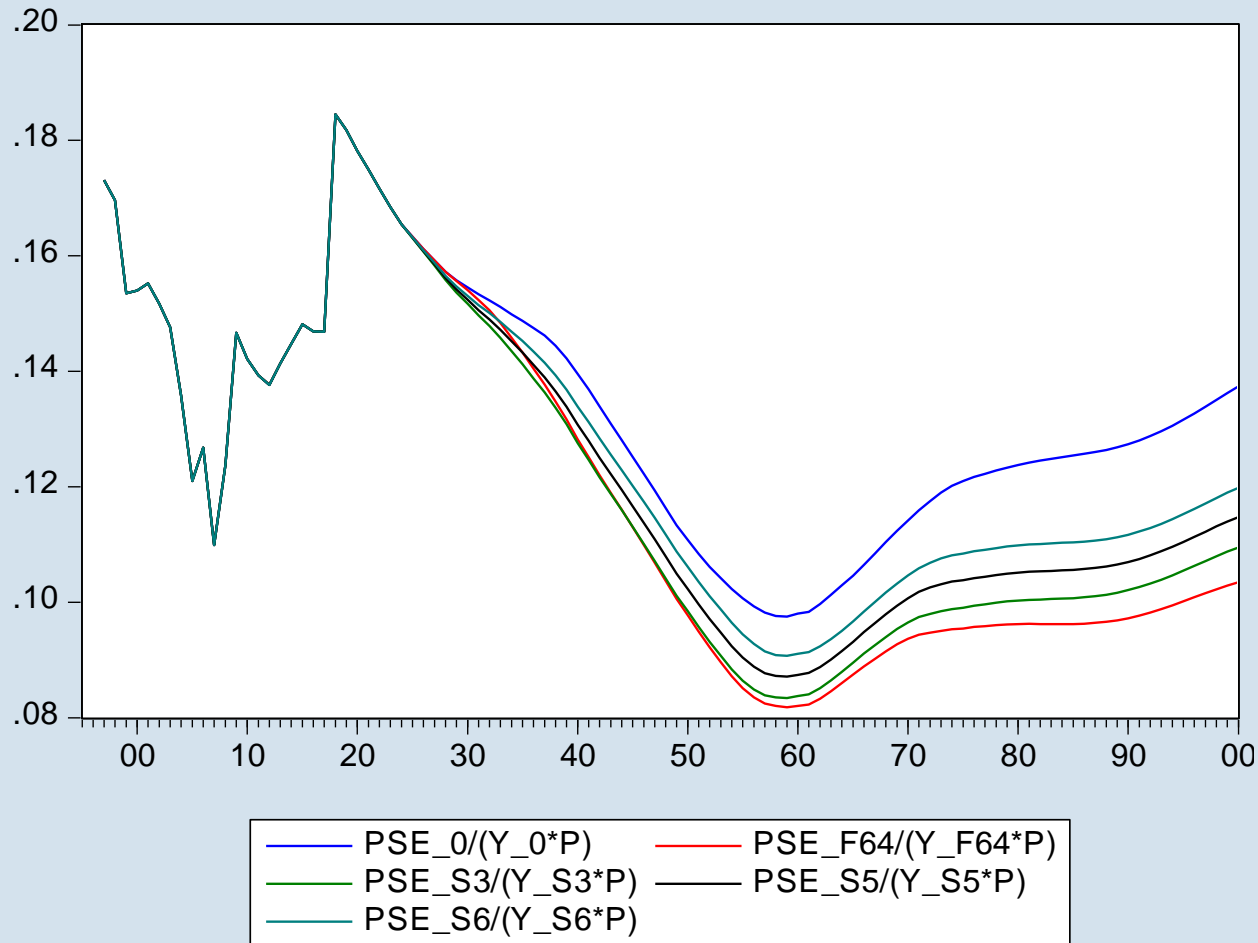
Statutory Retirement Age – First Pension Pillar Balance
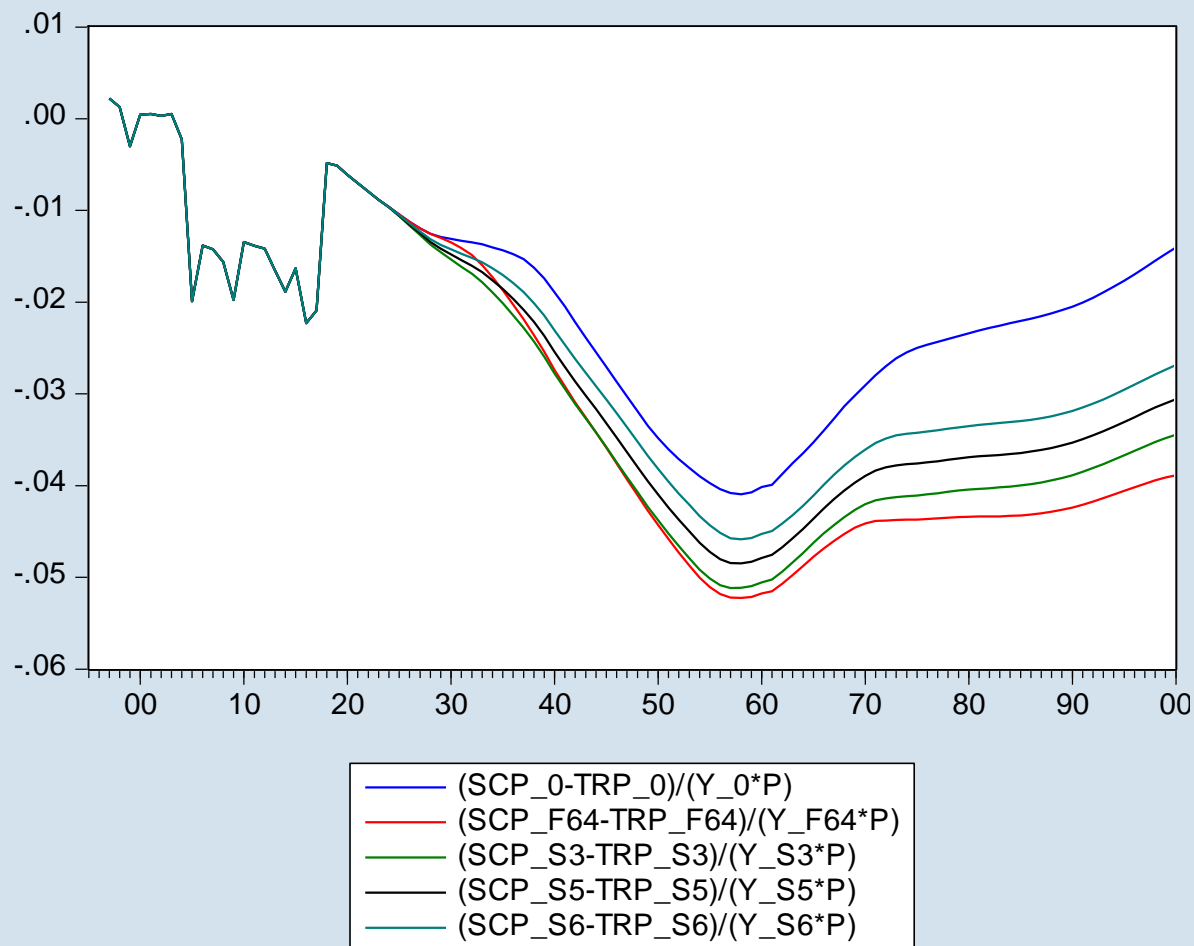
Effect of Second Pension Pillar - Real GDP
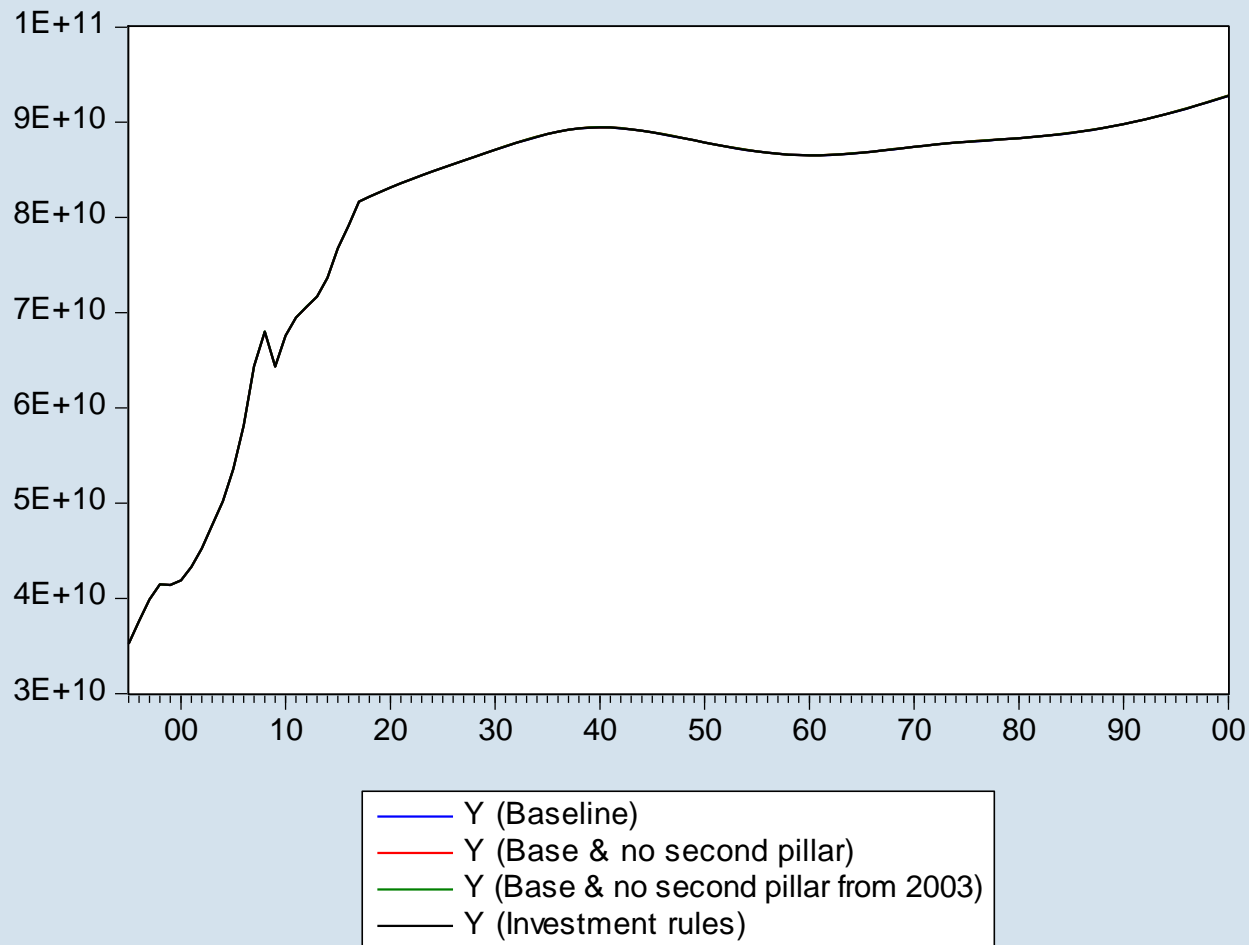
Effect of Second Pension Pillar - Real Income
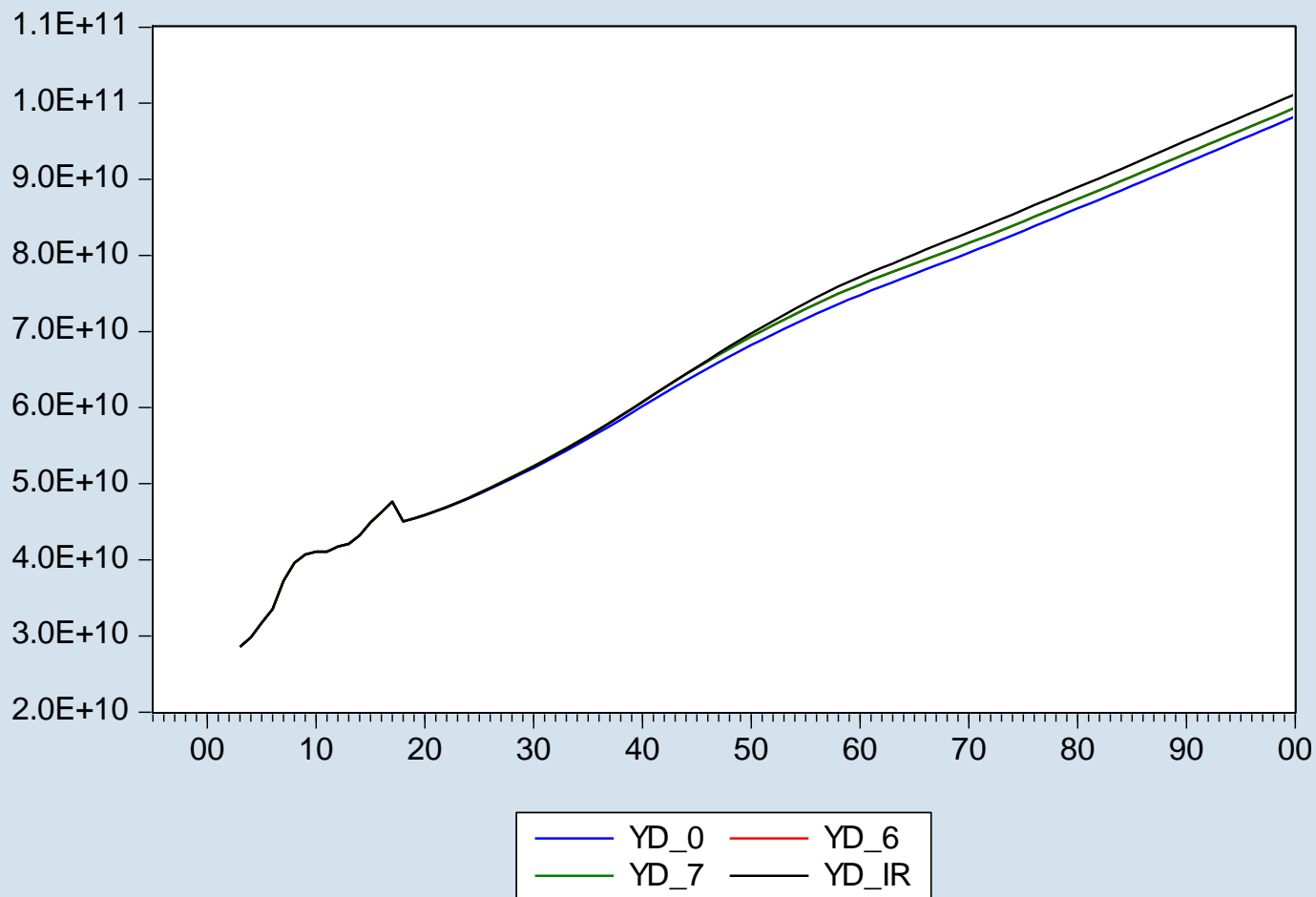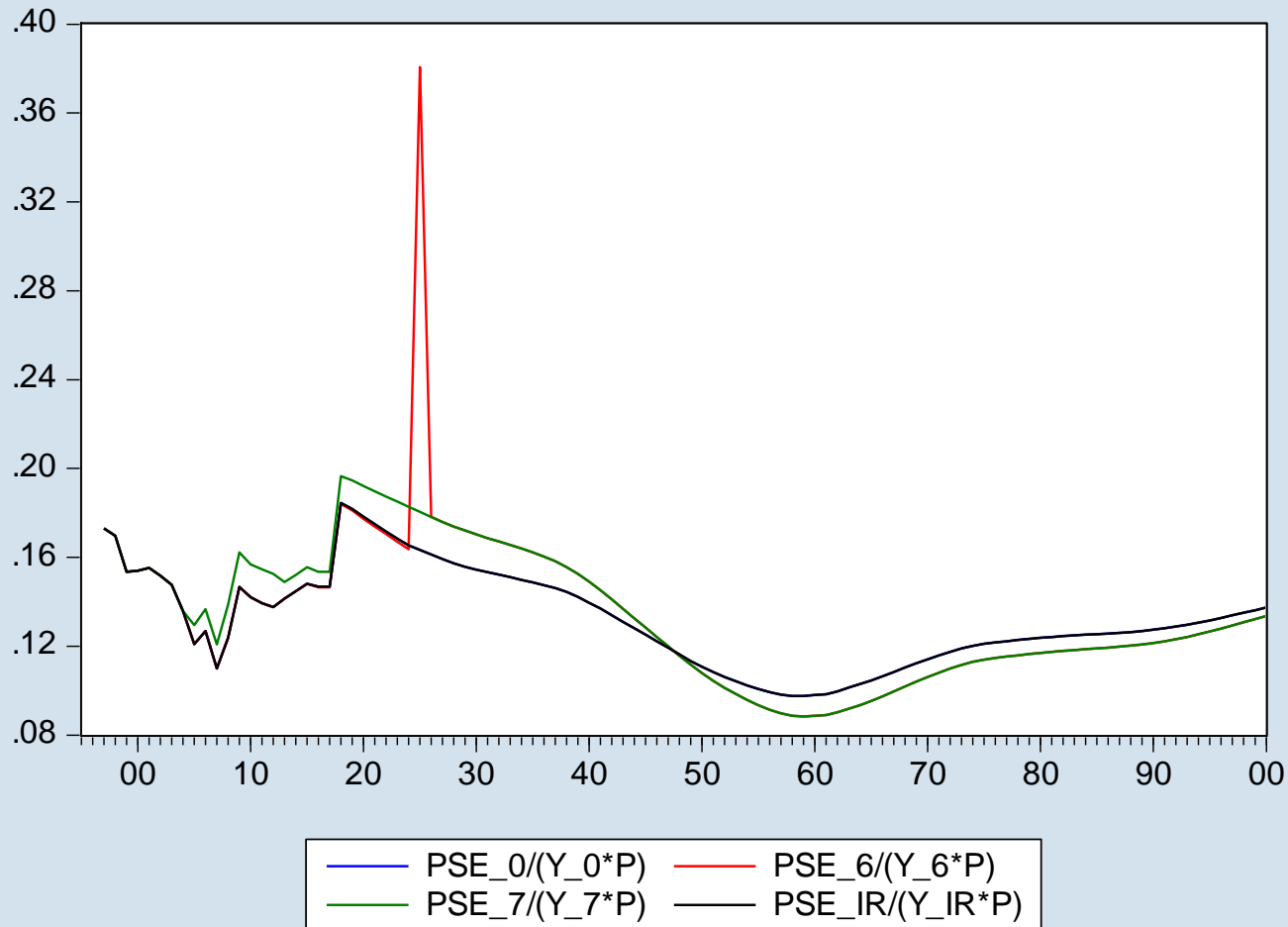
Effect of Second Pension Pillar - Real Consumption
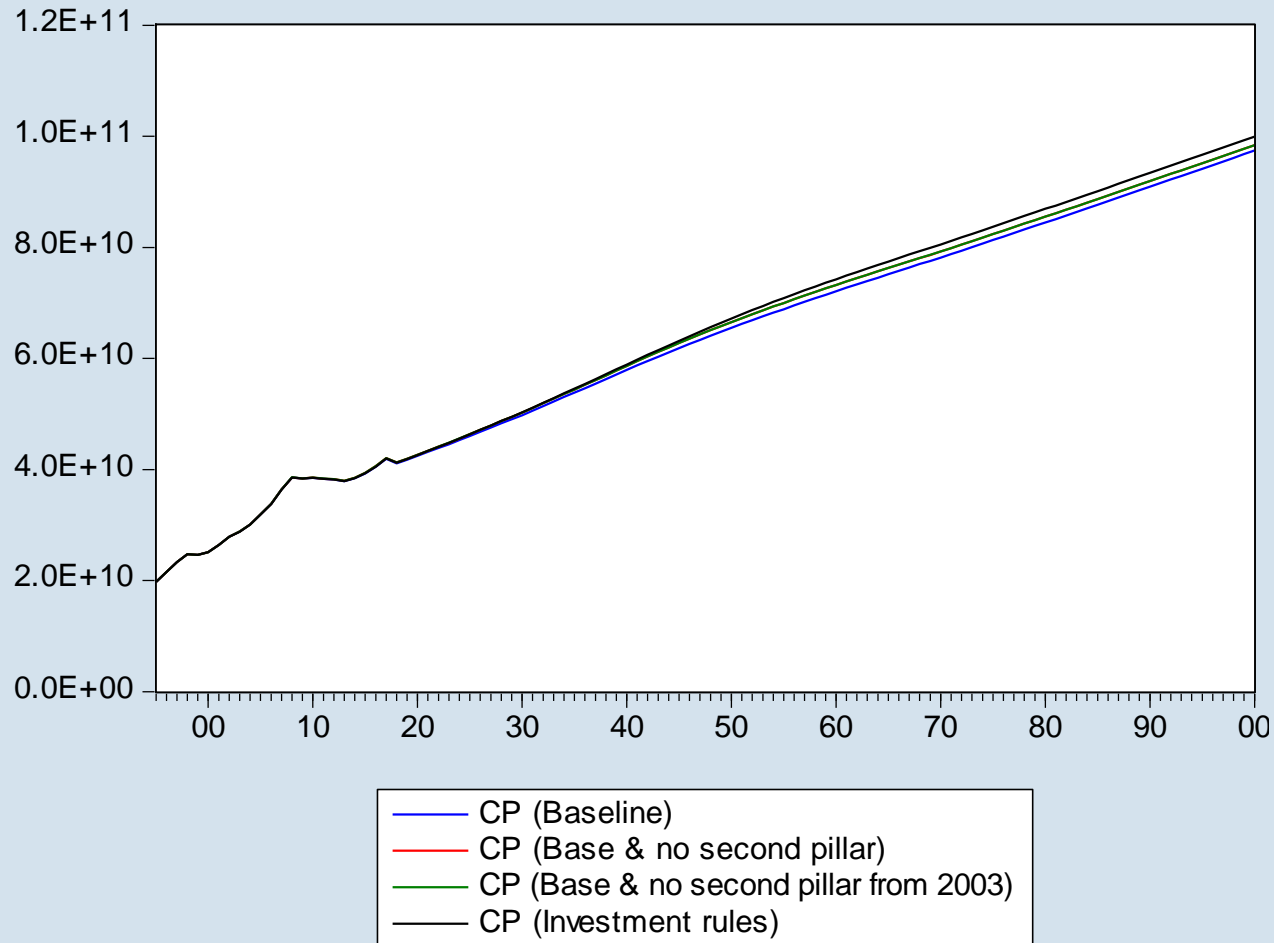
Effect of Second Pension Pillar - Government Debt

Legend:
- GD_Y (Baseline)
- GD_Y (Base & no second pillar)
- GD_Y (Base & no second pillar from 2003)
- GD_Y (Investment rules)
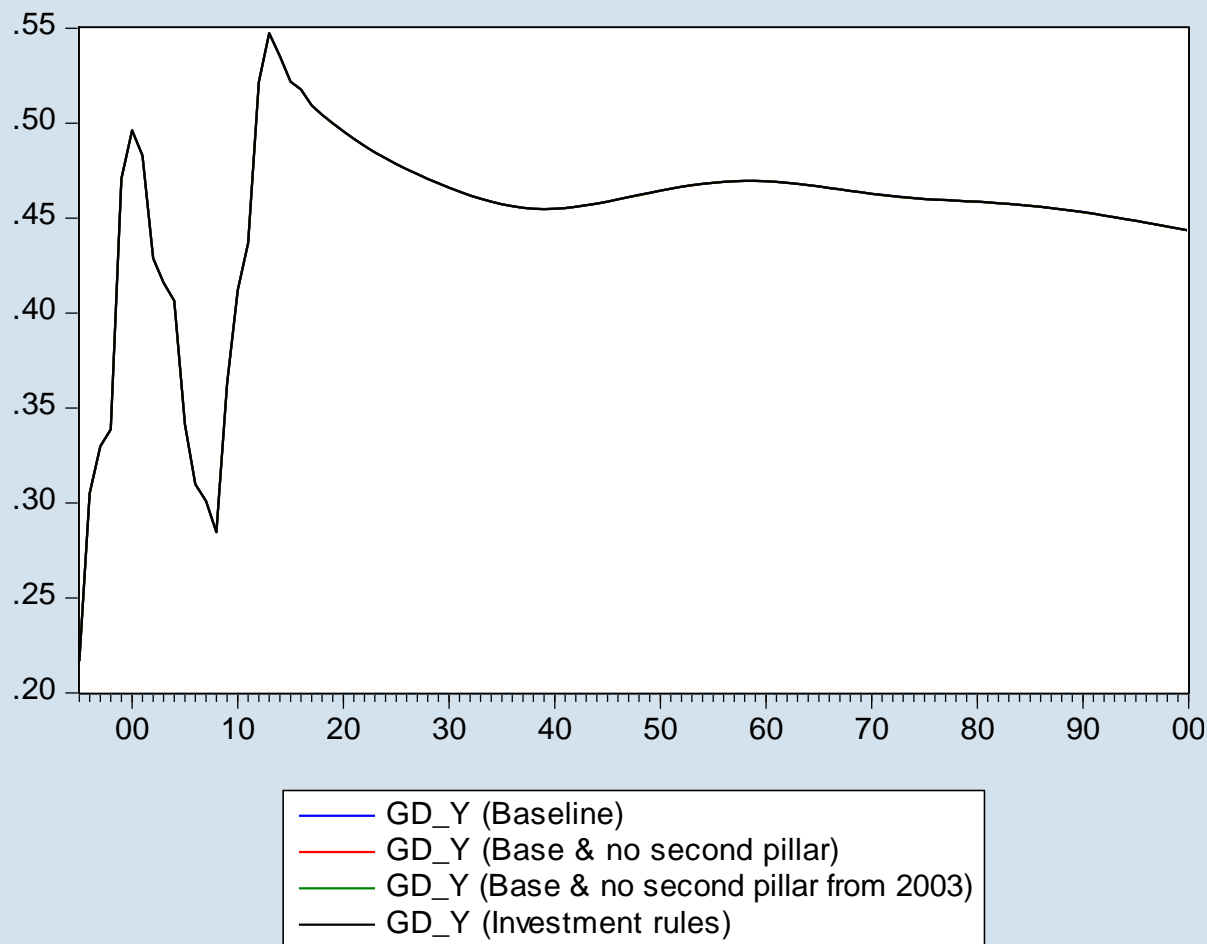
Effect of Second Pension Pillar - Public Sector Expenditures

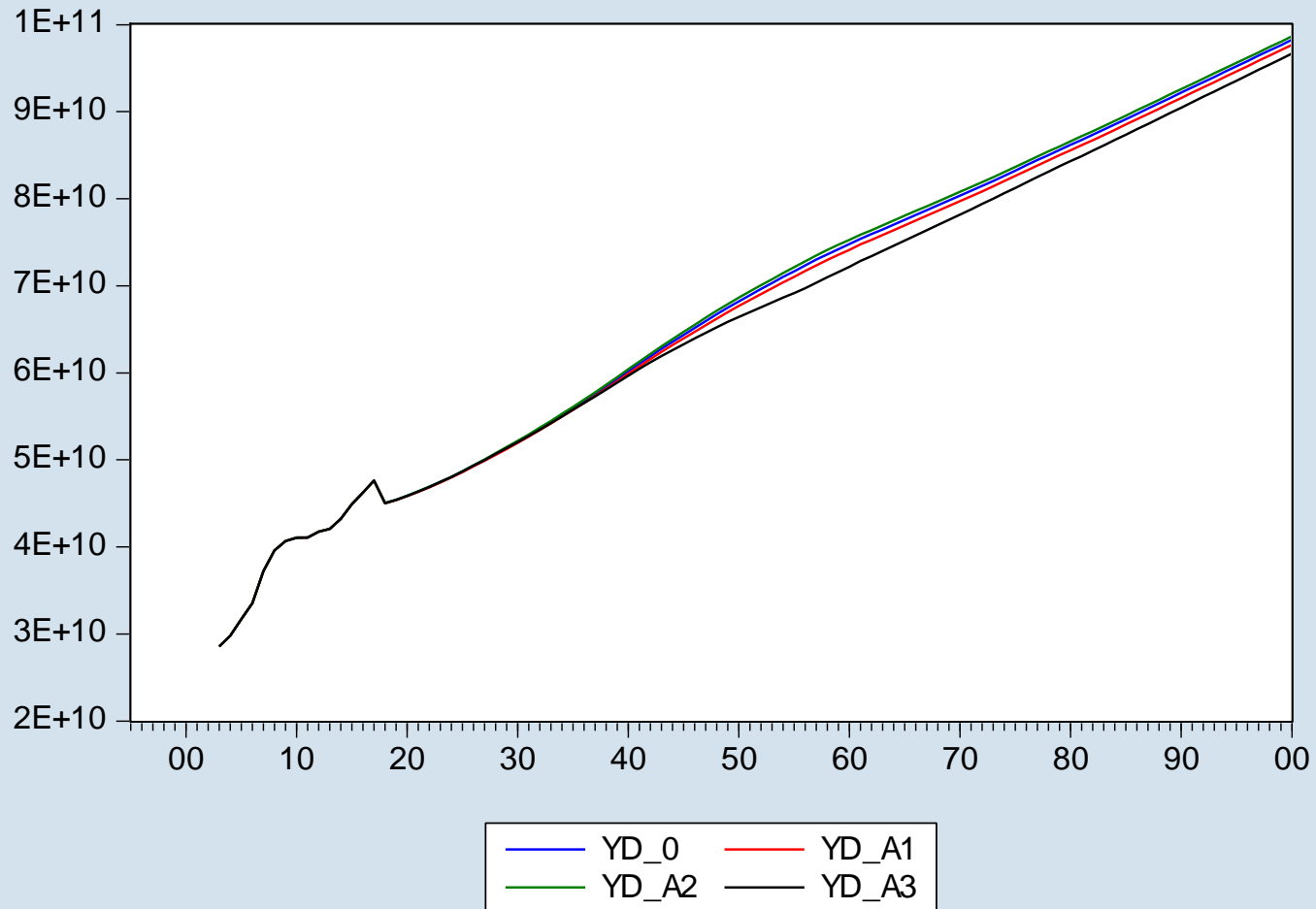# Effect of Second Pension Pillar - First Pension Pillar Balance
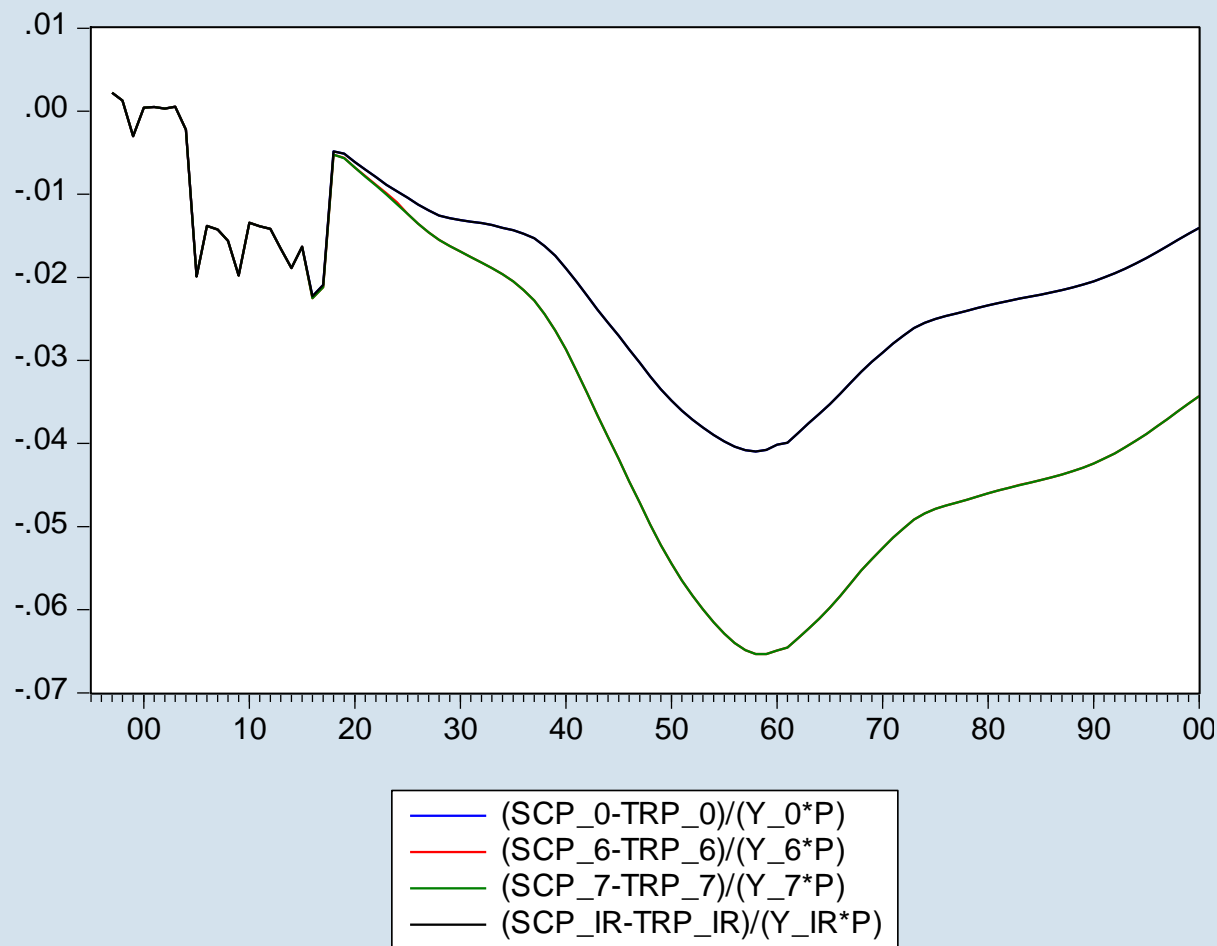
Multi-Pillar Setting – Real GDP
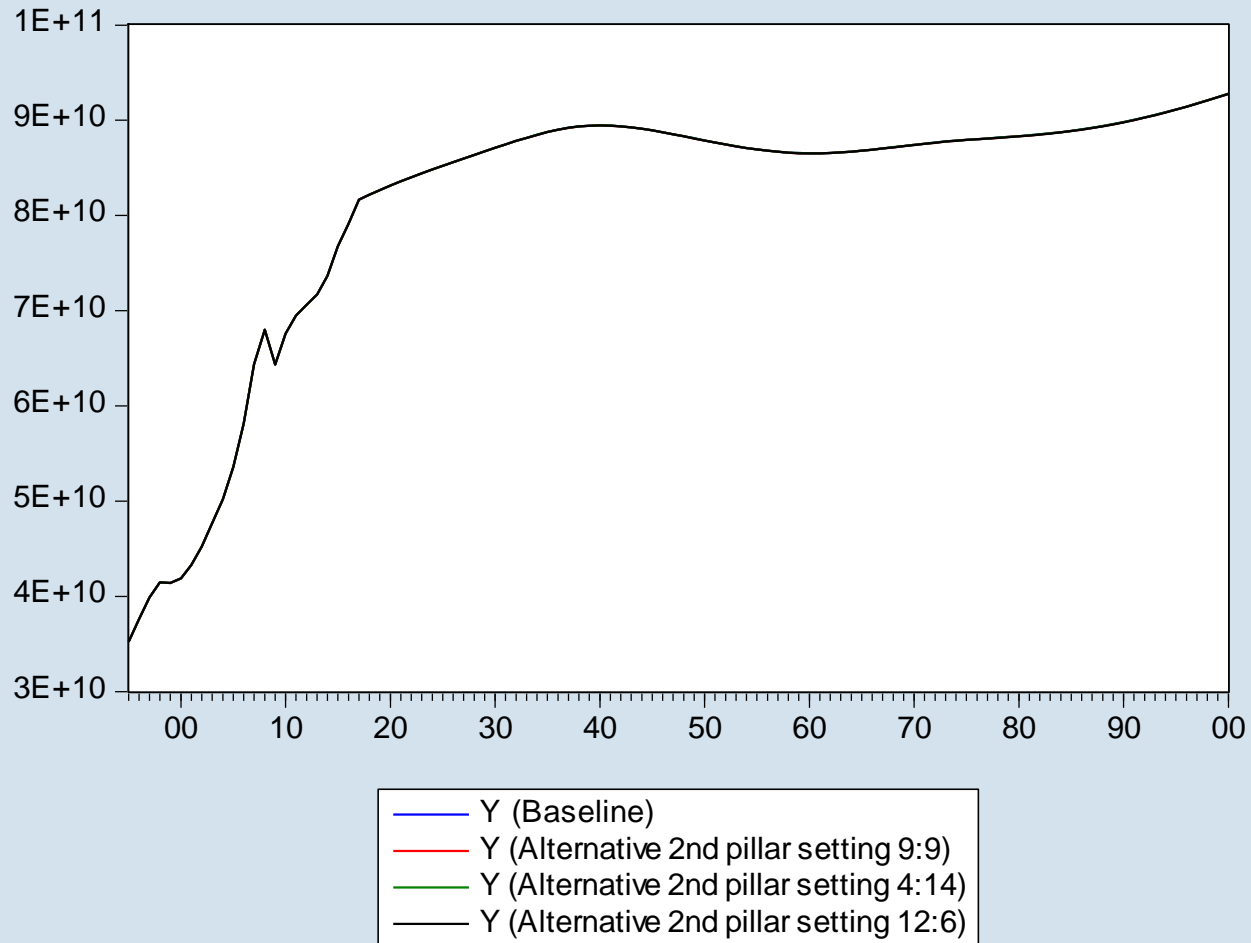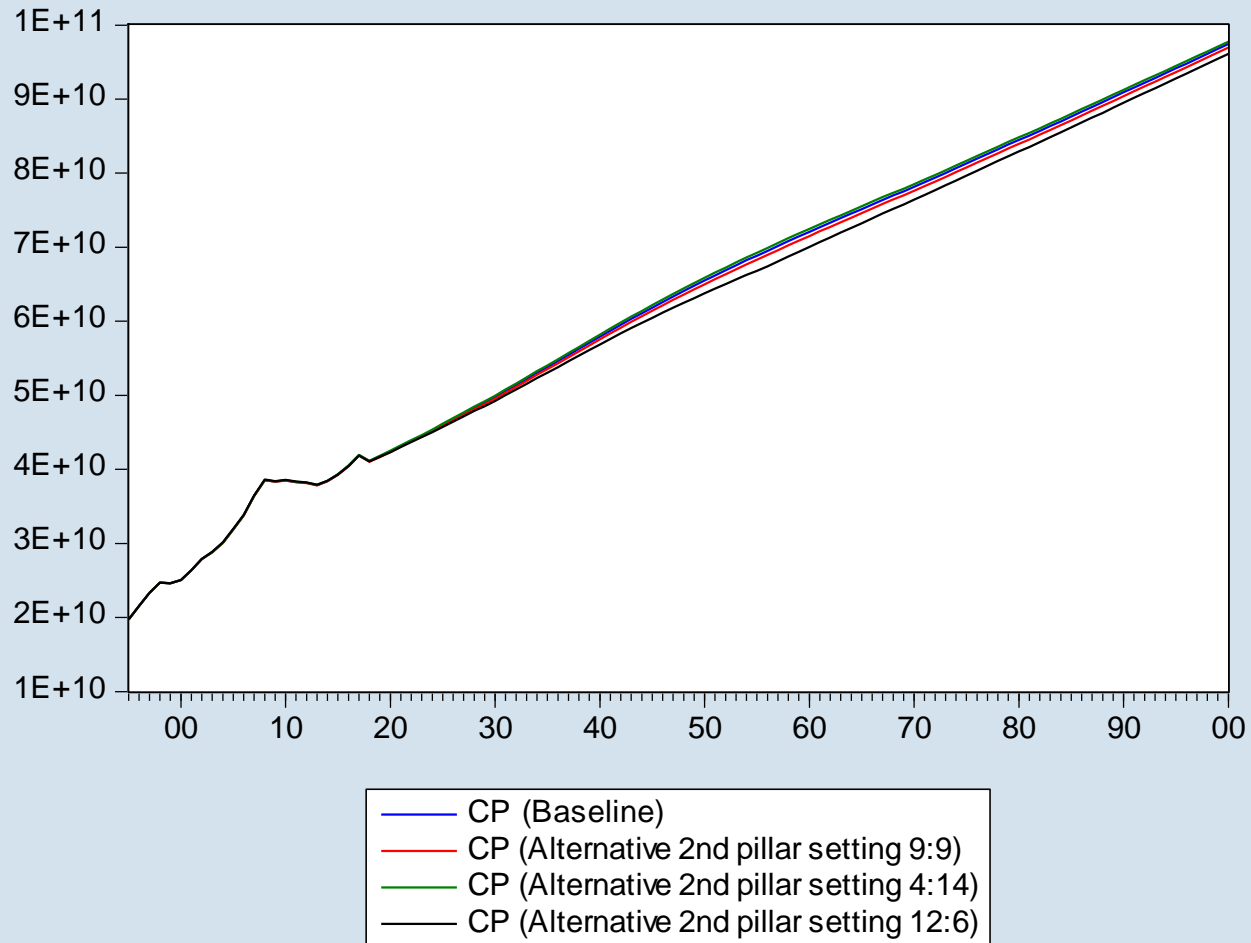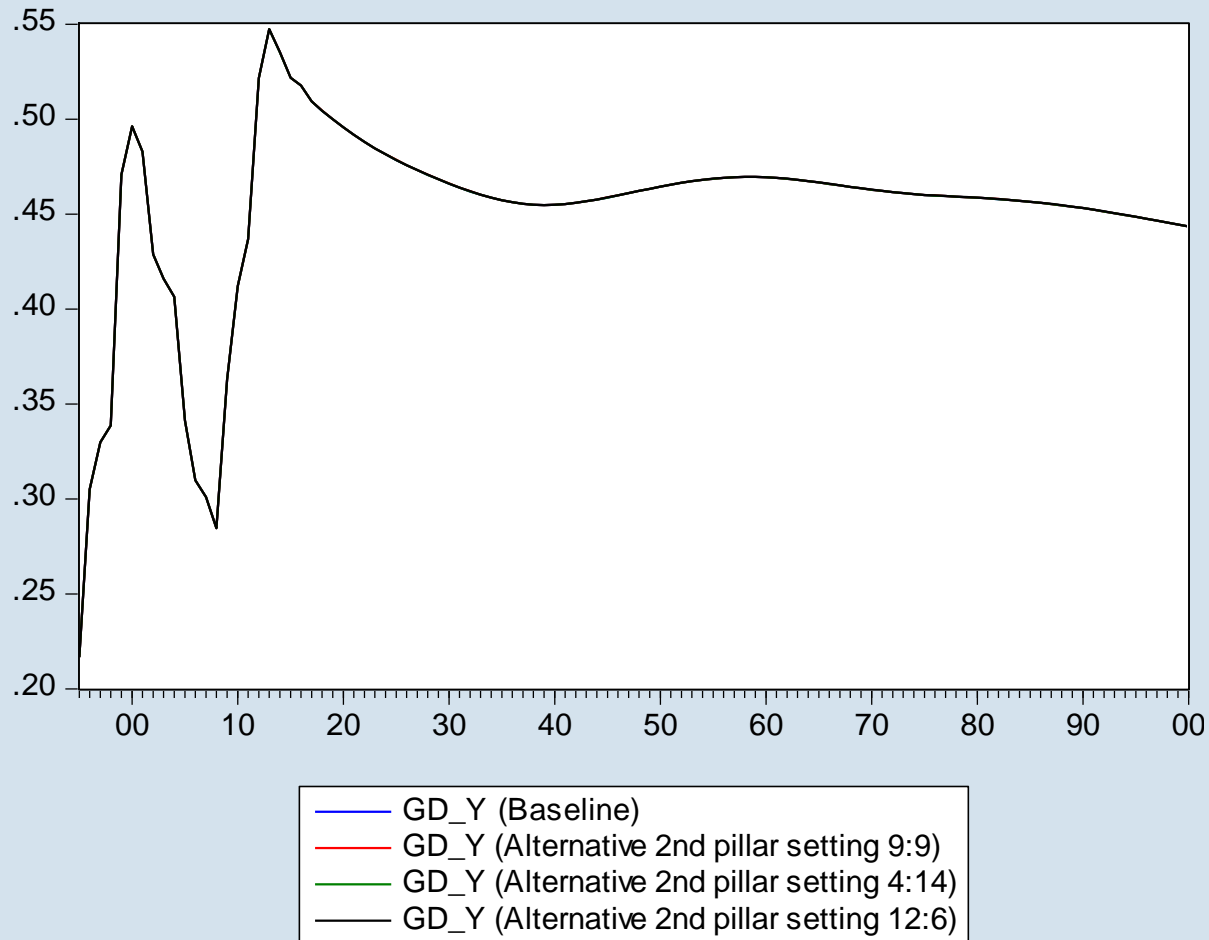
Multi-Pillar Setting – Real Income

Multi-Pillar Setting – Real Consumption

Multi-Pillar Setting – Government Debt

Legend:
- GD_Y (Baseline)
- GD_Y (Alternative 2nd pillar setting 9:9)
- GD_Y (Alternative 2nd pillar setting 4:14)
- GD_Y (Alternative 2nd pillar setting 12:6)
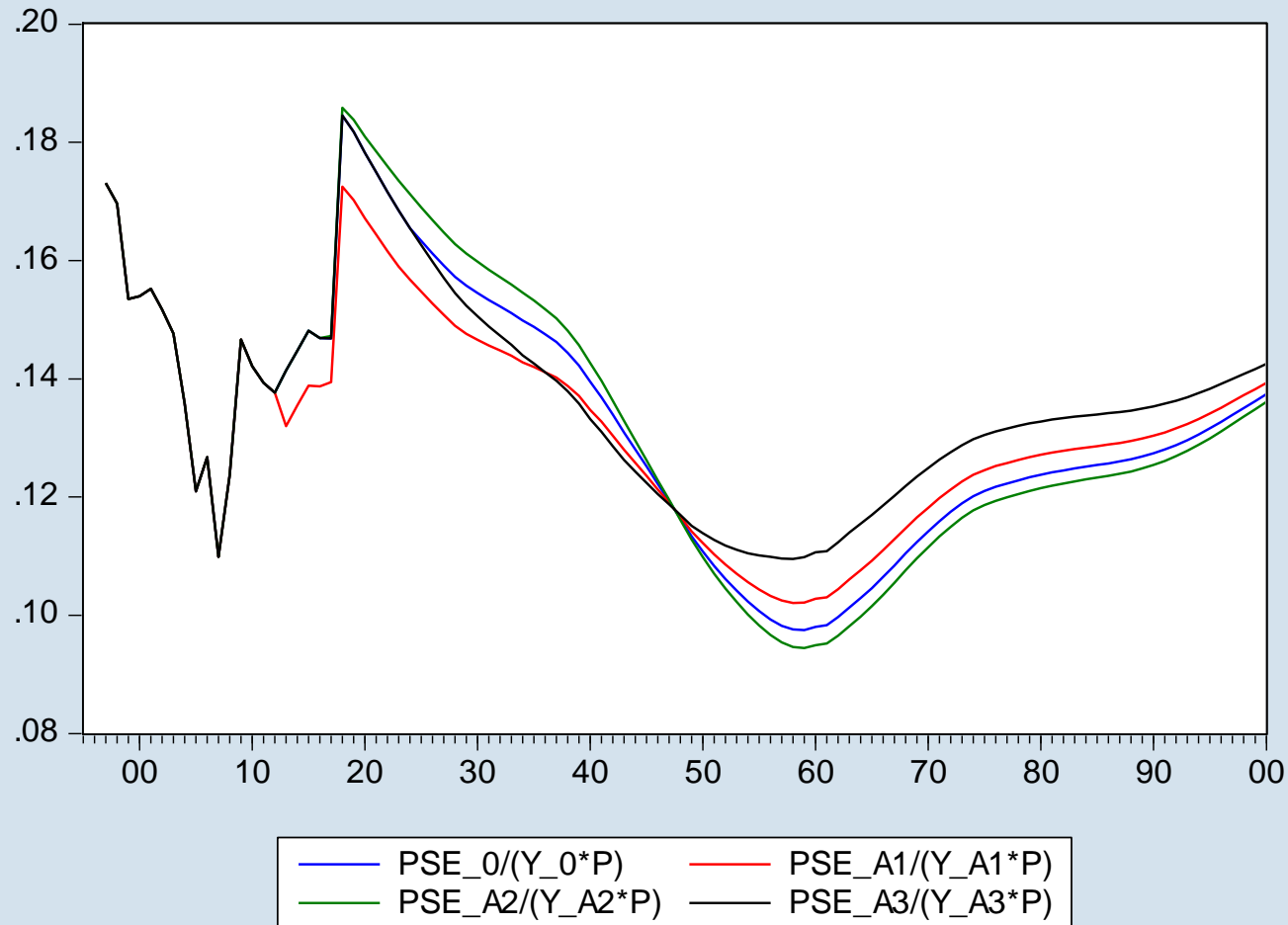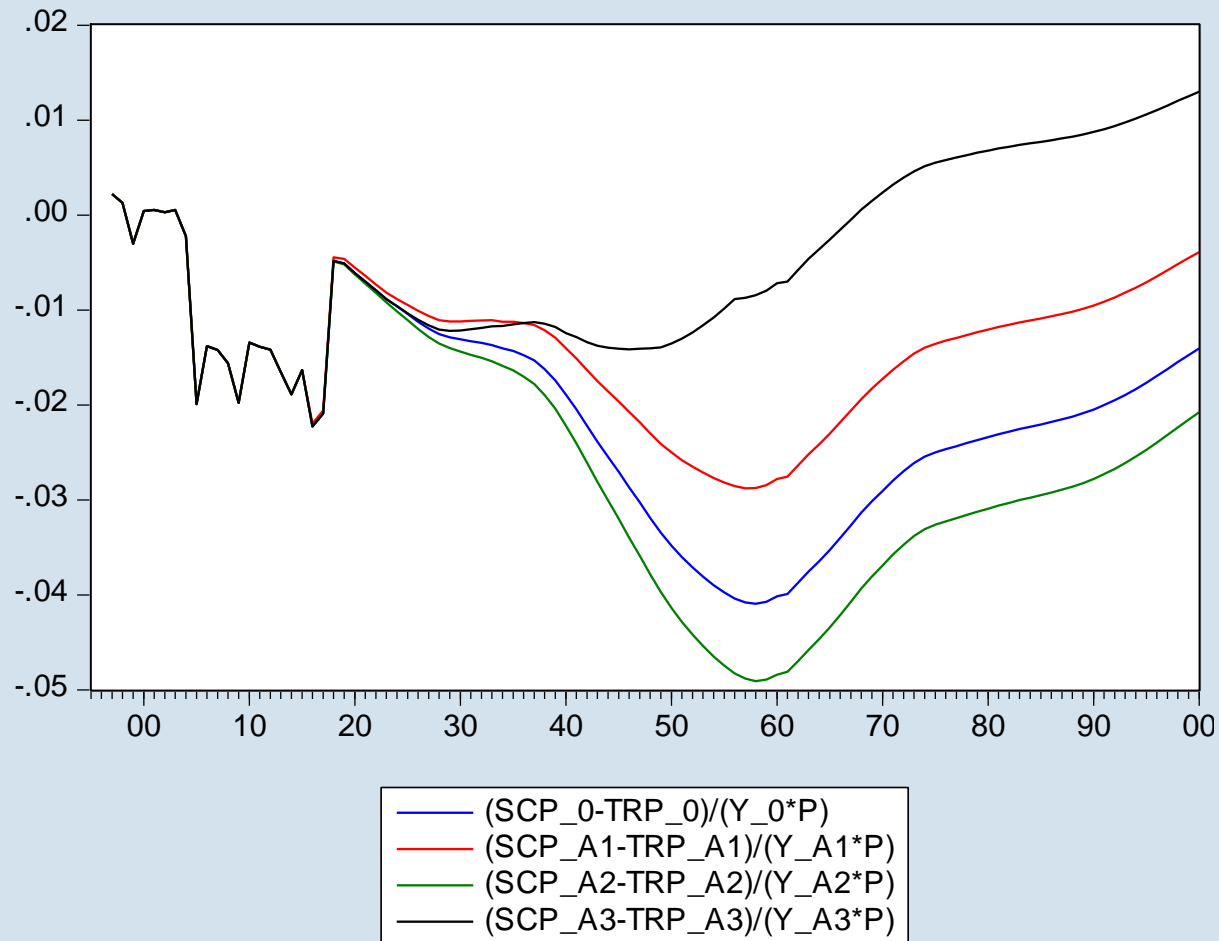
Multi-Pillar Setting – Public Sector Expenditures

Multi-Pillar Setting – First Pension Pillar Balance

Legend:
- (SCP_0-TRP_0)/(Y_0*P)
- (SCP_A1-TRP_A1)/(Y_A1*P)
- (SCP_A2-TRP_A2)/(Y_A2*P)
- (SCP_A3-TRP_A3)/(Y_A3*P)

Additional pension-system sources – Real GDP
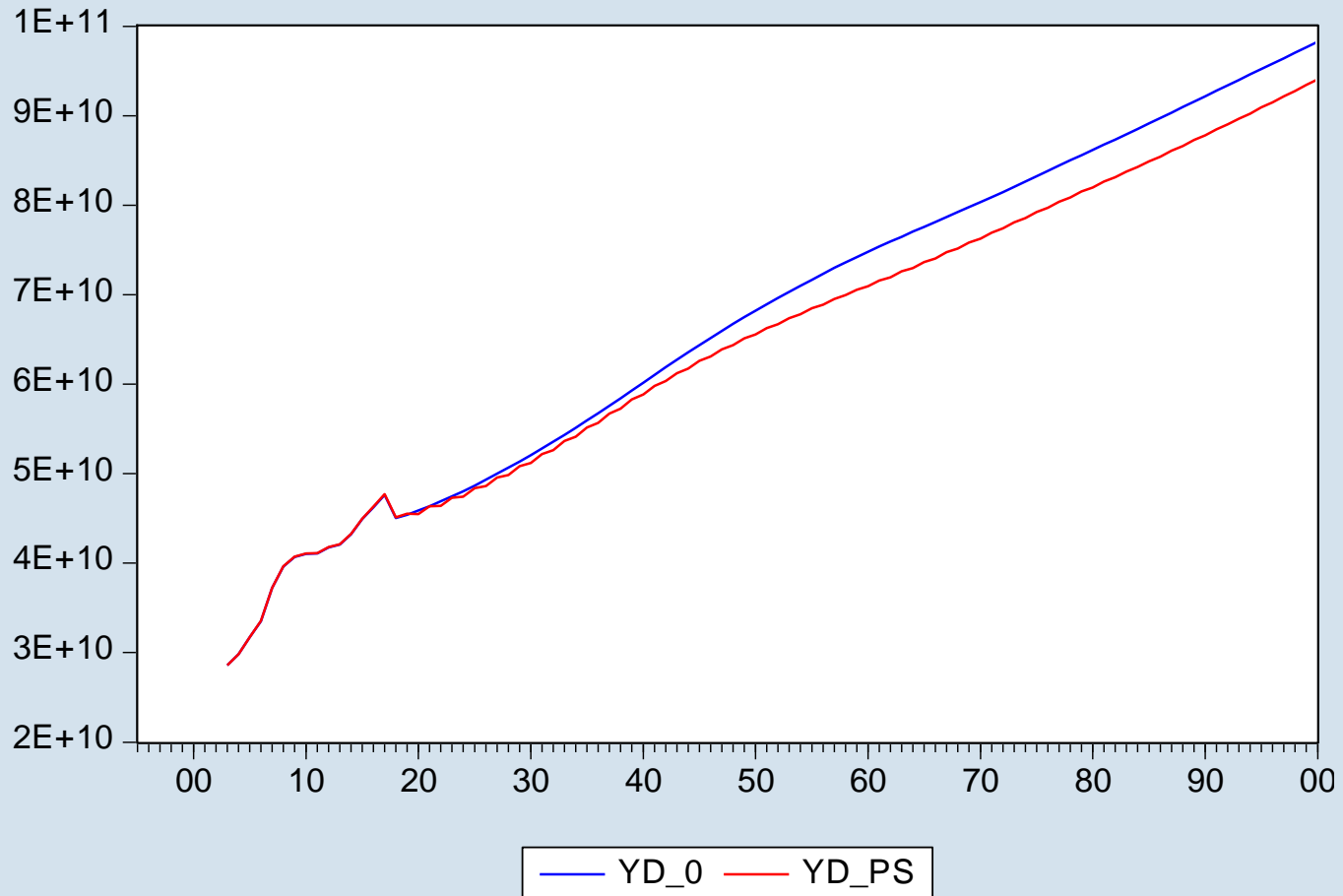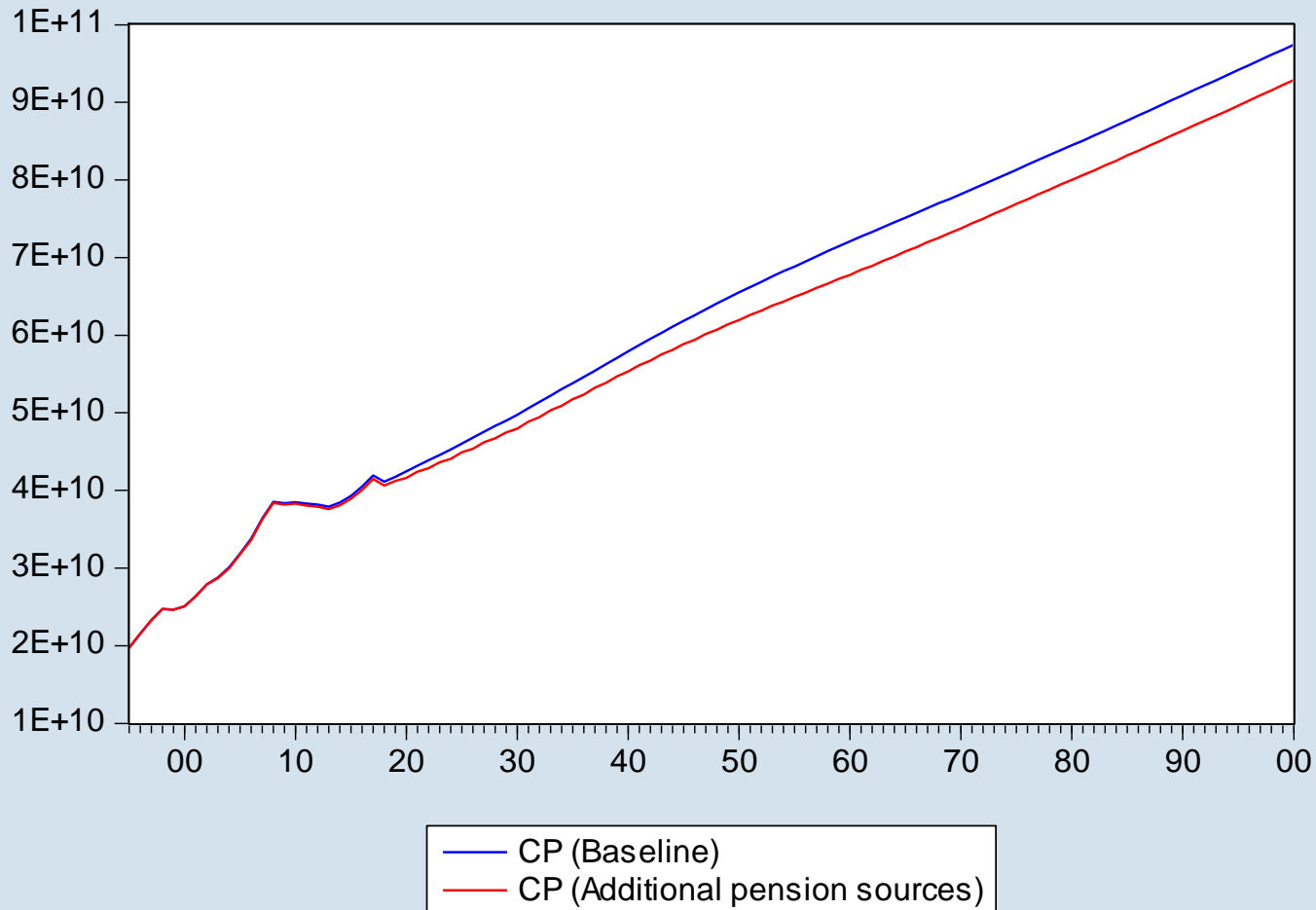

Y (Baseline)
Y (Additional pension sources)
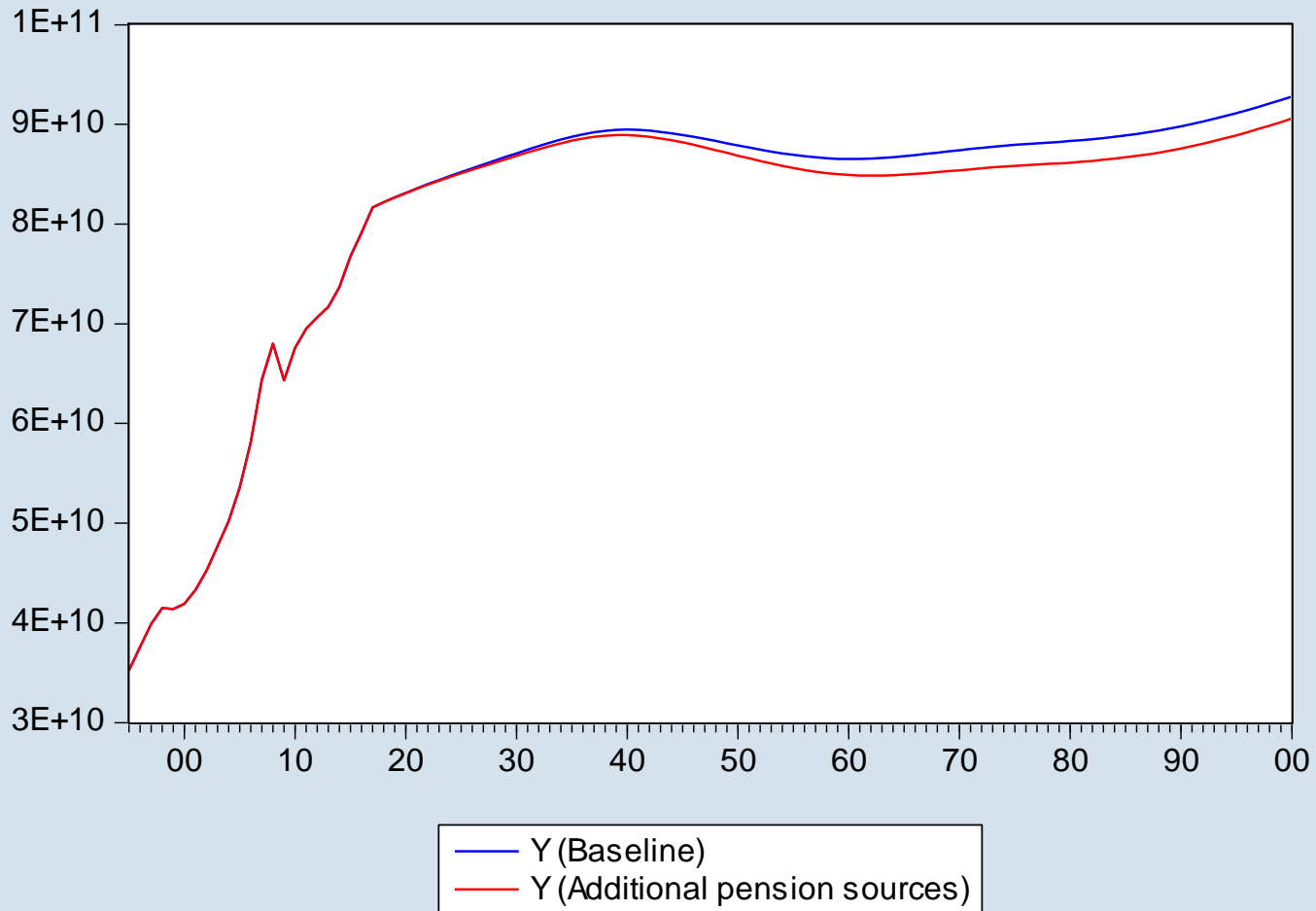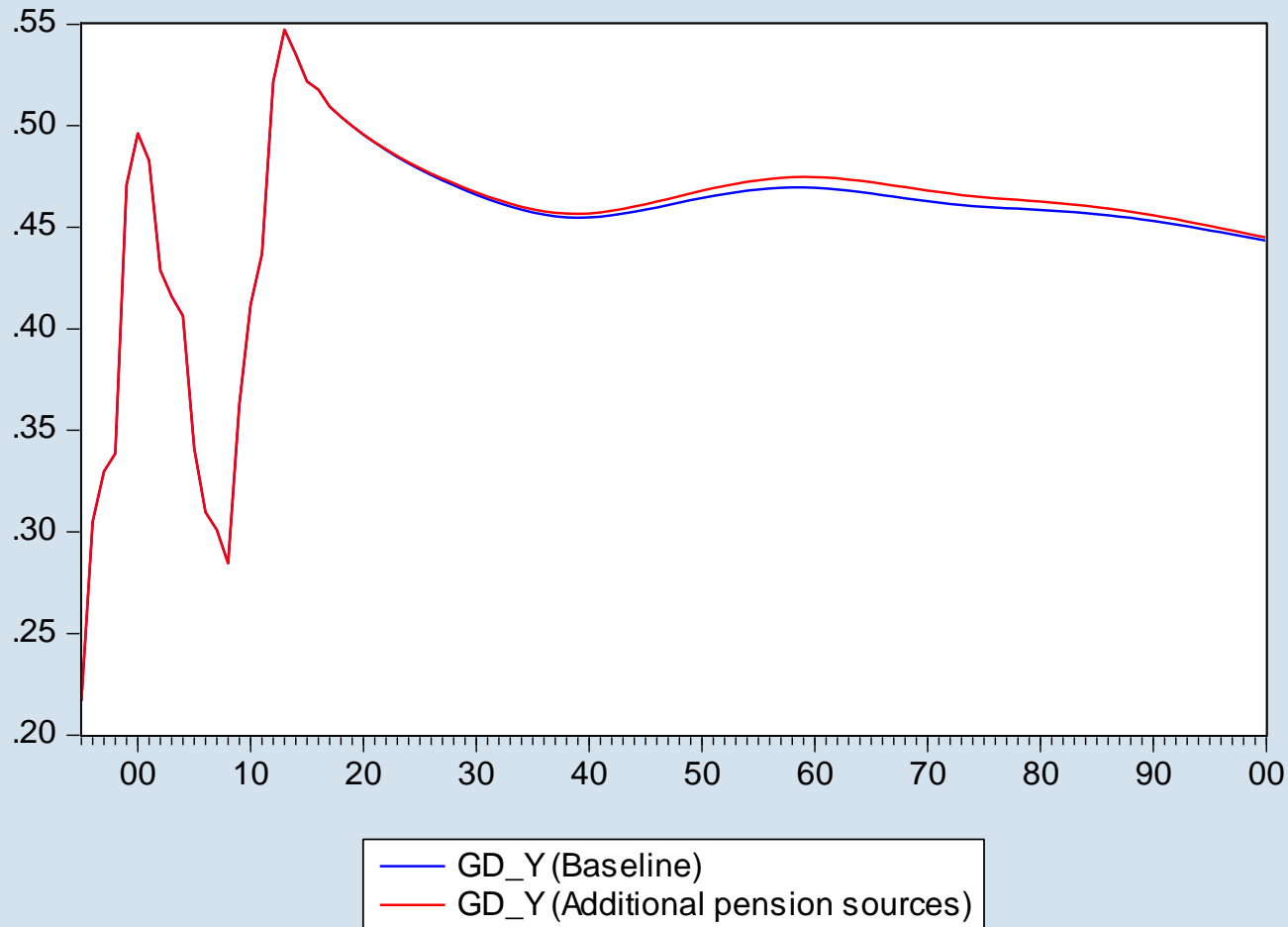
Additional pension-system sources– Real Income

Additional pension-system sources— Real Consumption

Additional pension-system sources– Government Debt

Legend:
- GD_Y (Baseline)
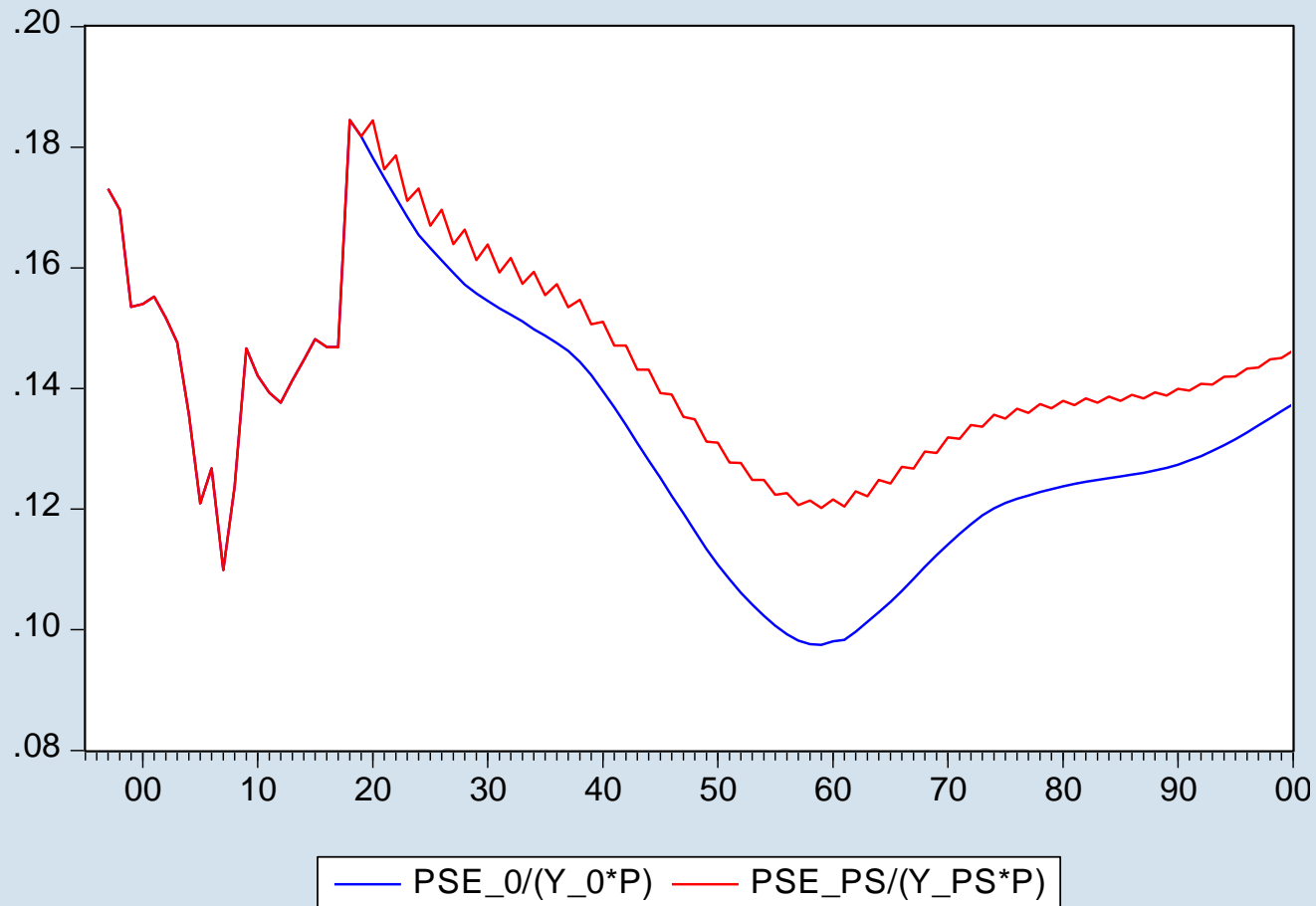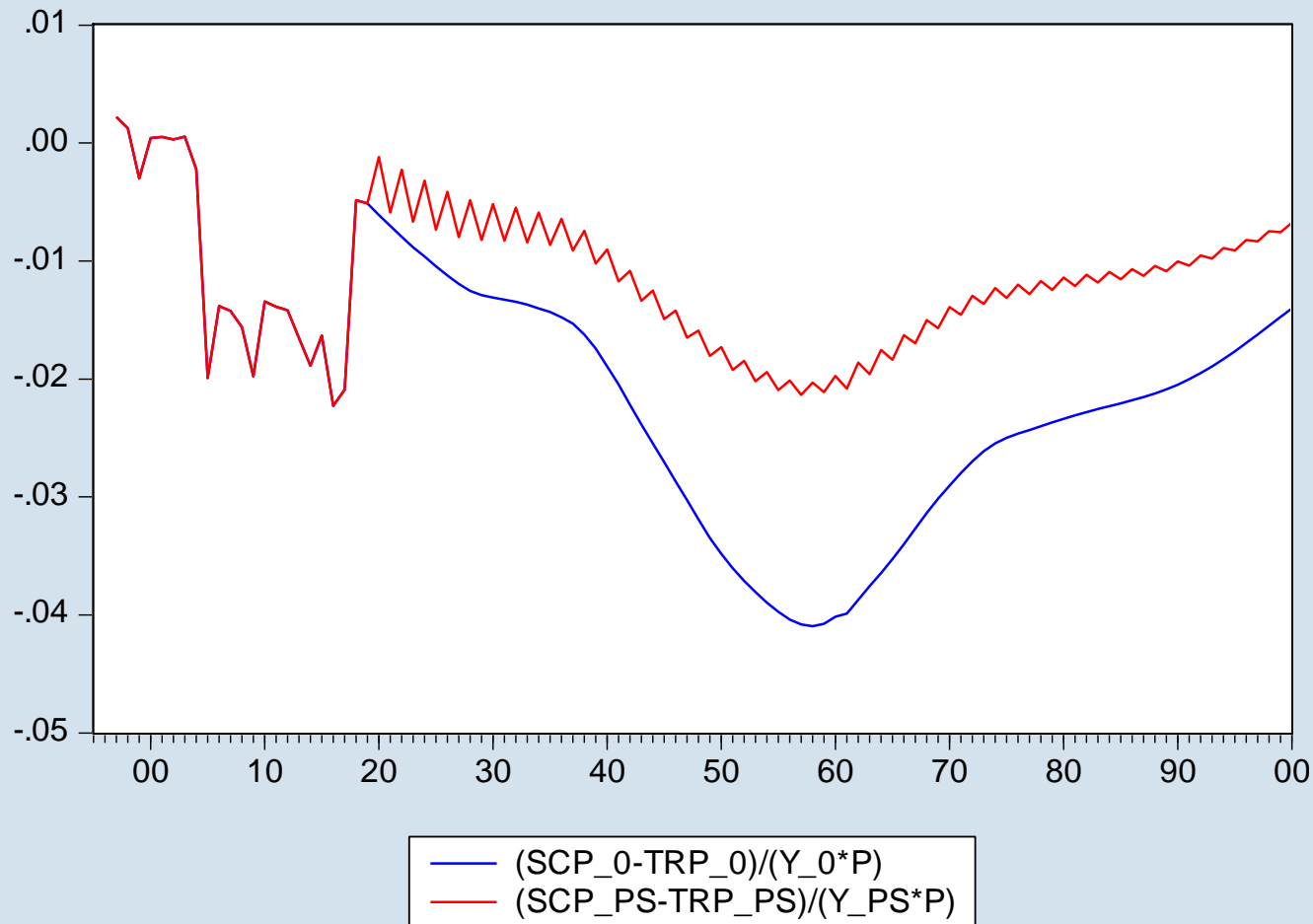- GD_Y (Additional pension sources)

Additional pension-system sources–Public Sector Expenditures

Additional pension-system sources— First Pension Pillar Balance

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Concluding remarks

- Further variant scenarios can be produced which consider different assumptions or combination of assumptions

- The uncertainty which can be observed as a result of various demographic projections as well as a policy measures (investment rules, SRA changes) has a severe impact on the achieved results

- The uncertainty which stems from the discrepancies in data and the abstraction used is not accounted for in the presented framework

References

- BAUMGARTNER, J. et al. (2004): A Long-run Macroeconomic Model of the Austrian Economy: Model Documentation and Simulations. [Workshops No. 5.] Oesterreichische Nationalbank, pp. 170 – 271

Acknowledgement

THANK YOU FOR YOUR ATTENTION

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