EUROPEAN ECONOMY

**Economic spillover and policy coordination
in the Euro Area**

by

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Final Report

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The views expressed in this report represent exclusively the positions of the authors and do not necessarily correspond to those of the European Commission.

Klagenfurt, November 2005

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Executive Summary

1. There is a broad consensus among economists that the increased interdependence that comes from sharing a common currency and a single monetary policy justifies some degree of economic policy coordination between euro area Member States. However, empirical studies have, thus far, offered inconclusive evidence regarding the comparative importance of different types of economic spillover. Accordingly, estimates of the welfare gains from economic policy coordination in the euro area have varied considerably.

2. This study presents original research on the nature of economic interdependence under European Economic and Monetary Union. Its main contribution is to provide plausible estimates of the sign and size of economic spillover in the euro area and the welfare gains from economic policy coordination. These results are relevant for the European Commission's ongoing work on strengthening economic governance in the context of the Stability and Growth Pact and the Lisbon Strategy.

3. A combination of empirical methods is used in this study. Vector autoregression analysis is used to explore the interplay between government borrowing, public debt and short- and long-term interest rates. Panel data techniques are used to investigate the link between structural reform and economic performance. Structural models are used to estimate the cross-country spillover from budgetary consolidation and structural reforms and the interaction between these policies.

4. The analysis of short-run budgetary spillover in the aggregate euro area suggests that a reduction in the budget deficit results in a small but positive effect on output. This result suggests the prevalence of positive non-Keynesian effects of fiscal consolidation. Crowding-in effects and positive supply-side effects from fiscal consolidations are the most intuitive explanations for this finding. A fiscal consolidation in the euro area only weakly affects short-term interest rates and inflation. The disaggregated analysis reveals that in most cases there are significant positive direct output and inflation spillover effects from the rest of the euro area. Moreover, Member States display substantial differences in the spillover from fiscal

consolidations in the euro area. These differences can be explained by diverging trade links, the size of the economies, and initial fiscal conditions.

5. The analysis of long-term budgetary spillover in the euro area finds that, with the exception of highly-indebted countries, rising government debt in one Member State has a weak impact on long-term interest rates. Aggregate euro area responses, on the contrary, are stronger than for the individual Member States. This means that rising debt levels in the euro area as a whole will "crowd out" private investment through higher long-term interest rates. This provides a strong argument for economic policy coordination in the euro area, since a coordinated budgetary consolidation by Member States will yield lower long-term interest rates.

6. Structural reforms that achieve greater competition in product, labour and capital markets are found to generate positive macroeconomic effects in the form of higher productivity and employment and lower unemployment. Econometric estimates suggest that a reduction of the relative mark-up in the euro area by around 10 percent – about the current difference with the US level – would raise average total factor productivity growth in the euro area by around 0.6 percentage points.

7. In order to compare the macroeconomic outcomes of the different policies considered in this report, an assessment of the results in terms of welfare gains or losses for each of the simulations performed with the MSG3 Model is conducted. In the central scenario, only real GDP is included in the objective function. We assume that future periods are discounted by a discount rate of 4 percent in the objective function, which is in line with estimates of long-term market interest rates and the rate of depreciation of the capital stock.

8. Scenario 1 represents coordinated structural reform for the entire euro area. Scenario 2 shows coordinated budgetary consolidation in the entire euro area. Scenario 3 describes structural reform in one large Member State (Germany) and budgetary consolidation in another (Italy). Scenario 4 looks at simultaneous structural reforms and budgetary consolidation in one large Member State (Germany). Scenario 5 depicts coordinated structural reforms and budgetary consolidation in the entire euro area.

Table: Welfare effects (GDP target)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Germany	9.65	3.09	8.92	14.28	20.29
Austria	8.20	3.28	0.23	1.43	18.93
Italy	17.26	4.15	0.59	2.29	34.69
France	8.59	3.66	0.18	2.45	21.61
Rest of euro area	8.95	2.58	0.12	1.49	19.02
Total euro area	*52.66*	*16.76*	*10.03*	*21.95*	*114.54*

[Note: Positive figures denote welfare gains, negative figures welfare losses.]

9. The main result to emerge from this welfare analysis is that the optimal approach to coordination is one in which all euro area Member States pursue coordinated structural reforms and budgetary consolidation (Scenario 5). This resulting welfare gain outweighs the gain from coordinated structural reform only (Scenario 1), coordinated budgetary consolidation only (Scenario 2) and a situation in which one large Member State (Germany) pursues structural reform while another (Italy) undertakes budgetary consolidation (Scenario 3). The implication is that there is strong positive spillover between stability-oriented macroeconomic policies and structural reforms to ensure greater flexibility in product, labour and capital markets. There is also evidence of strong positive cross-country spillover from coordination. Individual euro area Member States enjoy a higher welfare gain from coordinated structural reforms and budgetary consolidation (Scenario 5) than a situation in which they pursue these policies in isolation (Scenario 4).

10. In summary, this study finds that there are non-trivial gains from economic policy coordination in the euro area. Firstly, coordinated budgetary consolidation can help to crowd-in private investment through lower long-term interest rates. Secondly, coordinated structural reforms generate higher GDP, lower interest rates and reduced budget deficits and government debt levels. Thirdly, a combination of coordinated budgetary consolidation and structural reforms by euro area Member States can help to bring about a permanent improvement in the economic and employment performance. These findings show that the most effective way of achieving permanently higher output and lower public debt without undesirable side-effects is via a euro area wide coordinated design of both structural reforms and budgetary consolidation policies.

1   Introduction and objectives

Economic and Monetary Union (EMU) increases the degree of economic interdependence between euro area Member States. Sharing a common currency and a single monetary policy means that there is a higher probability that economic policies and developments in one Member State will spillover into the rest of the euro area. Coordination of economic policy instruments across the Member States of a monetary union is justified when this spillover is significant. In view of this fact, Article 99 of the Treaty calls on Member States to treat their economic policies as a matter of common concern and to coordinate them in Council with a view to achieving, *inter alia*, higher non-inflationary growth and a better standard of living. This commitment to economic policy coordination is given effect in a number of ways. The Broad Economic Policy Guidelines issue guidance on the economic policies of Member States and the Community. The Excessive Deficit Procedure prohibits budget deficits in excess of 3% of GDP. The Stability and Growth Pact encourages Member States to run budgetary positions close to balance or in surplus over the medium term. The Lisbon Strategy promotes structural reforms in labour, product and capital market with a view to achieving higher growth and more jobs.

The academic literature offers mixed results with regard to the precise nature of economic spillover under EMU, the gains from economic policy coordination and the optimal design of coordinating instruments. Following insights initiated by Rogoff (1985), cooperation between different economic policy-makers, e.g. between governments and the ECB and in particular between governments only (excluding the ECB from their agreement) can be counterproductive compared to a situation without coordination. Given the complexity of the interactions between policy-makers in the EMU, no general answer is to be expected from a theoretical analysis alone. There is also much dissent in the policy literature about these questions. For example, Allsopp et al. (1999) stress the importance of fiscal policy coordination in the case of fiscal consolidation in order to reduce output losses. However, De Grauwe (1999) is rather critical of this recommendation, stressing instead the importance of monetary policy applied in conjunction with fiscal policies. Some recent contributions on policy coordination within the EMU can be found in Hughes Hallett et al. (2001), for example. Coordination may in particular be justified in the presence of significant spillover. Bayoumi et al. (2004) estimates that structural policies on the goods and labour markets in the

euro area would not only increase production in the euro area. Due to international spillover, other countries and regions like the US would also gain.

This study presents original research on the nature of economic interdependence under European Economic and Monetary Union. Its main contribution is to provide plausible estimates of the sign and size of economic spillover in the euro area and the welfare gains from economic policy coordination. A better understanding of economic spillover will contribute towards the European Commission's work on the strengthening of economic governance in the EU. More specifically, evidence on the comparative importance of different types of economic spillover will support the ongoing debate on the need for greater flexibility in the EMU's budgetary rules and on strategies for structural reforms on capital, labour and product markets.

The ***first part*** of the study provides theoretical deliberations on the conceivable dimensions of economic spillover.

- *Chapter 2* provides an overview of the literature on spillover and derives a working definition of spillover on which the subsequent empirical analysis is based.

The ***second part*** of the study presents the results of the empirical investigations.

- *Chapter 3* studies the short-run spillover of fiscal policy in the euro area. To this purposes, VAR models are estimated. First, the euro area countries are considered as an aggregate entity. In a next step, VARs are estimated for the individual euro area countries to gain more insight into spillover at the disaggregated level.
- *Chapter 4* focuses on the crowding-out effects of deficits and their accumulation in public debt. The analysis is based on an empirical model of fiscal policy and interest rates, together with a small economic system. A first methodological contribution is to include public debt – in addition to deficits – to analyse crowding-out. The second contribution is to analyse spillover by extending the model to open economies.
- As a complement to the analyses of chapter 3 and 4, *chapter 5* looks for potential non-linearities in the real effects of fiscal policy actions on economic activity. In particular, the question is addressed whether the spillover from public debt depends on the size of the debt level.

- *Chapter 6* analyses the benefits of structural reforms on factor and product markets in the euro area. The reduction of structural rigidities on the capital, goods, and labour markets should reduce mark-up ratios, enhance the growth potential and boost productivity of the euro area economy, increase employment and reduce unemployment. The empirical investigations focus on the effects of the deregulation of the goods and factor markets on total factor productivity growth by affecting the mark-up, i.e. the deviation of prices from marginal costs.

- *Chapter 7* analyses and evaluates the macroeconomic and welfare effects of structural policies and of budgetary consolidation. The former uses the results obtained in chapter 6 regarding the spillover from economic reforms. Chapters 3 and 4 provide empirical estimates of the spillover from budgetary policies that increase the surplus of the public budget, and Appendix 4 gives the corresponding results for the MSG3 Model.

Finally, the ***third part*** of the study summarises the findings of the empirical analyses.

- *Chapter 8 presents* conclusions for economic policy-making in the euro area and delineates future avenues of research.

PART 1: THEORY

2 A working definition of spillover

2.1 Introduction and literature overview

The main objective of this study is to provide plausible estimates of the magnitude of economic spillover and the impact of economic policy coordination on economic performance in the euro area. It will be empirically analysed whether there exists a coordination dividend, i.e. gains from implementing structural and budgetary policies in a coordinated way. Throughout this report, the term "coordination" should be understood in a rather narrow sense in that it refers to a situation in which autonomous Member states pursue commonly agreed goals. The farther reaching concept of the optimisation of a common objective function by a single economic authority is not the object of this study.

In a monetary union, budgetary laxity in individual Member States negatively affects the other members. If the no-bail out clause stating that no Member State can be forced to step in for another state's liabilities is not totally credible, there are risks that individual fiscal irresponsibility impairs economic performance in the other Member States. Extremely profligate fiscal policies in some countries might harm other less profligate members via higher borrowing costs, especially if markets believe that members would have to stand in for peers that became insolvent. If this is the case, the profligate members could 'free-ride' on the backs of the others. These negative consequences of irresponsible fiscal policies could be avoided by coordinated budgetary discipline.

Regarding structural policies, negative spillover may arise if reforms are undertaken only in one individual country or a very limited number of Member States. Such an isolated action would be likely to improve the respective country's competitiveness at the expense of other Member States. Thus, not only concerning budgetary policies, but also regarding the implementation of structural reforms, coordination can be expected to pay off.

In general, a number of different types of spillover can be distinguished in the euro area:

(i) *External vs. internal spillover:* External spillover originates from interactions between the euro area and the rest of the world. In particular, developments in the US economy influence the euro area economy significantly, especially via trade linkages and the euro/US dollar exchange rate. Prices of oil and other raw materials are determined in international markets largely beyond the control of the euro area

but having potentially strong spillover on its economies. Internal spillover originates from the economic linkages between the euro area countries.

(ii)   *Shock vs. policy induced spillover*: This is particularly relevant from the perspective of policy action. Policy induced spillover implies a direct influence of policy measures undertaken on the individual country level on other individual countries. Coordination mitigates negative consequences from policy errors and internalises the consequences of spillover from non-coordinated policies. Policy coordination may also be beneficial to address spillover produced by macroeconomic shocks hitting either all euro area countries symmetrically (like oil price shocks) or individual countries (like the German unification).

(iii)   *Direct vs. indirect spillover*: In the context of the euro area, direct and indirect spillover of the different countries is present. Direct international spillover operates mainly through trade linkages. In addition, indirect spillover working through the common interest rate and the euro exchange rate is also important. As an example, an overly expansionary fiscal policy by one country may result in higher interest rates, influencing all other euro area Member States. Furthermore, fiscal policy measures may induce exchange rate reactions affecting all members of a monetary union.

(iv)   *Positive vs. negative spillover*: In the case of positive spillover, individual policies reinforce each other. In the case of negative spillover, policy measures are mutually inconsistent and in conflict to each other. Obviously, this difference has implications for the design of coordination. In the presence of negative spillover, there is a stronger need for monitoring, corrective mechanisms, and sanctions in case of non-compliance. While there is often a clear theoretical notion why a certain spillover is likely to be positive or negative, empirical estimations of spillover may not always confirm theoretical priors. The interactions of spillover, non-linearities and the complexity of dynamics may lead to more indeterminate outcomes concerning sign, size and timing of spillover.

In the context of the present study, the following channels of spillover from fiscal policies and structural reforms in the euro area are relevant:

(i)   *Output channel*: Fiscal policies by their effects on domestic output will significantly influence the demand for imports in an integrated space such as the euro area. This will influence the net exports in the rest of the euro area. This spillover propagated via the "trade channel" is a classic example of positive spillover.

(ii)   *Price channel*: Fiscal policies by their effects on domestic inflation will influence inflation in other countries, which is commonly known as "pass-through". In addition, price changes induced by fiscal policies are likely to lead to relative price changes resulting in spillover via the "competitiveness channel". In the euro area, nominal exchange rates have been irrevocably fixed, but *via* differences in the price levels, the real exchange rate does matter.

(iii)   *Interest rate and exchange rate channel*: In the euro area, fiscal policies can induce changes in the short-term interest rates and exchange rate of the euro, implying interest rate and exchange rate spillover via the "interest rate channel" and the "exchange rate channel". This spillover in the euro area is related to the standard "beggar-thy-neighbours" arguments for policy coordination enabling the internalisation / attenuation of the negative spillover from fiscal policies resulting from these channels. It is also important to realise here that euro area countries are likely to differ in the spillover they experience from changes in the common short-term interest rate and the euro exchange rate.

(iv)   *Government debt channel*: In the euro area, government debt will affect long-term interest rates. Spillover will occur if financial markets do not price the risk of government debt of individual countries appropriately due to, e.g., the possibility that the no-bail out clause is not perfectly credible. In that case, excessive fiscal debt in individual countries leads to higher real interest rates in all euro area countries.

(v)   *Structural reform channel*: Structural reforms on the output and input markets shall enhance competition, resulting in higher productivity growth, increased employment and reduced unemployment. This induces spillover, e.g. growth enhancing supply-side measures undertaken by individual countries increase imports from the other euro area members, thereby positively influencing the other countries' public finances.

Economic spillover can contribute to the presence of common elements in national business cycles. With the start of EMU, the discussion about the existence of parallels in the European economies' business cycles has gained importance, since the common monetary policy of the ECB may be inadequate for some countries in case of insufficient similarities between the participating countries. Whether there exists a "European business cycle" therefore plays a crucial role for success or failure of the union. While there appears to be a consensus in the literature that the European economies indeed share some common elements in their aggregate cyclical behaviour (Artis et al., 1998), opinions diverge concerning the question whether or not this common component has gained importance for the national economies. Most econometric studies however suggest increasing similarities between the national business cycles with ongoing European integration.

By studying fiscal policy spillover, policy coordination and structural reforms in the euro area, this report aims

1. to estimate and analyse spillover from fiscal policy in the euro area;
2. to estimate and analyse the effects from structural reforms in the euro area;
3. to evaluate the scope for the coordination of fiscal policies and of structural reforms in the euro area.

In part 2 of the present study, the following spillover in the euro area are analysed empirically:

(i)   the link between fiscal and monetary policies;
(ii) the link between public debt and long-term interest rates;
(iii) the links between budgetary stabilisation and the level of public debt;
(iv) spillover from structural reforms.

There is a substantial amount of literature directly or indirectly dealing with the channels of spillover listed above. Many applications are made within the euro area context where the potential effects of spillover and the consequent need for policy coordination seem prominent. This section provides an overview of the existing research relevant for this study.

(i) The link between fiscal and monetary policies

A number of studies use (S)VAR, i.e. (structural) vector autoregressive models to analyse macroeconomic spillover. Ahmed et al. (1993) study macroeconomic spillover between the US and the rest of the OECD using a two-country SVAR model. Canova and Dellas (1993) analyse bilateral trade interdependence and common disturbances in a group of 10 industrial countries. Kim (1999) undertakes a comparative study of the G-7 countries modelling them as interdependent in fluctuations in world commodity prices and exchange rates. Kim and Roubini (2000) identify the effects of US monetary policy on the non-US G-7 nations. They find that two offsetting effects are at work: (1) an exchange rate depreciation is expansionary via the trade channel, (2) a rise in the Federal Funds rate (and, in response, a domestic interest rate increase) decreases interest-sensitive spending worldwide, and a subsequent fall in US output decreases the demand for exports of other countries.

Giordani (2004) builds an SVAR model to analyse the impact of US macroeconomic shocks on Canadian output, inflation, interest rate and exchange rate using both Impulse Response Functions (IRF) and Variance Decompositions (VD). Moreover, he compares the IRF of the SVAR model with the IRF of a theoretical model that incorporates the interactions between the Canadian and US economy in a New-Keynesian (NK) framework. It is shown that the IRF of the SVAR model and the NK model resemble each other relatively closely.

Beetsma and Giuliodori (2004) use an SVAR model to study the cross-border spillover of fiscal shocks via the trade channel. Fiscal expansions in Germany, France and Italy are shown to increase their imports from other European countries significantly. This supports the potential scope for the coordination of fiscal policies in the euro area.

Generally, these studies find that a non-trivial fraction of the variance in many domestic variables can be attributed to external shocks. The importance of cross-border spillover is typically highest for variables such as the exchange rate, prices and the interest rates and lower for real variables such as output. To estimate the spillover from the rest of the world (ROW) on domestic variables in a VAR framework, these papers implement a small open-economy assumption. A VAR model of a small open domestic economy and that of a big closed foreign economy/ROW are analysed simultaneously. This is achieved by imposing a block exogeneity restriction: domestic variables are postulated to enter the external block equations neither contemporaneously nor with lags. Put differently, external variables are a

linear combination of external shocks only, whereas domestic variables are generated both by domestic and external disturbances. If this restriction is accepted, one can decompose the sources of variations of the variables by their origin - domestic or foreign. The fraction of the variation due to innovations in foreign variables provides a measure of the extent of international spillover.

Spillover from fiscal policy is not confined to the trade channel. In particular, a fiscal expansion or contraction in one or more euro area countries may affect both short- and long-term interest rates, an effect that is transmitted to other countries via the common monetary policy in the euro area or via the integrated capital markets. A VAR model can be used to estimate the spillover from fiscal policy on monetary policy (and vice versa) in the euro area. EMU has raised a lot of interest in the issue of monetary and fiscal policy interactions both from a theoretical and empirical perspective. In theoretical analyses, the emphasis has been on strategic elements (see e.g. Buti et al., 2001, for an overview). Empirical analysis has focused on the related question on the complementarity and substitutability of monetary and fiscal policy (see in particular Mélitz, 2000). In the first case, a restrictive monetary policy is accompanied by a restrictive fiscal policy and vice versa. In the second case, a restrictive monetary policy is accompanied by an expansionary fiscal policy response and vice versa.

Muscatelli et al. (2002) use an SVAR of the output gap, inflation, a measure of the fiscal stance and the short-term interest rate to analyse the interactions of monetary and fiscal policies in G-7 economies. It is found that monetary and fiscal policies are increasingly used as strategic complements and that the responsiveness of fiscal policy to the business cycle has decreased since the 1980s. Bruneau and De Bandt (2003) estimate SVAR models with monetary and fiscal policies in case of the euro area, France and Germany. Dalsgaard and Des Serres (2000) estimate SVAR models with monetary and fiscal policies for eight euro area Member States. Garcia and Verdelhan (1999) estimate an SVAR with monetary and fiscal policies for the aggregate euro area.

VAR models can be used to look at aspects of policy interdependency, such as the link between government spending and revenues. An important question in the literature concerns the existence of causal links between government spending and taxation. This issue of causality and exogeneity can be phrased as the "tax and spend" vs. the "spend and tax" view. According to the former, changes in tax revenues cause changes in government spending,

whereas the latter supposes that changes in government spending induce adjustment in tax revenues in order to match the changes in financing needs. Blanchard and Perotti (2002) and Fatas and Mihov (2000) investigate the effects of both type of causality by imposing the appropriate identifying restrictions on revenue and spending shocks in both regimes in their fiscal SVAR model. Koren and Stiassny (1998), Garcia and Henin (2000) and De Arcangelis and Lamartina (2004) also address the possible links between taxes and spending using an SVAR model.

(ii)   The link between public debt and long-term interest rates
An important dimension of spillover in a monetary union concerns the link between public debt and interest rates: since no no-bail out clause ever is totally credible, there are risks that individual fiscal irresponsibility leads to higher interest rates throughout the monetary union. Moreover, at higher debt levels such a process is getting more and more self-reinforcing. Indeed this danger would be a vital reason to amend the SGP with more strict procedures regarding the debt level rather than focussing too much on deficits.

Recently, there have been a number of contributions in the literature on monetary and fiscal policy interactions analysing the interdependence between monetary and fiscal policy in the perspective of intertemporal solvency. In this so-called "Fiscal Theory of the Price Level" (FTPL), the fiscal policy decisions may affect the equilibrium price level/inflation rate in the so-called "non-Ricardian" regime where the fiscal authority disregards the intertemporal solvency constraint. In that case, the price level and monetary policy have to adjust to ensure government solvency. Cochrane (2001), Daniel (2001), and Dupor (2000) address in more detail the theory of the FTPL, also considering open economy aspects. Bayoumi and Masson (1998) study the implication of the FTPL in an EMU perspective.

At the empirical level, Sala (2004) works out identifying restrictions of the FTPL and analyses them for the US. Testing of the FTPL focuses in particular on the feedbacks between fiscal deficit and government debt. Semmler and Zhang (2004), for instance, find evidence of non-Ricardian regimes in Germany and France for the period 1970:I-1998:IV as deficits did not react to debt levels in line with Ricardian predictions. In addition, they test the interdependence between the deficit and short-term interest rates.

Claeys (2004) constructs a structural vector error correction model (SVECM) to analyse the interactions of monetary and fiscal policies. Fiscal shocks are identified as short-term deviations from the intertemporal government budget constraint. The effects of these departures from solvency are to increase interest rates, but this effect disappears in a monetary union. While the framework is fully consistent with the FTPL, it cannot test this theory directly as the effect of inflation is included.

An interesting way to analyse the spillover from government debt in a monetary union or a fiscal federation is found in Landon and Smith (2000). The authors analyse the impact of debt accumulation by the central and sub-central governments on the creditworthiness of other federal members and find significant spillover. Although their analysis is applied to the case of Canada so that we cannot directly relate their results to the euro area, there seems to be a number of interesting parallels with the euro area case, an aspect which is also acknowledged by the authors. Ardagna et al. (2005) extend this analysis to the issue of national versus global spillover.

(iii)   The links between budgetary stabilisation and the level of public debt
The euro area countries vary considerably in the amount of government debt. It can be argued that one cannot ignore this condition when analysing the effects of fiscal policy and deriving implications concerning spillover and policy coordination. The idea that the initial level of debt could play an important role is put forward in the above mentioned FTPL literature and also in the literature on so-called 'non-Keynesian' effects of fiscal policy. This literature argues that due to expectation effects, wealth effects and supply side effects, the standard Keynesian effects of fiscal adjustments may not hold under all conditions. In particular, the initial level of debt is likely to be crucial: if government debt is high, the private sector will expect that a fiscal expansion will cause much higher taxation fairly soon and reduce its consumption and investment, possibly by such an extent that the initial expansionary effect of the fiscal stimulus is actually followed by a recession. Similarly, the announcement and implementation of fiscal retrenchment can positively affect private spending in a situation of high government debt.

We analyse the importance of the initial level of debt for the effects of fiscal policies by distinguishing different high and low debt regimes and testing how these regimes affect

outcomes of fiscal policy. Several studies adopt such an approach; see e.g. van Aarle and Garretsen (2003).

Given the previous analyses, the question can be posed how the spillover from public debt and the spillover from fiscal deficit compare. Clearly, they share a common element since the stock of debt is necessarily the sum of the fiscal deficit flows in the past. The spillover from debt works mainly through its effect on the credibility of monetary policy, and hence through interest rates (via the effect on future inflation that monetary policy has to bring about, and via the possible bail out effects in the monetary union). Deficits may also affect cyclical conditions in the short run; they can also be interpreted as resulting from strategic games of governments vis-à-vis the central bank (this even more so in a monetary union). Of course, the short-term deficits aggravate the longer term debt spillover. Empirically, the distinction between both effects can be hard to make, unless stricter identifying restrictions are imposed.

(iv) Spillover from structural reforms

Besides sound fiscal policies, the removal of structural rigidities in the capital, goods, and labour markets would positively affect the growth potential of the euro area economy. By establishing an effective internal market, by boosting research and innovation, and by improving education, structural reforms aim at creating productivity and employment.

Deregulations on the goods, labour, and capital markets aim at increasing competition and achieving productivity gains, resulting in lower product prices and thus reducing inflationary pressure and stimulating final demand. Sauner-Leroy (2003) concludes that until 1993, i.e. in the run-up to the introduction of the Single Market Programme, profit (i.e. price-cost) margins fell, but recovered subsequently thanks to the realisation of efficiency gains, resulting in falling unit costs while output prices remained stable.

Structural reforms reduce the mark-up of prices over marginal cost by increasing potential and actual competition. As the example of the telecommunication sector has shown, the liberalisation of formerly regulated markets tends to reduce prices and to increase productivity. The main reason behind this success is the fact that the economies of scale have disappeared as the result of emerging new technologies (Coppens and Vivet, 2004). Since entry barriers are reduced, the number of firms increases, entailing a positive impact on job creation.

Employment is also supported by the fact that lower profit margins are accompanied by lower real wage claims and thus by reduced structural unemployment. More competition in product markets tends to lead to lower wage mark-ups. Thus, both mark-ups are generally positively related (Jean and Nicoletti, 2002). Deregulation of the labour market works in a similar fashion. Increased labour mobility and flexibility induces wage moderation by limiting the scope for exploiting economic rents.

According to modern growth theories, structural policies and institutional settings have an impact on the path of long-term economic growth. To some extent, regulation is necessary to ensure the functioning of market economies, for example in the areas of competition, natural monopolies, consumer protection, property rights and environmental protection. Institutions can increase efficiency by correcting market failure. On the other hand, over-regulation might worsen the resource allocation and reduce the incentives for innovation, thereby exerting adverse effects on the growth potential.

Structural reforms affect economic activity through numerous channels (Ahn, 2002; Griffith and Harrison, 2004; European Commission, 2004). Direct and indirect effects can be distinguished. As structural reforms reduce production costs (mainly administrative costs) and remove barriers to enter new markets, productivity is increased directly. In addition, indirect effects occur through three channels: firstly, a higher degree of market contestability reduces the market power of incumbents. As a result, the mark-up of prices over marginal cost decreases. Factor inputs are used more efficiently, and the allocation of goods and services is improved. In addition, less productive firms are forced to leave the market, thus aggregate productivity rises (allocative efficiency). Secondly, companies are encouraged to reorganise work, reduce slack and increase work effort. The under-utilisation of production factors is diminished (productive efficiency). Thirdly, incentives to research and innovate in order to move to the modern technology frontier are improved (dynamic efficiency). On the one hand, dynamic efficiency gains enhance the economy's long-term growth rate while advancements in allocative and productive efficiency raise the levels of productivity and output but not their growth rates. On the other hand, dynamic efficiency advances may take more time to accrue than allocative and productive efficiency gains from structural reforms.

Estimating the impacts of product market reforms undertaken in the European Union over the 1980s and 1990s, Griffith and Harrison (2004) conclude that product market reforms reducing

barriers to the entry of new firms, removing price controls and diminishing the government engagement in production, reduce economic rents as measured by the mark-up of value-added over the sum of labour and capital costs. The decline in economic rents in turn benefits employment and investment. A positive impact of regulatory reforms, in particular those removing barriers to entry and thus reducing the mark-up, on investment is also found by Alesina et al. (2003). Gjersem (2004) argues that the full scope for efficiency improvements has not yet been fully exploited in the European Union, despite the product market reforms that have been implemented over the past years.

As in the case of fiscal policies, cross-country spillover may also arise from structural reforms. Reforms on factor and goods markets implemented in individual countries can be expected to benefit also the other euro area countries. In addition, the ECB is supported in conducting its stability oriented monetary policy. The positive effects of structural reforms are internationally transmitted through various channels (Bayoumi et al., 2004). Firstly, the countries are linked by international trade. Competition enhancing reforms in one country will result in increasing domestic output, employment, consumption and investment. Part of the additional demand falls on imports, thus directly enhancing foreign output. In the exporting country, the additional output will lead to increasing tax revenues and an improving government budget. This positive trade effect is partly compensated as within a monetary union, lower inflation in a country implementing structural reforms improves directly the respective country's international competitiveness. Cross-country spillover arising from product market reforms can be expected to outweigh international spillover brought about by labour market reforms. This can be attributed to the fact that labour market reforms benefit in particular employment and thus private consumption, while competition enhancing product market reforms promote investment which has a higher import content than consumption.

In addition to trade linkages, structural reforms can be expected to result in wage moderation and thus lower inflation and in a decline of the sacrifice ratio, i.e. the cumulative output gap required to permanently cut the inflation rate by one percentage point. This would support the ECB in ensuring price stability. Low inflation achieved by structural reforms would allow a less restrictive monetary policy stance. As inflation expectations would also decline, long-term interest rates would be lower, thus supporting fixed capital formation across the entire euro area. Stimulated growth in the other euro area Member States brought about by structural reforms in individual countries would also support fiscal policies. By the working of

automatic stabilisers, revenues would be higher and expenditures would be lower, facilitating fiscal consolidation.

Using a variant of GEM, the IMF's new large-scale micro-founded multi-country general-equilibrium model with nominal rigidities, a recent study (Bayoumi et al., 2004) estimates that structural policies on the goods and labour markets in the euro area increasing competition and reducing the price and wage mark-ups to US levels would increase production in the euro area by 12.4 percent. Due to international spillover, other countries and regions would also benefit: US output, e.g., would rise by 1 percent. Cross-country spillover depends crucially on the reaction of the exchange rate. The increase in competition results in a real depreciation of the euro as the relative supply of euro area goods rises. In addition to the effects on output, the reduction in mark-ups associated with product and labour market reforms positively influences the ability of monetary policy to stabilise output and inflation.

While a coordinated implementation of structural reforms would be beneficial for all euro area countries, a lack of coordination might be harmful. Structural reforms on the product and factor markets improve a country's international competitiveness. Thus, if only some individual countries pursued such policies, they would improve their positions at the expense of other Member States.

2.2   Foundation of empirical analysis

Starting from the previous theoretical considerations and the existing literature on spillover from fiscal policies and structural reforms, this section provides the basis for the subsequent empirical analyses. The following figure shows the various channels of spillover which are investigated in this study. In the figure, "country i model" refers to a model for an individual euro area country, whereas "Euro area -i model" denotes a model for the aggregate euro area excluding country i.

Figure 1: Overview of spillover analysed in this study
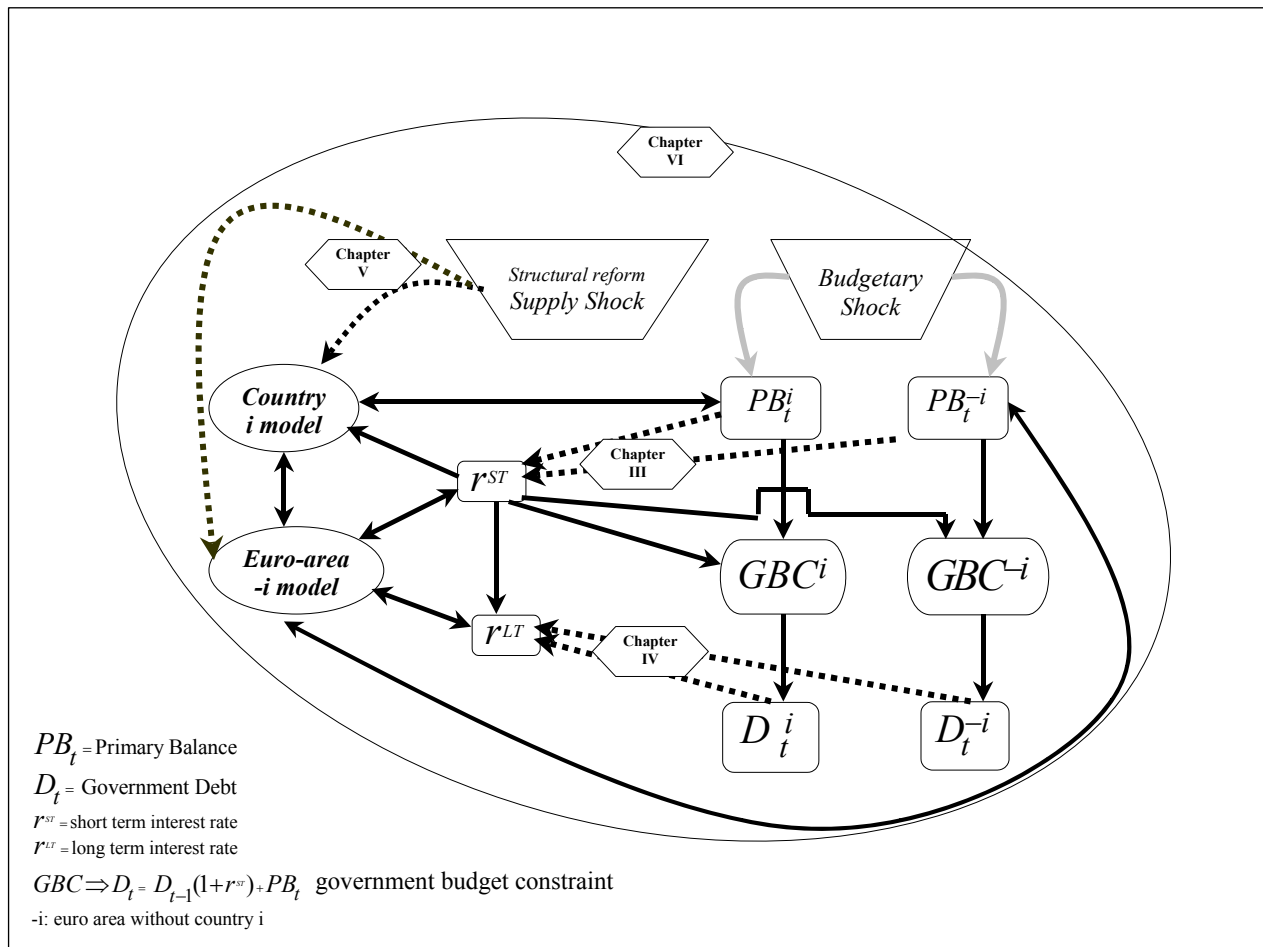
This study focuses on the links between fiscal policies and short- and long-term interest rates as well as spillover from structural reforms. In a monetary union, fiscal policy actions implemented in individual countries affect all other Member States via the common monetary policy and thus the common short-term interest rate. Fiscal expansions undertaken in individual countries may induce inflationary pressure in the respective country which, by definition, affects the area-wide inflation rate. This may force the common central bank to raise its policy rates which also leads to an increase in short-term market interest rates. This channel is elaborated in *chapter 3* of this report.

Via the term structure the long-term interest rate of government bonds is linked to the short-term rate. Since the government has to pay interest on its outstanding debt, the overall fiscal balance is influenced by the long-term interest rates. As the government budget constraint reveals, the development of the public debt level is determined by the primary balance and the interest payments on the outstanding public debt. In turn, high debt levels increase the default risk. Thus, capital market participants claim higher risk premiums. To the extent that market

participants expect a fiscal bail out, or the financing of fiscal bail outs with monetary financing, this will also show up in higher inflation. Summing up, in addition to the direct link between the fiscal balance and short-term interest rates, there is spillover between public debt and long-term interest rates. These links are investigated empirically in *chapter 4*. In chapters 3 and 4, models for selected individual euro area countries are combined with models for the aggregate euro area excluding the respective country.

As a complement to the previous analyses, *chapter 5* looks for potential non-linearities in the real effects of fiscal policy actions on economic activity. It should be clarified whether the impact of a fiscal contraction (expansion) is independent of the initial or the accompanying conditions. Alternatively, it is conceivable that the impact depends on the level of public debt.

Chapter 6 analyses the effects of supply-side measures. Structural reforms on the output and input markets will boost competition in the euro area. This enhanced competition will reduce the mark-up of prices over marginal cost, leading to higher total factor productivity (TFP) growth, increased employment and lower unemployment.

Structural reforms implemented in individual countries affect all other Member States of the monetary union directly due to the trade linkages as well as indirectly via the common monetary policy and integrated capital markets. Higher growth in the country implementing structural reforms also boosts growth in the other euro area countries by increased imports. By the working of automatic stabilisers, faster growth results in increasing government revenues and decreasing government expenditures. Thus, discretionary budget consolidation is facilitated. Such budget consolidation measures in turn lead to decreasing interest rates reinforcing the positive effects both for the country which has originally implemented supply-side reforms and for all other countries of the monetary union. In addition to the trade channel, structural reforms aiming at intensifying competition result in lower interest rates as more competition reduces the inflationary pressure. Using a multi-country model, these cross-country links between the effects of structural reforms and fiscal policies are elaborated in *chapter 7*. In addition, the international spillover between fiscal and monetary policies investigated in chapters 3 and 4 are also considered here. In particular, the MSG3 Model, a structural multi-country model, is used to perform simulations in order to derive numerical values of macroeconomic spillover for key macroeconomic policy target variables like GDP,

price level/inflation, (un)employment, etc. under different policy shocks both for individual countries and for the entire euro area.

The ultimate goal of these empirical analyses is to assess the magnitude of international spillover from fiscal policies and structural reforms in the euro area. In addition, the welfare effects of these spillover and the scope for policy coordination are estimated.

PART 2: EMPIRICAL FINDINGS

Based on the theoretical considerations discussed in part 1, empirical estimations have been performed. The applied methodologies comprise VAR models, panel estimations, and simulations with a structural model.

Data sources

Data requirements are a quarterly database for estimating the outlined VAR models, e.g. 1980:1-2004:4. In some cases, we are restricted to use annual data due to data limitations. Sources for both the fiscal and monetary variables, and the national income accounts data are e.g. the EU AMECO database, the OECD Main Economic Indicators, the Eurostat Euroindicators database, the ECB EAS database, the IMF International Financial Statistics and various national statistics. The OEF Model contains an extensive quarterly database, too.

Details on the data sources for the different chapters can be found in the appendices. For each variable, together with the source, the minimum and the maximum available time span are indicated. Macroeconomic indicators were taken from the OECD economic outlook. Data on labour market institutions can be found in Nickell and Nunziata (2001). As a major shortcoming, the database ends in 1995. Nickell (2003) provides an update, extending the period until 1998, for some indicators until 2000. A comprehensive source for data on institutions is the Fraser Institute database (Gwartney and Lawson, 2004), containing annual data from 2000 to 2002. For the period 1970 to 1995, data are available for every five years. In order to get annual time series for the entire period, the data have been linearly interpolated.

3 Budgetary spillover and short-term interest rates

As outlined in chapter 1, the main aim of the project is to provide plausible estimates of the magnitude of economic spillover and the impact of economic policy coordination on the macroeconomic performance in the euro area. Policy coordination has been defined as the adoption of a set of commonly agreed objectives. Such objectives may be defined in terms of output (co-movement of output and stable growth), inflation (convergence of inflation), the current account, or the fiscal balance (a sustainable budgetary stance that contributes to the objectives of output and inflation stability). In chapter 2, it has been discussed in detail that there are various spillover effects from budgetary policies in a highly integrated economic space like the euro area. This macroeconomic spillover constitutes an important rationale for pursuing policy coordination: through spillover, macroeconomic policies and conditions in one euro area country will affect other Member States. Vice versa, the economic conditions and policies in the rest of the euro area constitute an important factor of the macroeconomic adjustments in the individual euro area countries. As explained in chapter 2, this spillover manifests itself e.g. through trade flows, pass-through of inflation, adjustments of the common short-term interest rate and the exchange rate of the euro. Chapter 2 also noted that there exist several spillover effects between monetary and fiscal policies in a highly integrated monetary union like the euro area. In the long run, these spillover/interdependencies come from the accumulation of government debt. In the short run, spillover arises from the effects that monetary policy may have on the macroeconomic conditions under which fiscal policies are undertaken, and vice versa. This chapter focuses in particular on the short-run spillover from fiscal policy in the euro area. While there is a substantial amount of literature on spillover - see, e.g., some references in chapter 2 -, it is nevertheless fair to say that knowledge on the sign, size and timing of spillover in the euro area is far from complete.

3.1   Introduction

To analyse spillover in the euro area, this chapter utilises VAR models. In these models various channels of spillover can be identified in a straightforward and intuitive manner. The issue of spillover of fiscal and monetary policies in the euro area is studied at two levels of aggregation.

(a) The aggregate euro area level: Here, the following issues are addressed: What are the spillover effects from (i) a euro area fiscal policy shock on output and inflation in the euro

area, (ii) a euro area fiscal policy shock on the short-term interest rate / monetary policy of the ECB and the euro exchange rate? (iii) What are the spillover effects from "external" shocks (e.g. oil-price shocks or shocks to output, interest rates or inflation outside the euro area) on the euro area macroeconomic adjustments?

(b) The individual euro area country level (disaggregated level): A number of issues concerning fiscal policy spillover is relevant at the disaggregated level: (iv) How do developments in the rest of the euro area affect the individual Member States? How do adjustments outside the euro area affect the individual Member States? (v) What are the spillover effects of short-term interest rates / monetary policy changes by the ECB / changes in the euro exchange rate on individual counties? For the three largest euro area countries, Germany, France and Italy, we also analyse (vi) the spillover of fiscal shocks in these countries to macroeconomic variables in the rest of the euro area[1].

3.2   Methodology and literature on fiscal and monetary policy analysis using VARs

VAR models have been used extensively to study the transmission of real and monetary shocks.[2] A VAR represents a reduced form model of the endogenous variables. The advantage of the VAR approach is that there is no need to build a structural model describing the economy in general and the mechanisms of fiscal and monetary policy design and transmission in particular. Moreover, the VAR models deliver two convenient tools in the form of impulse response functions (IRF) and variance decompositions (VD) that provide detailed information on the impact and transmission of macroeconomic shocks and policy innovations. IRF show the effects of different types of shocks on the various endogenous variables. VD show which fraction of the total variability of the endogenous variables is explained by each shock.

In the context of this project, the VAR method is particularly suited to assess the effects of fiscal and monetary policy innovations and spillover, since it isolates the response of each variable to shocks and policy innovations and shows their macroeconomic transmission over time. However, some limitations have to be kept in mind: the VAR model is entirely data-driven. The underlying structure is determined by the data themselves (proponents of (S)VAR modelling, of course, argue that this is the main advantage of the VAR approach). Economic

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[1] We focus on the three large euro area since we can safely assume that the impact of shocks in one the small euro area countries on the rest of the euro area is of a minor importance.
[2] Insightful studies are e.g. Sims (1992), Bernanke and Blinder (1992), Gerlach and Smets (1995), Rudebusch (1998). Gordon and Leeper (1994) and Leeper et al. (1996) analyse in detail the difficulties with identification in VAR models of monetary policy.

theory is only brought into the analysis when the identifying restrictions are based on economic theory.[3] This lack of theoretical and behavioural relations may, however, also result in outcomes that seem counterintuitive. In VAR models of monetary policy, counterfactual results like, e.g., the price-puzzle are well-known.

The working of the VAR approach can be briefly summarised as follows. Assume that an unrestricted VAR model,

$$(3.1a) \qquad\qquad\qquad x_t = A(L)e_t$$

is estimated - written here in moving average form - where x is a vector of covariance stationary (macroeconomic) variables, $A(L)$ a polynomial matrix of lag length l, L the lag operator and e a vector of reduced-form innovations in the elements of x with variance-covariance matrix $E(e_t e_t^T) = \Sigma$. These reduced-form innovations, however, are likely to be correlated and can, therefore, not necessarily be interpreted as purely structural innovations. To remedy this, the SVAR approach relates the vector x to a vector of structural innovations, u_t,

$$(3.1b) \qquad\qquad\qquad x_t = B(L)u_t$$

where $B(L)$ is a polynomial matrix in L. In this SVAR, u_t is a vector of serially and contemporaneously uncorrelated, normalised structural residuals with $E(u_t u_t^T) = I$. From (3.1a) and (3.1b) it follows that the vector of reduced-form innovations can be represented as a linear combination of the structural residuals, i.e., $e_t = Cu_t$ with $CC^T = \Sigma$. As a result, $x_t = A(L)Cu_t = C(L)u_t$ and $A(L)C = B(L)$, enabling the identification of the structural innovations from the reduced-form innovations of the reduced-form VAR. $C(L)$ is a lag polynomial where the C's are coefficient matrices at the respective lags of the errors. In this way the structural form (3.1b) can be obtained from the estimates of the reduced-from representation (3.1a), provided that the transformation matrix C is of full rank. Put differently, the structural VAR model (3.1b) imposes identifying restrictions upon the VAR estimates (3.1a) to recover structural innovations from the estimated VAR.

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[3] In macroeconomic SVAR models e.g., long run restrictions are often based upon small scale IS-LM-Phillips

Structural VAR models impose additional identifying restrictions upon VAR estimates to recover structural ("orthogonalised") innovations from the estimated VAR. In practice, the identification is achieved by imposing identifying short or long-run restrictions. In order to exactly identify a VAR model of *n* endogenous variables, $(n^2–n)/2$ restrictions need to be imposed to obtain an SVAR model.[4] These restrictions can be related to economic theory. Another popular way to obtain a set of orthogonalised innovations is to use the Cholesky decomposition or a generalisation of the Cholesky decomposition.

3.3   Fiscal spillover at the aggregate euro area level

At the aggregate euro area level a number of types of budgetary spillover are important: (i) the effects of a euro area fiscal policy shock on output, inflation, and net exports in the aggregate euro area, (ii) spillover from fiscal policies on short-term interest rates and the euro exchange rate. Fiscal policy in the euro area - via its impact on output and prices - is likely to affect interest rates and exchange rates. Expansionary fiscal policies will to some extent cause crowding-out of private consumption or investment and net exports. In the euro area fiscal policy thus influences the conditions for monetary policy managed by the ECB. (iii) Spillover from foreign variables on euro-area output and prices. The euro area itself is in many ways affected by external conditions. An increase in growth of the world economy will tend to increase extra-euro area exports. This will raise output and improve the current account. Changes in oil prices and prices of intermediate goods will affect producer prices in the euro area etc. Fluctuations in the euro exchange rate will affect net exports via the effects on competitiveness of the euro area and inflation via the pass-through of exchange rate fluctuations to prices.

To obtain insights into these aspects, this section estimates VAR models of monetary and fiscal policy transmissions to determine fiscal policy spillover at the aggregate euro area level. The euro area countries are considered as an aggregate entity. In this way, the estimated VAR model can be interpreted as representing a macroeconomic model of the euro area and the innovations can be viewed as macroeconomic shocks in the aggregate euro area economy.

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curve type models.
[4] The SVAR approach was pioneered by Blanchard (1990) and Blanchard and Quah (1989) who concentrated on long-run identifying restrictions in identifying demand and supply shocks in the economy. Building upon these two papers, Gali (1992) proposes a set of identifying restrictions containing a combination of short-run and long-run restrictions. In another influential analysis, Bayoumi and Eichengreen (1992) use the SVAR approach to

The vector *x* of macroeconomic variables that are included in the VAR analysis consists of the output gap in the euro area, YGAP_EA, the fiscal balance to GDP ratio, NLGY_EA, the current account to GDP ratio, CUAY_EA, the short-term interest rate, SIN_EA, the rate of depreciation of the euro to the US dollar, DEPREUR, and inflation, INF_EA. These variables were collected for the euro area aggregate for the period first quarter of 1980 (1980:I) to fourth quarter of 2004 (2004:IV). The dynamics of the endogenous variables are displayed in Figure 2:

Figure 2: Endogenous euro area variables in the euro area VAR
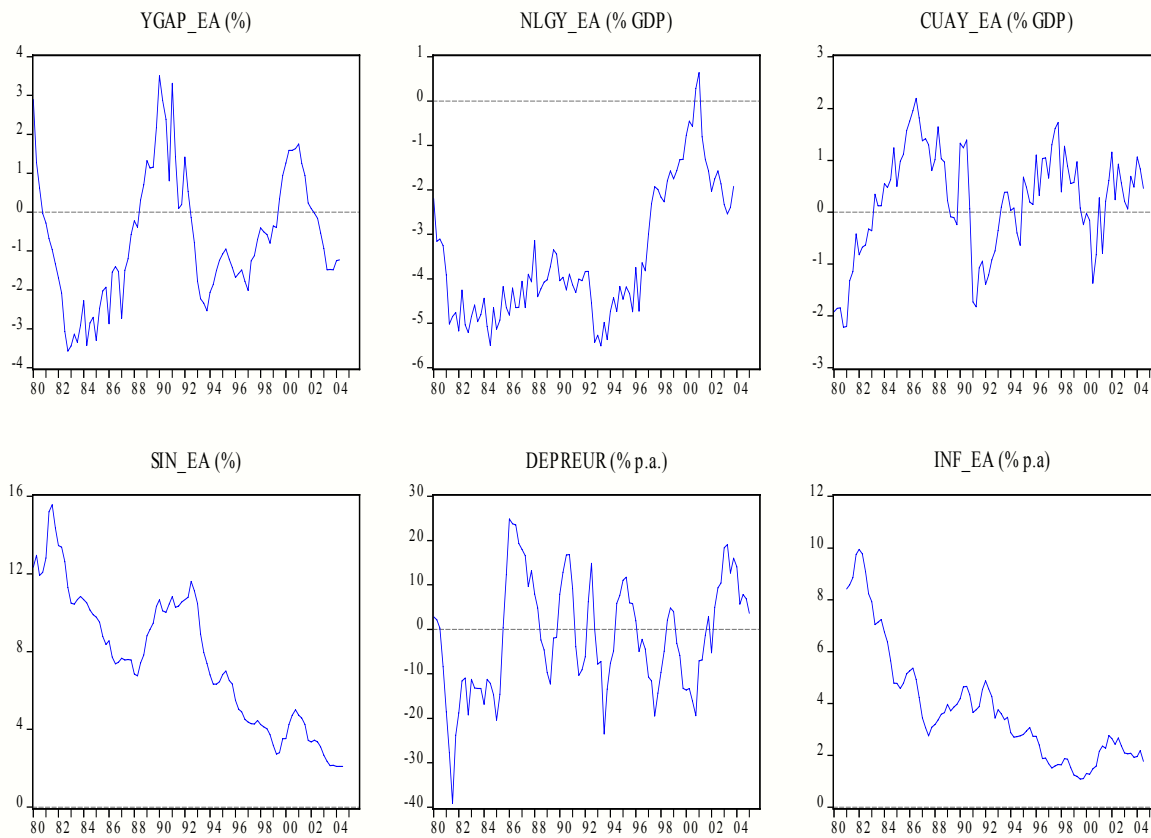
To calculate the euro area output gap, fiscal balance, current account and inflation we used weighted averages of the individual country variables. As weights, the GDP weights of the individual countries in euro area GDP were taken. This approach turns out to be useful and consistent in light of section 3.4 where we define for each country aggregates of the euro area which exclude the respective country in order to study the effects of developments in the rest of the euro area on this country. The GDP weights have fluctuated a bit over time: e.g. in

identify aggregate demand and supply shocks in the EU and to assess to which extent the EU countries constitute an optimum currency area by distinguishing between symmetric and asymmetric shocks.

1999:I the weights were: Austria 3.1%, Belgium 3.8%, Finland 2.0%, France 21.6%, Germany 31.8%, Greece 1.8%, Ireland 1.4%, Italy 17.7%, Netherlands 6.0%, Portugal 1.7%, Spain 8.9%.

In the VAR model, the following exogenous variables are also included: the oil price, OIL, the output gap in the US, YGAP_US, and DUM_EUR, a time dummy that takes a value of 1 from 1999:I onwards and a value of 0 before to capture any shift effect from the start of EMU on January 1, 1999. The Appendix lists the exact definitions, data-availability and other details about the data set. The model is estimated with two lags in its specification. Lag lengths tests find that one or two lags in the specification are optimal and that increasing the number of lags is not useful. This also applies to the country-specific models estimated in the next section, where also in all cases a lag length of two is adopted, implying that for all countries the same model structure is imposed.

The VAR model is given by equation (3.2). It is driven by six macroeconomic shocks: an output shock, $e^{\text{YGAP\_euro area}}$, a fiscal shock, $e^{\text{NLGY\_euro area}}$, a current account shock, $e^{\text{CUAY\_euro area}}$, a monetary shock, $e^{\text{SIN\_euro area}}$, an exchange rate shock, $e^{\text{DEPR\_euro area}}$, and an inflation shock, $e^{\text{INF\_euro area}}$.

$$(3.2) \quad \begin{bmatrix} \text{YGAP\_EA} \\ \text{NLGY\_EA} \\ \text{CUAY\_EA} \\ \text{SIN\_EA} \\ \text{DEPREUR} \\ \text{INF\_EA} \end{bmatrix} = A(L) \begin{bmatrix} e^{\text{YGAP\_EA}} \\ e^{\text{NLGY\_EA}} \\ e^{\text{CUAY\_EA}} \\ e^{\text{SIN\_EA}} \\ e^{\text{DEPREUR}} \\ e^{\text{INF\_EA}} \end{bmatrix} + D \begin{bmatrix} \text{OIL} \\ \text{YGAP\_US} \\ \text{DUM\_EUR} \end{bmatrix}$$

The VAR part estimates a reduced form model of output, the fiscal balance, net exports, interest rates, inflation and the exchange rate depreciation for the euro area. The matrices $A(L)$ capture all relations between the endogenous variables. The output equation is interpreted as a reduced form "IS curve" and gives e.g. estimates of output persistence, output determinants (where we are interested especially in the fiscal multiplier), the interest rate channel of monetary policy and the effects of oil prices and world trade. The VAR estimations for the fiscal balance and interest rate equations can be interpreted as systematic (or automatic) or anticipated fiscal and monetary policy responses to the endogenous variables in the VAR

(sometimes also interpreted as policy rules), providing information, e.g., about fiscal stabilisers, persistence of fiscal and monetary policies and the effects of oil price changes on the fiscal balance and interest rates. In this interpretation, the monetary and deficit shocks represent unanticipated monetary and fiscal policy innovations[5]. The trade balance estimation provides insights into the adjustment dynamics of the euro area trade balance, into the expenditure switching effect and the J-curve effect of exchange rate changes.[6] The exchange rate depreciation equation shows the adjustment of the euro/US dollar exchange rate as a function of the various shocks and macroeconomic fluctuations. The inflation equation estimates a euro area "Phillips curve" and provides estimates of, e.g., inflation persistence and the exchange rate pass-through.

To obtain a set of structural innovations from the reduced form residuals, the generalised Cholesky decomposition was used. The advantage of the generalised decompositions as compared to the ordinary Cholesky decomposition is that in the former outcomes are not sensitive to the ordering of the variables in the VAR. Figure 3 provides the estimated one standard deviation impulse response functions of the VAR model for the euro area aggregate economy, including the plus and minus two standard deviations confidence bands.

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[5] As noted earlier, this interpretation of the fiscal and monetary innovations in the SVAR approach as representing deliberate policy actions remains subject to some criticism.
[6] Kim (2001) uses a VAR model to estimate the effects of monetary policy shocks on the trade balance of Italy, France and the UK.

Figure 3: Impulse response functions of macroeconomic shocks in the euro area model

Response to Generalized One S.D. Innovation +/- 2 S.E.

Response of YGAP_EA to YGAP_EA   Response of YGAP_EA to CUAY_EA   Response of YGAP_EA to NLGY_EA

Response of CUAY_EA to YGAP_EA   Response of CUAY_EA to CUAY_EA   Response of CUAY_EA to NLGY_EA

Response of NLGY_EA to YGAP_EA   Response of NLGY_EA to CUAY_EA   Response of NLGY_EA to NLGY_EA

Figure 3 (cont'd)

Response of SIN_EA to YGAP_EA   Response of SIN_EA to CUAY_EA   Response of SIN_EA to NLGY_EA

Response of DEPREUR to YGAP_EA   Response of DEPREUR to CUAY_EA   Response of DEPREUR to NLGY_EA

Response of INF_EA to YGAP_EA   Response of INF_EA to CUAY_EA   Response of INF_EA to NLGY_EA

Figure 3 (cont'd)
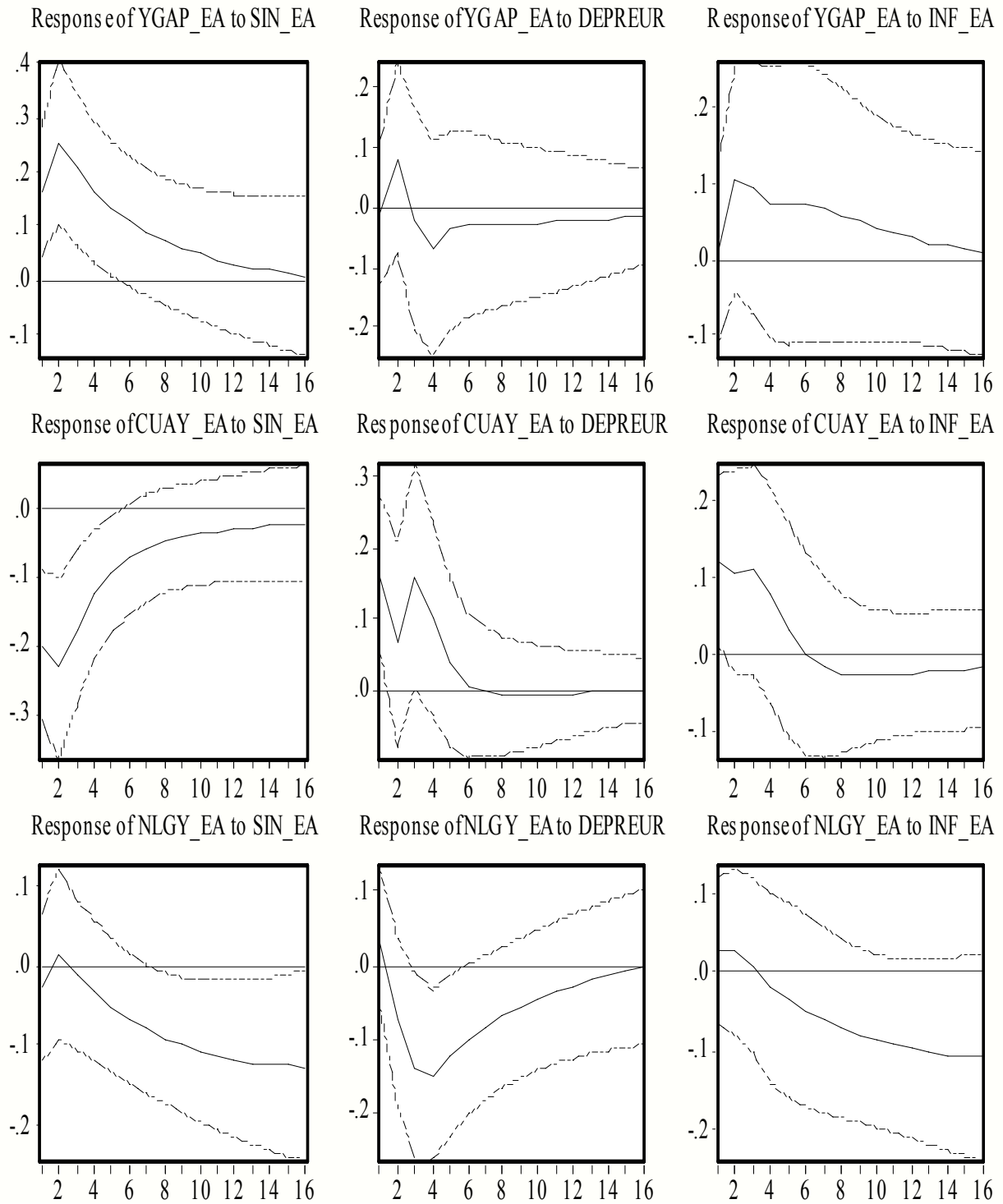
Figure 3 (cont'd)
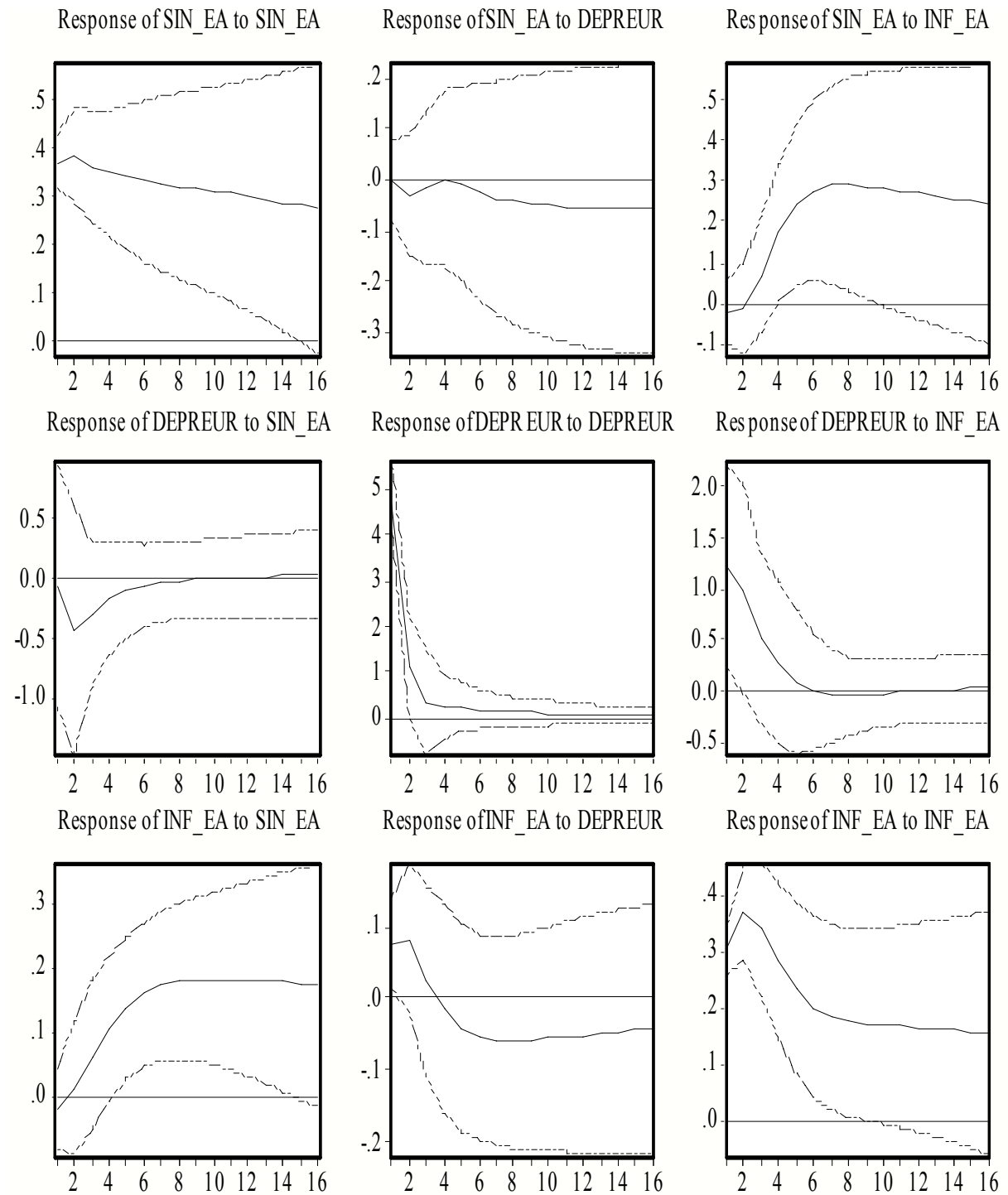
The first column displays the effects of a positive output (gap) shock: it tends to decrease the current account balance, and to increase the fiscal balance, interest rates and inflation, as would be expected from economic theory. The size of the effects can also be determined rather straightforwardly: an initial increase of output by 0.5 percent raises the fiscal balance and interest rates by about 0.1 percent. We are interested especially in column 3 which shows the effects of a fiscal innovation (i.e. an increase in the fiscal balance). An improvement of the fiscal balance increases output, suggesting the prevalence of positive non-Keynesian style effects from fiscal consolidation. The observed improvement of the trade balance suggests that the "twin deficits" hypothesis holds for the euro area: changes in the fiscal balance tend to affect the external balance in the same direction. Furthermore, the fiscal balance shock induces a depreciation of the euro and a small increase in inflation. Interest rates rise with positive output and inflation shocks, which could be related e.g. to a Taylor-type rule reaction by the ECB. Indirectly, it may also be interpreted such that the short-term interest rate is an important transmission mechanism of spillover: increases in output or inflation drive the interest rate, which in turn induces various effects on the fiscal balance, exchange rate, output etc.

The VAR model can also be used to study the important issue of the short-run interaction of fiscal and monetary policies: these interactions are measured by the impact of interest rate shocks on the fiscal variables and the impact of fiscal shocks on the interest rate. A positive innovation in the fiscal balance has no sizeable effect on the short term interest rate - note, however, that this relation appears to be estimated imprecisely given the large confidence bounds. A positive shock to the short term interest rate by 0.3 percent tends to deteriorate the fiscal balance by 0.1 percent. This suggests that monetary policy affects the conditions for fiscal policy. A plausible explanation for this result seems to be the increasing interest rate burden on government debt when interest rates rise.

Another source of spillover in the aggregate euro area model comes from shocks to the euro exchange rate: a depreciation of the euro has initially a small positive effect on output, improves the current account and has some inflationary effects, reflecting "pass-through" mechanisms. Finally, concerning the effects of the exogenous variables it is found that the US output gap initiates a significant positive effect on the euro area output gap and current account. The oil price has a negative effect on the output gap and the current account and a positive effect on inflation, but the effects are relatively imprecisely estimated. The EMU

dummy has a significant negative effect on the interest rate suggesting that the establishment of the monetary union had an effect of lowering interest rates even when considering the effects of all macroeconomic variables in the model. There is no evidence that the dummy affected other variables in the euro area aggregate economy: in that sense, the introduction of EMU does not seem to have had a significant independent impact on output growth, inflation, the current account or fiscal balances.

Summarising, in the aggregate model there is some - albeit weak - evidence of direct spillover between monetary and fiscal policies in the euro area. Apart from this direct spillover there are a number of indirect connections between monetary and fiscal policies. In addition, external factors - fluctuations in the exchange rate of the euro, oil prices and US output - initiate various spillover effects on the euro area economy.

3.4   Fiscal spillover in the euro area at the country level

The aggregate analysis of the previous section reveals that many spillover effects in the euro area actually occur between individual Member States. In this section, we therefore investigate spillover on the level of individual countries in the euro area. This requires a disaggregated analysis. Therefore, in this section VARs of individual EMU countries are used to estimate the effects of shocks in the rest of the euro area on the individual Member States. In addition, we estimate how shocks in the three largest Member States (Germany, France and Italy) affect the rest of the euro area. We again focus the analysis on spillover from fiscal policies.

A number of issues concerning spillover are relevant at the disaggregated level in the euro area: (i) How do developments in the rest of the euro-area affect the individual Member States? This regards in particular the spillover from output, inflation and fiscal shocks in the rest of the euro area. (ii) What is the spillover from the short-term interest rate / monetary policy changes by the ECB / changes in the euro exchange rate on individual counties? (iii) How do adjustments outside the euro area affect the individual Member States? For the three largest euro area countries, Germany, France and Italy, we also analyse (iv) the spillover from fiscal shocks in these countries on macroeconomic variables in the rest of the euro area.

To analyse these issues, it is necessary to define for each country j the output gap, fiscal balance and inflation rate in the rest of the euro area (i.e. the euro area aggregate excluding

country j). These variables were calculated using the set of (time-varying) GDP weights referred to above when discussing euro area aggregates. Obviously, for small countries the difference between euro area aggregates and their country "rest of the euro area" aggregates are very small; only for the set of the three large euro area countries, this distinction between total euro area and rest of the euro area is more substantial as each of the large countries forms a significant part of the euro area. This point is also seen in Table 14 of the Appendix that provides the contemporaneous correlations between euro area countries (suffix _J) and correlations between euro area countries and the euro area aggregate (suffix_EA) vis-à-vis the rest of the euro area aggregates of each country (suffix_REA) for the output gap, inflation and fiscal balances.

The correlations of a country's output gap with the rest of the euro area aggregate varies between 0.30 in the case of Finland and 0.84 in France, according to panel (a). The degree of inflation co-movement is in many countries even higher than output co-movement as can be seen from the correlations between inflation in the euro area countries and inflation in the rest of the euro area according to panel (b). Fiscal policy displays the lowest correlations (see panel (c)): not only are the correlations between countries in most cases relatively low, also the correlation between the fiscal balance of country j and that in the rest of the euro area is typically lower than in the cases of output and inflation. The lowest correlation is seen for Germany. Idiosyncratic factors such as German reunification may explain this observation to some extent.

To determine the spillover outlined in chapter 2, for each euro area country a VAR model was estimated that includes as endogenous variables the output gap, the fiscal balance, the current account and inflation of country j together with the output gap, fiscal balance and inflation in the rest of the euro area as well as the euro area short-term interest rate. Exogenous variables in the individual country VAR models are: the oil price, OIL, the output gap in the US, YGAP_US, the depreciation of the euro exchange rate, DEPREUR, and the time dummy DUM_EUR that captures any shift effects from the start of EMU on January 1, 1999. In the case of Germany, in addition a shift dummy for German reunification is included, taking a value of 1 as of January 1, 1990.

$$(3.3) \quad \begin{bmatrix} \text{YGAP\_J} \\ \text{NLGY\_J} \\ \text{CUAY\_J} \\ \text{INF\_J} \\ \text{YGAPREA\_J} \\ \text{NLGYREA\_J} \\ \text{SIN\_EA} \\ \text{INFREA\_J} \end{bmatrix} = A(L) \begin{bmatrix} e^{\text{YGAP\_J}} \\ e^{\text{NLGY\_J}} \\ e^{\text{CUAY\_J}} \\ e^{\text{INF\_J}} \\ e^{\text{YGAPREA\_J}} \\ e^{\text{NLGYREA\_J}} \\ e^{\text{SIN\_EA}} \\ e^{\text{INFREA\_J}} \end{bmatrix} + \gamma \begin{bmatrix} \text{OIL} \\ \text{YGAP\_US} \\ \text{DEPREUR} \\ \text{DUM\_EUR} \end{bmatrix}$$

Lag lengths tests find that in practically all cases a VAR model with one or two lags is preferred. For simplicity and consistency, the model with two lags is estimated for all countries, so that for all Member States exactly the same model structure is used, as noted earlier. Any difference between countries is therefore the result of different transmissions of shocks, rather than different model structures (e.g. lags, variables).

For the three largest euro area economies, Germany, Italy, and France, Figure 4 shows the IRF of generalised 1 standard deviation shocks to (i) output in the rest of the euro area (YGAPREA, column 1), (ii) the fiscal balance in the rest of the euro area (NLGYREA, column 2), (iii) the euro area short-term interest rate (SIN_EA, column 3), (iv) inflation in the rest of the euro area (INFREA, column 4). We are particularly interested in the effects of these shocks on country j's output (YGAP, row 1), fiscal balance (NLGY, row 2), current account (CUAY, row 3) and inflation (INF, row 4). The remaining euro area countries in the panel can be found in Appendix 3b..

Figure 4: Spillover from the (rest of the) euro area on individual countries (France, Germany, Italy)

Response to Generalized One S.D. Innovations ± 2 S.E.
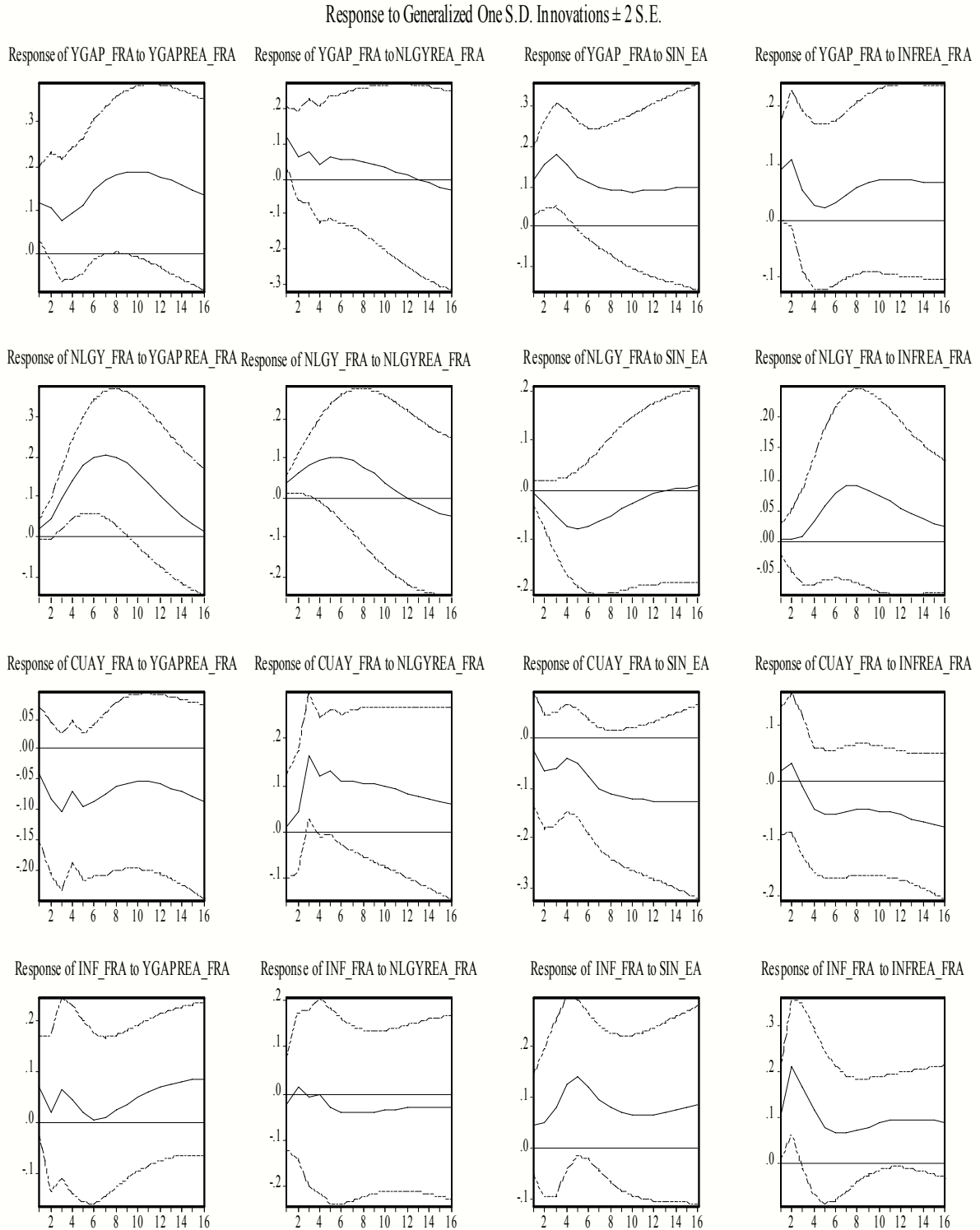
(a) France

Response of YGAPREA_FRA to YGAPREA_FRA   Response of YGAPREA_FRA to NLGYREA_FRA   Response of YGAPREA_FRA to SIN_EA   Response of YGAPREA_FRA to INFREA_FRA
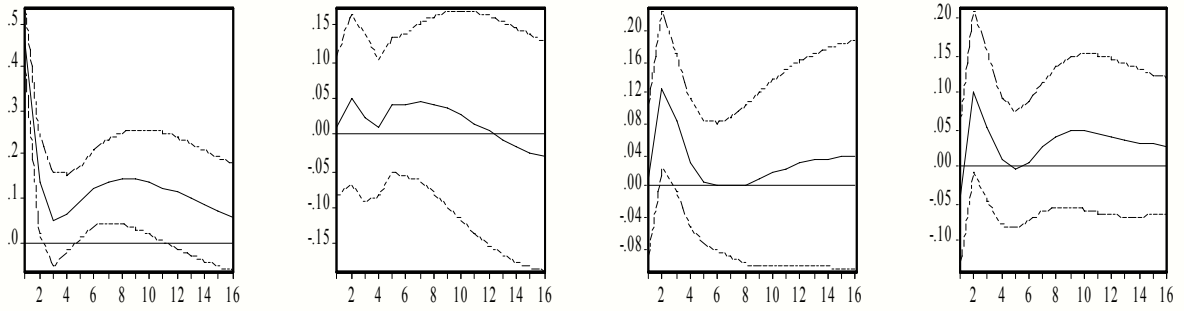
Response of NLGYREA_FRA to YGAPREA_FRA   Response of NLGYREA_FRA to NLGYREA_FRA   Response of NLGYREA_FRA to SIN_EA   Response of NLGYREA_FRA to INFREA_FRA
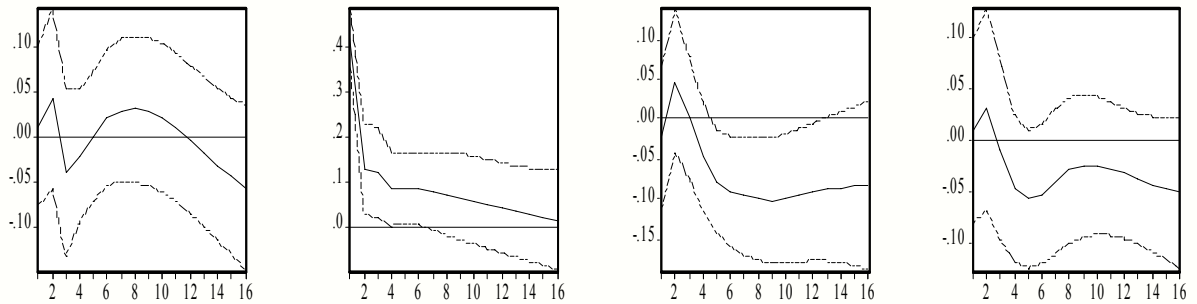
Response of SIN_EA to YGAPREA_FRA   Response of SIN_EA to NLGYREA_FRA   Response of SIN_EA to SIN_EA   Response of SIN_EA to INFREA_FRA
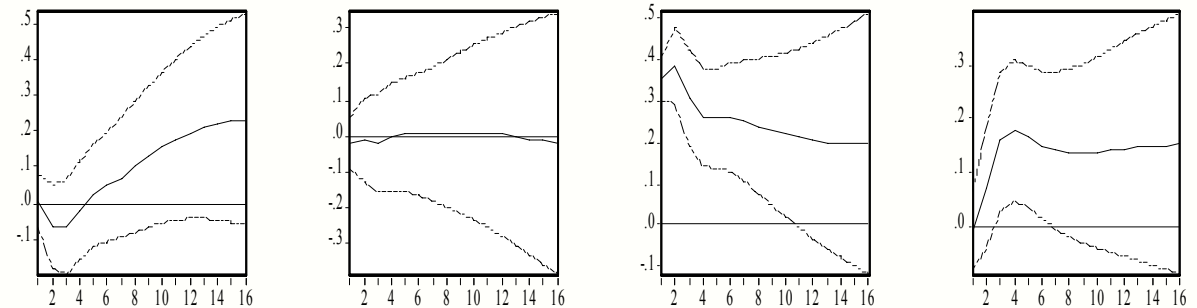
Response of INFREA_FRA to YGAPREA_FRA   Response of INFREA_FRA to NLGYREA_FRA   Response of INFREA_FRA to SIN_EA   Response of INFREA_FRA to INFREA_FRA

(a) France (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

Response of YGAP_GER to YGAPREA_GER

Response of YGAP_GER to NLGYREA_GER

Response of YGAP_GER to SIN_EA

Response of YGAP_GER to INFREA_GER

Response of NLGY_GER to YGAPREA_GER

Response of NLGY_GER to NLGYREA_GER

Response of NLGY_GER to SIN_EA

Response of NLGY_GER to INFREA_GER

Response of CUAY_GER to YGAPREA_GER

Response of CUAY_GER to NLGYREA_GER

Response of CUAY_GER to SIN_EA

Response of CUAY_GER to INFREA_GER

Response of INF_GER to YGAPREA_GER

Response of INF_GER to NLGYREA_GER

Response of INF_GER to SIN_EA

Response of INF_GER to INFREA_GER

(b) Germany

Response of YGAPREA_GER to YGAPREA_GER	Response of YGAPREA_GER to NLGYREA_GER	Response of YGAPREA_GER to SIN_EA	Response of YGAPREA_GER to INFREA_GER
Response of NLGYREA_GER to YGAPREA_GER	Response of NLGYREA_GER to NLGYREA_GER	Response of NLGYREA_GER to SIN_EA	Response of NLGYREA_GER to INFREA_GER
Response of SIN_EA to YGAPREA_GER	Response of SIN_EA to NLGYREA_GER	Response of SIN_EA to SIN_EA	Response of SIN_EA to INFREA_GER
Response of INFREA_GER to YGAPREA_GER	Response of INFREA_GER to NLGYREA_GER	Response of INFREA_GER to SIN_EA	Response of INFREA_GER to INFREA_GER

(b) Germany (cont'd)

Response to Generalized One S.D. Innovations ±2 S.E.

(c) Italy

(c) Italy (cont'd)

Figure 4 (for the three largest euro area countries) and Figure 39 (for the smaller Member States) provide a number of insights into the various spillover effects that have been identified in chapter 2. In particular, we obtain (i) the spillover of a positive output shock in the rest of the euro area on domestic output and domestic net exports (column 1). Next, we find (ii) the spillover of an increase in inflation in the rest of the euro area on domestic inflation (column 4). Also, the effects of (iii) an increase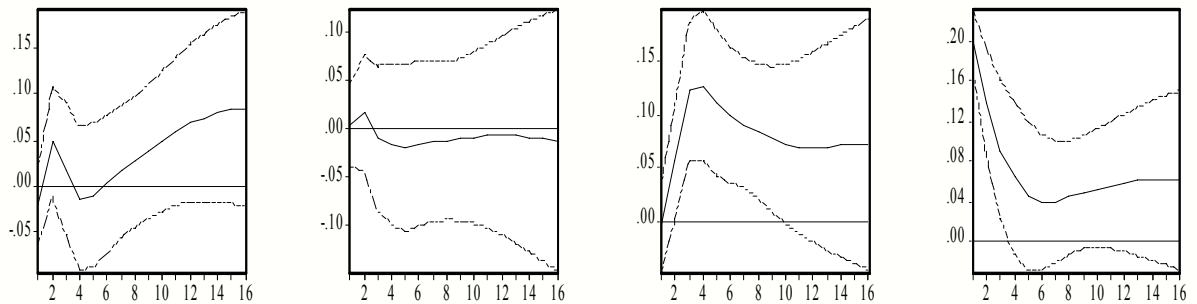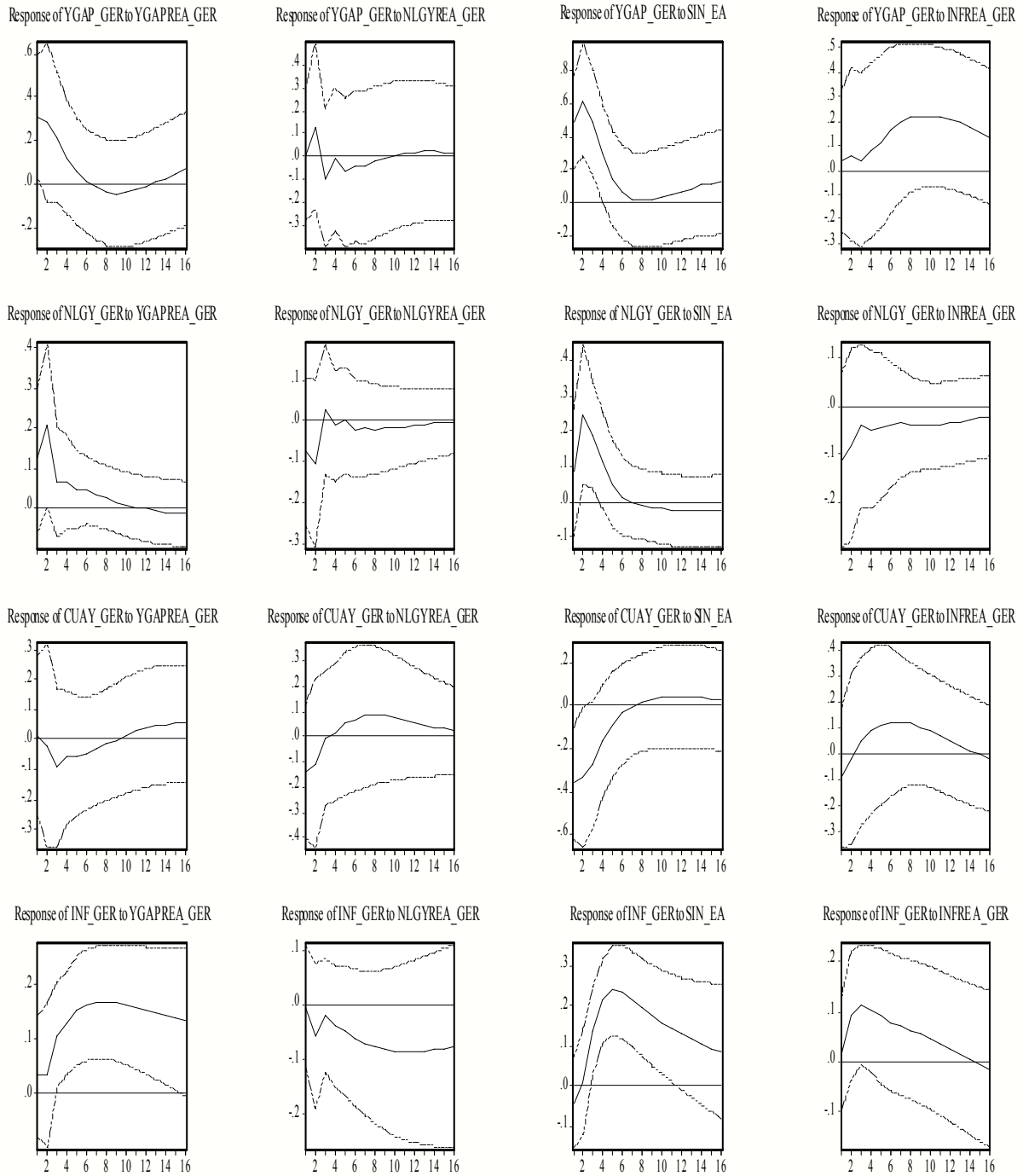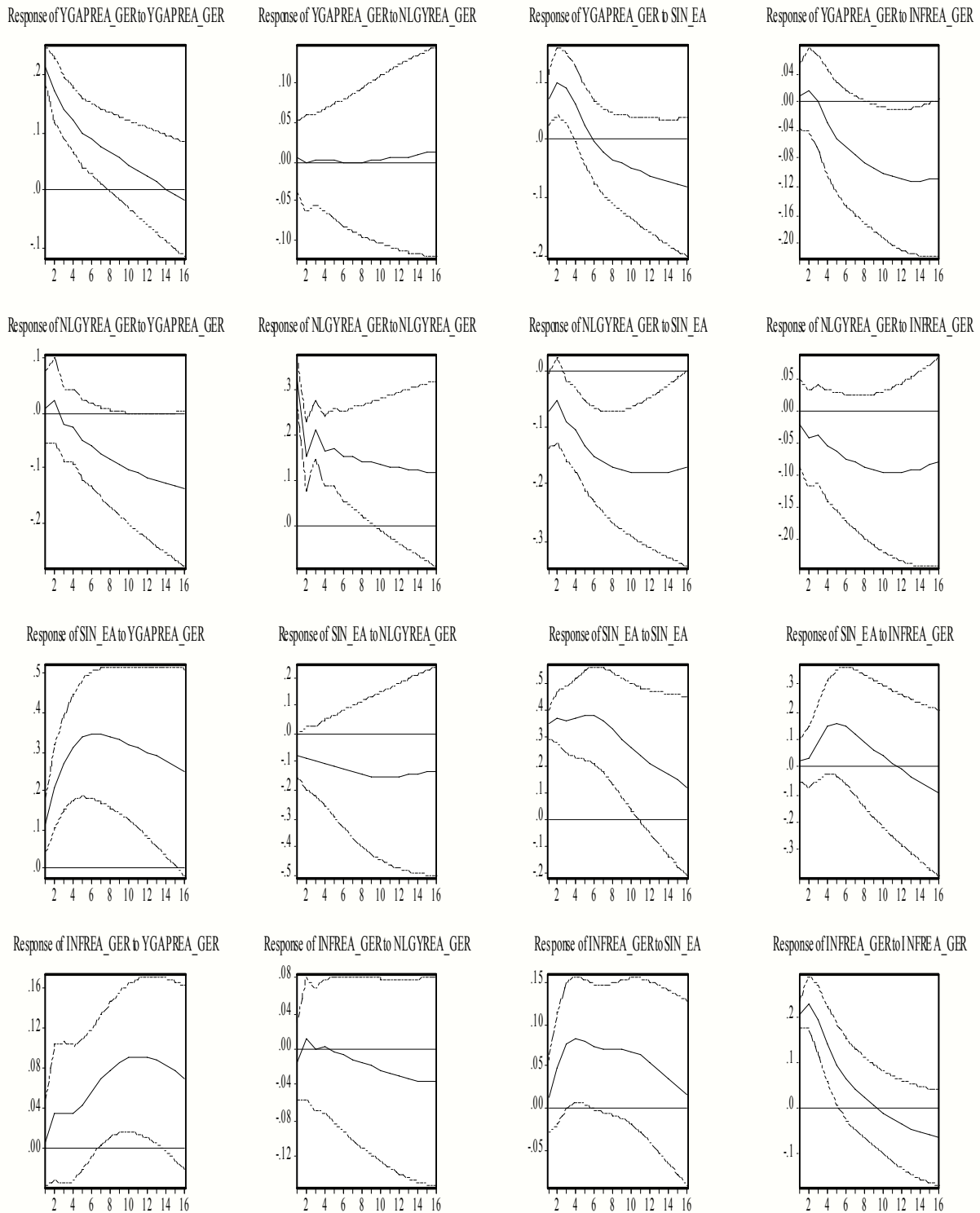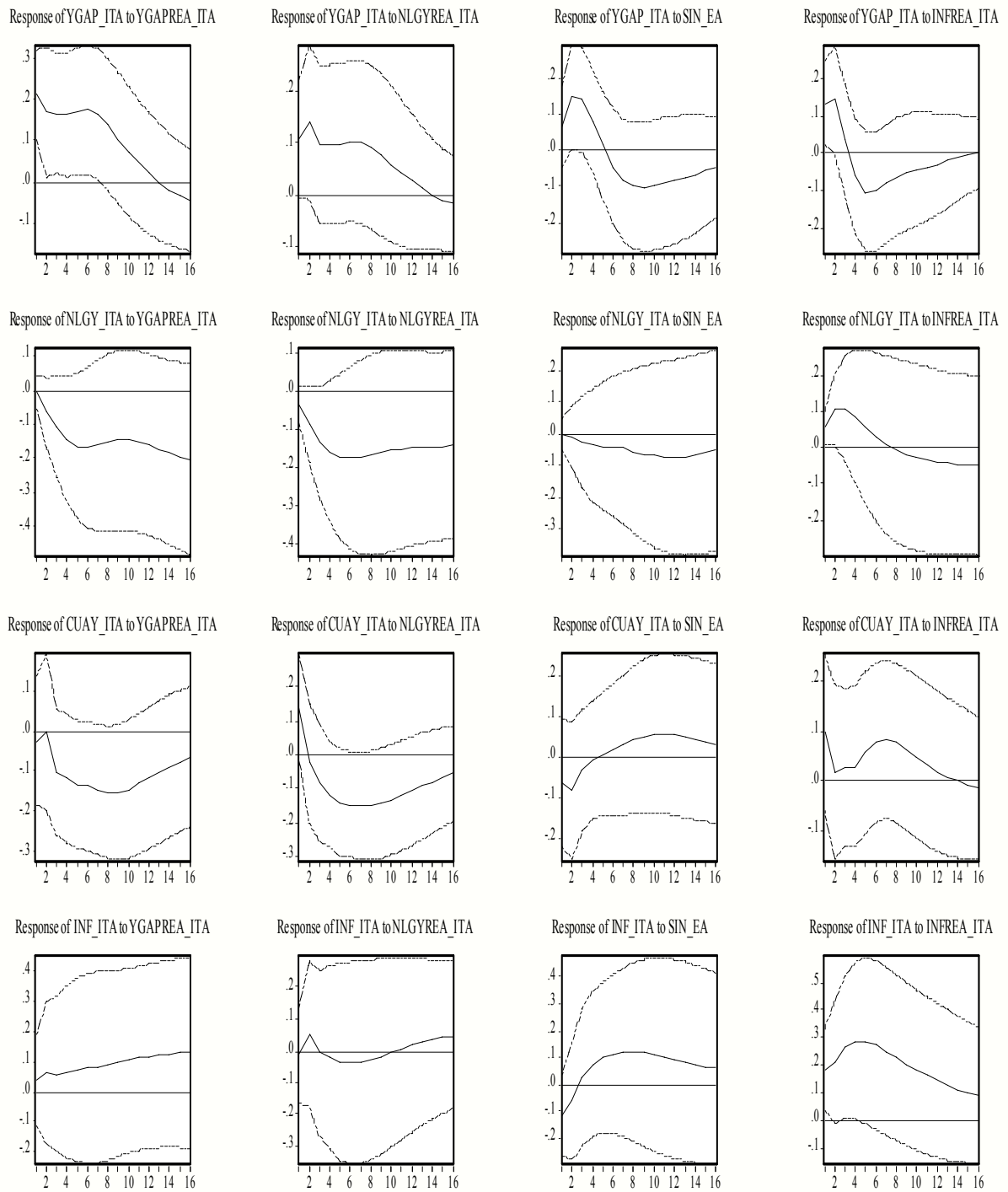 in the fiscal balance in the rest of the euro area (column 2) and (iv) an increase of the common short-term interest rate (column 3) on domestic output, inflation and the fiscal balance can be assessed. The last four rows are of minor importance, except for giving us the necessary information on the size and persistence of the shocks (on the diagonal).

In the case of *France*, there is evidence of positive output and inflation spillover. The fiscal balance is also positively affected by foreign output, fiscal shocks and inflation shocks. Higher interest rates tend to reduce the fiscal balance, even though the effect is small. The model of *Germany* finds positive spillover from the rest of the euro area on German output and inflation. Higher interest rates tend to improve the German fiscal balance in the short run, as if the German fiscal policy-makers were disciplined by higher interest rates. For *Italy*, we find positive output and inflation spillover, together with fiscal spillover, suggesting that a foreign fiscal consolidation improves output in Italy.

In the case of *Austria*, positive output and inflation spillover effects are present. Interest rate shocks mainly affect inflation rather than output or the fiscal balance. Interestingly, a fiscal balance shock in the rest of the euro area tends to induce changes in the same direction to the Austrian fiscal balance. The model of *Belgium* is in many respects similar to the Austrian case. Interestingly, however, the Belgian fiscal balance does not seem to react to deficits elsewhere; it improves in the short-run in response to higher output in the rest of the euro area, and it is negatively affected by interest rate increases. Most likely, this latter effect is explained by a relatively high debt level over the sample period. Higher interest rates burden the fiscal balance because of higher interest rate payments. *Finland* is outlying in the sense that there is no evidence of positive output spillover from the rest of the euro area on Finnish output. Compared with other countries, the evidence for spillover effects on the Finnish economy from the rest of the euro area are weaker in practically all cases as suggests the observation that the sign of the effects often changes over time and that the confidence bands are rather large.

Greece displays relatively small output, fiscal and interest rate spillover. The effect of inflation spillover is relatively strong: inflation in the rest of the euro area seems to have a substantial impact on Greek inflation as do short-term interest rates and output in the rest of the euro area. The short-run improvement of Greek net exports after an inflation shock in the rest of the euro area may reflect the improved competitiveness after such a shock as Greek inflation is only gradually affected by the foreign inflation shock. *Ireland* is marked by positive output and inflation spillover; the fiscal balance is negatively affected by an increase in the short-term interest rate. The model of the *Netherlands* displays positive output spillover but no inflation spillover. Interest rate increases tend to deteriorate the fiscal balance. These results also hold in the case of *Portugal*. Moreover, the Portuguese results give some evidence of fiscal spillover: an increase in the fiscal balance in the rest of the euro area tends to increase output in Portugal, deteriorate its current account and increase inflation. In the case of *Spain*, there is again evidence of positive output and inflation spillover. In addition, there is evidence of a small negative effect from interest rates on output and the fiscal balance as well as a positive effect from interest rate increases on net exports and inflation.

Summarising, in a number of cases restrictive fiscal policies in the rest of the euro area reduce output in the domestic economy; in some cases there is hardly any effect or the effect is positive. This is also the case for a restrictive monetary policy shock that raises the common interest rate. Positive inflation and output shocks in the rest of the euro area also lead often to higher inflation and output in the domestic economy. The evidence of these positive output and inflation spillover effects is found to be relatively consistent and convincing.

Interestingly, there are not only important similarities but also considerable differences between countries in terms of signs and sizes of the various spillover effects - note, moreover, that for each Member State the same model structure (exogenous variables, lags of the VAR) and practically the same sample period was used in the estimation, so that differences cannot be due to these factors -. This suggests that there are strong heterogeneities between euro area countries in the spillover, reflecting differences in economic structures, macroeconomic shock characteristics and fiscal policy reactions. E.g. for the fiscal spillover many factors such as the size and openness of a country, the size of the fiscal multipliers and the estimated persistence of the fiscal shock may be important. The heterogeneities between countries suggest that caution is needed when analysing the effects of shocks at the aggregate euro area level as in

section 3.3 and extending the conclusions of the aggregate analysis to the individual Member States.

In the model, external spillover is also present and measured by the impact of a depreciation of the euro, the oil price and the US output on the output, fiscal balance, current account balance and inflation in the euro area countries. It is assumed that for the individual countries these variables are exogenous. In most cases an increase in the oil price tends to decrease output, the current account balance and the fiscal balance and contribute to higher inflation. A depreciation of the euro has in most countries a small positive effect on output and inflation. In addition, in a significant number of countries output increases if US output increases. Despite a few exceptions in detail, the general picture suggests that such external spillover on individual euro area countries from oil price changes, changes in the euro exchange rate and output outside the euro area (here represented by the US) is a source of spillover that does matter also at the disaggregated level and, moreover, that countries vary to some degree in the sign and size of this spillover.

A final aspect that needs to be addressed in this chapter concerns the spillover from shocks in the three largest euro area countries on the rest of the euro area. The country VARs that were estimated in (3.3) can also be used to analyse these spillover effects since they determine how shocks in Germany, Italy and France affect the respective rest of the euro area. Figure 5 displays the spillover from output, the fiscal balance and inflation shocks in, respectively, Germany, France and Italy on output (row 1), the fiscal balance (row 2), and inflation (row 4) in the respective rest of the euro area. Also the effect on the short-run interest rate in the euro area is shown (row 3).

Figure 5: Spillover from Germany, France and Italy on the respective rest of the euro area

Response to Generalized One S.D. Innovations ± 2 S.E.

(a) Germany

(a) Germany (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

(b) France

(b) France (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

(c) Italy

Response of YGAP_ITA to YGAP_ITA

Response of YGAP_ITA to NLGY_ITA

Response of YGAP_ITA to INF_ITA

Response of NLGY_ITA to YGAP_ITA

Response of NLGY_ITA to NLGY_ITA

Response of NLGY_ITA to INF_ITA

Response of CUAY_ITA to YGAP_ITA

Response of CUAY_ITA to NLGY_ITA

Response of CUAY_ITA to INF_ITA

Response of INF_ITA to YGAP_ITA

Response of INF_ITA to NLGY_ITA

Response of INF_ITA to INF_ITA

(c) Italy (cont'd)

According to these estimations, the output and inflation spillover from shocks in France and Italy to the rest of the euro area appear to be larger than those from Germany. We observe that the spillover form France and Italy is often comparable and differ from the spillover produced by German shocks in size and sometimes also in sign. That fiscal spillover from Germany is rather small and/or counterintuitive may reflect statistical inaccuracies but also possibly deeper phenomena. It is possible that German reunification and the subsequent fiscal adjustments as well as the fundamental process of reforms and restructuring in the German economy caused diverging developments in Germany as compared to the rest of the euro area during the sample. The short-term interest rate in the euro area does not seem to be strongly affected by individual fiscal balance shocks in Germany, France or Italy. This is in line with the conclusion of the aggregate model where we also did not see a substantial effect of aggregate fiscal shocks on interest rates.

3.5   Conclusions

In an integrated monetary and economic union such as the euro area, budgetary and other types of spillover are likely to be important and complex. The short-run transmissions and spillover of budgetary policy in the euro area are working through several different channels. These include not only the traditional direct output and inflation spillover via net trade flows, but also channels operating via the common interest rate (and monetary policy) and the euro exchange rate.

The multitude of spillover and complex dynamics suggests that in particular a flexible econometric approach like VAR models are useful if one is seeking to estimate spillover in the euro area. In this chapter we have therefore estimated VAR models to analyse a number of spillover effects that were considered important in the euro area.

First, the spillover at the level of the aggregate euro area was analysed. The effects of a change in the euro area fiscal balance on output, net exports, interest rates, the euro exchange rate and inflation in the euro area were estimated. In the aggregate model there is some - albeit weak - evidence of direct spillover between monetary and fiscal policies in the euro area. In particular, a positive interest rate shock reduces the fiscal balance. A positive shock to the fiscal balance tends to reduce the interest rates in the short run, but this effect is rather small and imprecisely estimated. Apart from this direct spillover, there are a number of indirect connections between monetary and fiscal policies, running e.g. through output,

inflation and depreciation of the euro. These indirect interdependencies were also analysed. Finally, external factors - oil prices and US output – are another important source of spillover on the aggregate euro area economy.

Second, the disaggregated analysis indicated that behind the aggregate analysis of the euro area economy, there is a whole multitude of country-specific adjustments at work. The analysis at the disaggregated level finds that the effects of fiscal policy in the euro area differ substantially between countries. The most important results are: (i) there are positive direct output and inflation spillover from the rest of the euro area on individual Member States. (ii) The spillover from a fiscal policy shock in the rest of the euro area varies largely across Member States. (iii) External shocks in the form of oil price changes, changes in the euro exchange rate and fluctuations in the US output gap induce spillover to individual countries. The timing and size of effects varies across countries. (iv) For the three large euro area countries, Germany, France and Italy, spillover effects of fiscal policy on the rest of the euro area were estimated. In this way, the effects of a fiscal shock in e.g. Germany on the rest of the euro area were determined. Spillover from a fiscal shock in Germany on the rest of the euro area seemed to be somewhat smaller than spillover from a fiscal shock in France or Italy, but this result might be driven by significant changes not only to the economic structure but also to fiscal polices in Germany after reunification.

4 Budgetary spillover and long-term interest rates

4.1 Introduction

The effect of fiscal expansions on interest rates has commanded enormous theoretical interest, and the hypothesis of crowding-out has received some – albeit not very robust – empirical endorsement. Most economists would nevertheless agree with the position that consolidating public finances reduces pressure on interest rates and will be conducive to economic growth in the long run (Gale and Orszag, 2003). The crowding-out premise is also an important motivation underlying the fiscal policy paradigm in EMU, as is evident from the policy recommendations of both the European Commission and the ECB.

Capital flows between economically integrated economies tend to offset interest rate differentials. Fiscal deficits don't have necessarily to be financed by domestic financial resources. The budgetary decision of one government may therefore affect the financing conditions of other governments. This spillover effect is a purely pecuniary externality and would not really command international coordination. Nevertheless, governments in open economies that belong to a monetary union face different incentives. Basically, free riding between independent fiscal authorities distorts the disciplinary incentives of higher interest rates on governments and may therefore lead to excessive debt accumulation, and possibly higher inflation (Beetsma and Bovenberg, 1999). Budget constraints indeed soften when the fiscal relations between governments are not clearly spelled out. In EMU, the effects of debt spillover have been contained with the no-bail out clause that is enshrined in Articles 101 and 103 of the Treaty of Nice, prohibiting overdraft facilities from the ECB or the assumption of national commitments by other Member States. Keeping the national fiscal houses in order is probably a sufficient condition to eliminate the distortion caused by free riding. The numerical rules of the Stability and Growth Pact imply a debt target, and some reform proposals on the Pact have argued for a stronger focus on debt consolidation. But the negative coordination mechanism of deficit reduction should probably be conceived as pre-empting fiscal bail outs.

There is little direct evidence for European countries on the crowding-out effects of (accumulated) deficits, and there are even fewer studies that examine the spillover that fiscal expansions has on long-term interest rates in a monetary union. The aim of this chapter is to offer a framework to test both hypotheses. We do so by building on the literature that

examines the effects of fiscal policy with small VAR models. That is, we examine the gross effects that fiscal shocks have on domestic long-term interest rates. Accordingly, we specify a VAR containing a simple economic model supplemented with rules-based fiscal policy and long-term interest rates. We first examine this "national" SVAR for crowding-out for the large euro area countries, a couple of smaller European countries and the euro area as a whole. Then, we net out the spillover effects of public deficit and debt accumulation on a country's interest rate by benchmarking the model on aggregate euro area conditions.

The chapter is structured as follows. Section 4.2 makes the case for the modelling choice on the basis of a critical literature review. The pros and cons of the specification and identification of the SVAR model are detailed in section 4.3. The empirical results on gross crowding-out effects of deficit accumulation follow in section 4.4, while section 4.5 investigates the spillover of fiscal policies. The final section 4.6 summarises the main results, discusses some implications for the design of fiscal policy coordination in EMU, and closes with some policy recommendations.

4.2   Deficits and interest rates: is there any robust evidence?

Many economists probably consider Ricardian Equivalence as a reasonable starting point for the theoretical analysis of the effects of fiscal policy. Few would endorse it as a realistic description of fiscal policy. The view that private savings do not fully offset the change in public savings is not based on a firm empirical rejection of Ricardian Equivalence, for this hypothesis is not directly testable. Plenty of empirical studies have therefore examined the alternative question as to whether fiscal policy has any real economic effects. Recent evidence seems to converge on at least some crowding-out effect of fiscal expansions on long-term interest rates in practice. But no consensus has been reached: Elmendorf and Mankiw (1999) even consider the results of the literature not informative.

Typically, interest rates are explained by including fiscal balances among the regressors in a single equation – next to short-term interest rates, inflation and other relevant variables – often in a panel framework. The specification usually derives from a partial equilibrium "loanable funds" model in which the interest rate adjusts so as to maintain equality between the supply and demand of bonds (Cebula, 1998). Alternative specifications are based on intertemporal models of saving behaviour (Laubach, 2003). A large number of studies employ

various definitions of government deficit or debt, interest rates, econometric approach and data set. These studies can basically give support for any possible view on crowding-out.[7]

The factors that determine interest rates are plenty of course, and long-term structural factors probably account for much more of the variation in interest rates. But a major reason for the ambiguous effect is due to the static specification of the relation between deficits and interest rates in these models. Government bonds are actually traded on financial markets that are forward looking. The anticipation of upcoming deficits may therefore result in higher long-term rates already now, as the direct crowding-out of short-term rates accumulates in long-term rates via the expectations hypothesis. As a consequence, the exclusion of either of the ends of the term structure could also bias the results (Bernheim, 1987). Expectations of higher future deficits would show up directly in the slope of the yield curve, as future short-term rates rise. Those studies that include expectations of future fiscal developments – for example, by using the fiscal forecasts of the Congressional Budget Office (CBO) in the United States – unanimously find significantly positive effects of expected deficits on expectations of interest rate moves (Laubach, 2003).[8] Some studies capture interest rate expectations by modelling the effects on the entire term structure, and thereby obviate the need for modelling the determinants of interest rates (Reinhart and Sack, 2000; Lindé, 2001 or Canzoneri et al., 2002). Another way of capturing agents' expectations is through the "news" approach to public announcements of fiscal policy changes. Event studies try to detect the impact of unexpected changes in fiscal policy on financial markets, much alike the narrative VAR approach of Ramey and Shapiro (1998).[9]

Any direct relation between interest rates and fiscal balances is moreover obscured by contemporaneous influences of countercyclical monetary policy, the workings of automatic fiscal stabilisers and any economic effects of fiscal policy itself. In addition, the endogeneity of the fiscal balance to interest rates, via the higher interest payments on outstanding debt obligations, further cloud the direction of causality.[10] For these reasons, the econometric evidence of most reduced form empirical models remains rather inconclusive.

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[7] See the references in Barth et al. (1991), Gale and Orszag (2003) or the European Commission (2004).
[8] The scarcity of such data for European countries prohibits a straightforward extension. The European Commission produces forecasts for year $t+2$ at most.
[9] For the USA, Wachtel and Young (1987), Elmendorf (1996) and Kitchen (1996) give a good overview, while Knot (1996) or Afonso and Strauch (2003) give evidence for European countries.

Such effects can only be uncovered in dynamic models. Large macroeconomic models can account for the endogeneity of fiscal balances, but usually embed the consensus opinion of a positive crowding-out effect of fiscal deficits on long-term interest rates already. VAR-models have only recently received attention for the analysis of fiscal policy. Approaches that identify fiscal shocks following the Blanchard and Perotti (2002) methodology, do not always find significant effects.[11] Some early applications that rely on Choleski orderings can be found in Evans (1987a,b), Orr et al. (1995) or Miller and Russek (1996). Evans and Marshall (2002), investigating the determinants of the variability in the nominal Treasury yield curve with this method, do not find significant contributions of fiscal shocks. Tavares and Valkanov (2001) on the other hand, find robust evidence for the impact of fiscal policy on bond returns, relative to 3-month Treasury bills. Similarly, Canzoneri et al. (2002) include both the Federal Funds rate and the 10 year bond yield in their structural VAR, and find significant and large impact and long-term effects in response to spending shocks. A more recent application is found in Ardagna et al. (2004), who find rather large crowding-out effects in a panel of OECD countries, leading to cumulative 150 basis points rises at a horizon of 10 years.

The main hurdle in detecting changes in fiscal policy in VARs is that policy shocks need not affect fiscal variables first. There are indeed anticipation effects as the implementation of announced policy changes is subject to lengthy and visible political negotiations. Therefore, it is hard to pin down all the information concerning future government actions the public has. The unexpected component of changes in fiscal variables may bear little relation then to projections of future fiscal policies. Elmendorf (1993) demonstrates the poor performance of VAR-forecasts relative to fiscal projections. As the expected fiscal variables are merely extrapolations from past data, they do not account sufficiently for newly available information.

There may be a way around this problem by including the stock variable. Even if public debt reflects past fiscal imbalances, it also constrains future budgetary policy actions. We may indeed attribute the interpretation of a fiscal rule to the reaction of primary surpluses to public debt, as in Bohn (1998). Deviations from sustainability in the past likely signal fiscal corrections in the near to short-term future.[12] In addition, public debt allows including

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[10] The use of fiscal projections or cyclically adjusted balances as in Cebula and Koch (1989) or Kitchen (2002) can remove these effects.

[11] Note that in Blanchard and Perotti (2002) and consequent studies, only short-term interest rates are examined, as crowding-out is not the focus.

[12] Moreover, if we interpret the higher interest rates following fiscal expansions as the higher rates the government has to offer investors to willingly hold more bonds, the interest rate becomes a direct – probably

different degrees of persistence of fiscal deficits. Temporary changes that are expected to be undone afterwards may have little impact, whereas the effects of permanent deficits that raise debt permanently would crowd out interest rates considerably (Feldstein, 1986). There are few studies that consider the indirect impact of deficits via debt accumulation. The direct interest rate effect of debt is usually found to be small, or even negative (Ardagna et al., 2004). There is also some evidence for non-linear effects: only at higher debt levels do interest rates move significantly (O'Donovan et al., 1996; Conway and Orr, 2002)

Most of the empirical analysis pertains to US data, and this may provide few insights for EU countries. In open economies that are economically integrated and do not impede trade or financial flows, capital inflows may move massively so as to offset any domestic interest rate rises following higher bond-financed deficits. In the limit of total capital mobility, these increases are proportional to each country's total indebtedness on the relevant market. Yardstick comparisons across governments may partially offset this spillover, as debt accumulation of one government increases the relative creditworthiness of comparable governments. Empirical evidence on these spillover effects is little. Two different approaches can be adopted. The spillover can be assessed directly from the effects of deficits and debt on interest rates abroad. Alternatively, the effect of foreign capital inflows or fiscal developments is netted out from the total domestic crowding-out effect. The reasoning is that the domestic effect of fiscal expansions will likely be larger once these international linkages are controlled for. In the reduced form approach, Cebula and Koch (1989) condition the relation between interest rates and deficits on foreign capital inflows. Faini (2005) considers the fiscal effect on interest rates at home and at EMU level contemporaneously. On a global scale, all spillover effects should cancel out and a significant crowding-out effect restored. Tanzi and Lutz (1993) look into the effects of domestic deficits and debt on global rates (see also Ford and Laxton (1995)). Studies in the VAR-tradition have rather looked into the effect of domestic fiscal policy changes on economic variables abroad. Ardagna et al. (2004) find significant crowding-out effects from both domestic and average foreign fiscal expansions in a panel of OECD countries. Beetsma and Giuliodori (2004) consider the impact of German fiscal policy on the French and Italian economies, as does Marcellino (2002). In a further paper, Beetsma et al. (2005) explicitly model the trade channel of fiscal spillover. Paesani et al. (2005) take a somewhat different approach by identifying spillover from shocks to bond markets on internationally linked capital markets. This allows the authors to consider also the direction of

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non-linear – function of debt too. Evidence on default premia can be found in Alesina et al. (1992), Favero et al.

the spillover: fiscal policy changes in the United States are argued to have a greater influence on bond yields in Europe than vice versa. A similar argument is found in Brook (2003).

The spillover of domestic fiscal policies can only be enhanced if different governments borrow in the same currency. In the absence of agreements specifying the fiscal relations among governments, the crowding-out effect depends – ceteris paribus – on the aggregate fiscal policy stance of all tiers of government. The free-riding problem between the various tiers makes each fiscal authority disregard its intertemporal solvency constraint.[13] A variety of reasons may be invoked for the lack of credibility of no-bail out clauses that prevents other governments (or the central bank) from saving the insolvent government.[14] Political and economic cohesion calls for fiscal solidarity. Systemic risk increases if government revenues are interdependent: tax bases may be very mobile or elastic in highly synchronised and integrated economies. Contagion effects may further amplify the debt accumulation spillover when lenders interpret the difficulties of one debtor as signalling impending problems of similar governments. The offsetting interest rate effects do not need to materialise then, as default premia are spread out over the n members of the union. The distortion of the bond market is one way to read a possible insignificant reaction of interest rates to debt accumulation. Disentangling empirically the spillover effects that come from capital mobility from those induced by monetary union is difficult. Landon and Smith (2000) compare the significant cross-effects of federal and provincial debt in Canada. Beetsma and Giuliodori (2004) simulate the effects of monetary union in their fiscal VAR for the three main euro area economies. They find cross-country spillover from a fiscal expansion to be magnified via the trade channel.

4.3   A stock-flow fiscal VAR for open economies

We propose using the VAR-approach to examine crowding-out of long-term interest rates induced by changes in fiscal policy. We first set up the empirical model for inferring on crowding-out in a closed economy, and then extend this model to indirectly infer on spillover effects of fiscal policy. The central question of interest in the empirical analysis of the closed economy is:

(1997) or Codogno et al. (2003).

[13] We can refer to models of monetary union in both the Fiscal Theory of the Price Level (Canzoneri et al., 2001) and New-Keynesian settings (Beetsma and Jensen, 2002) for the complete economic effects of such free-riding behaviour.

[14] See Bayoumi et al. (1995) for a discussion.

> ***QUESTION 1**: What is the <u>gross</u> crowding-out effect of shocks to deficits – and the accumulation of debt – on long-term interest rates within a country?*

In other words, what is the overall crowding-out effect on domestic long-term interest rates from fiscal expansions at home? To answer this question, we suggest specifying an empirical model that contains the deficit flow and the stock of public debt. Attributing to the reaction of deficits to debt the meaning of a systematic fiscal rule à la Bohn (1998) tackles the anticipation problems discussed above. Rules have become an increasingly popular method of describing policy behaviour, as well as a means of constraining discretionary policy interventions. A positive reaction of the primary surplus to debt accumulation is considered a necessary and sufficient condition for government solvency. Deviations from that rule likely signal fiscal corrections in the near to short-term future.[15] Consequently, this specification overcomes inference problems on the anticipation of fiscal shocks.

The inclusion of debt moreover allows distinguishing the crowding-out effects of both deficits and debt. Deficits typically are highly persistent. Permanent changes in deficits accrue in public debt and may be argued to have stronger permanent effects on interest rates than temporary reversals of cyclically induced deficits (Feldstein, 1986). We could thus label our shock to debt as a "Permanent deficit" shock, and the shock to net lending as a "Temporary deficit" shock. We can indeed discriminate both as we supplement the rules-based modelling of the government sector with a small economic system, as in Favero (2003). Government sets deficits in reaction to debt developments, but also as a function of the output gap and inflation. This again helps identification, as the automatic stabilisers can be filtered from the structural policy changes.

In order to account for the endogeneity problem of fiscal policy setting, the model is further completed with inflation and output gap. The equations for inflation and output gap can then be seen as summarising the economy in a very generic version of a Phillips curve, and an IS-equation. We thus have a complete model of fiscal policy and the economic system to analyse the effects on long-term interest rates. We consider principally the real long-term interest rate,

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[15] The inclusion of debt may cause inference problems on the VAR-parameters if there are non-linear effects of fiscal policy. While we later show that such different effects exist on interest rates, we show in Chapter 5 that no such switching effects happen on real economic variables for different levels of indebtedness.

but also span the full term structure of interest rates by including the yield between both long and short-term rates.[16]

To settle thoughts, the system can be divided in three blocks of variables: (a) the fiscal block F that includes the debt B_t and deficit d_t, $F = \begin{bmatrix} B_t & d_t \end{bmatrix}'$; (b) the monetary block M that includes some different specifications for interest rates, $M = \begin{bmatrix} i_t \end{bmatrix}'$; and (c) the economic block Y that summarises economic conditions in the output gap y_t and inflation p_t, $Y = \begin{bmatrix} y_t & p_t \end{bmatrix}'$.

This specification can suffice for characterising effect of fiscal shocks in a closed economy. The identification strategy that will be used in this chapter is based on a simple choleski ordering, as in Beetsma and Giuliodori (2004) or Ardagna et al. (2004). There is no obvious choice on placing debt before or after deficits. Debt is the accumulation of deficits over time, and is arguably more endogenous than deficits. The initial conditions of debt can also be a constraint on current fiscal actions. We therefore decide to put debt before the deficit so as to allow for the strongest possible reaction of deficits for maintaining sustainability. We do not take a position on the monetary block following the economic block or vice versa, but will experiment with both possibilities. Placing the fiscal block first

(4.1a) $$\begin{bmatrix} F & M & Y \end{bmatrix}' \text{ or } \begin{bmatrix} F & Y & M \end{bmatrix}'$$

implies no contemporaneous reaction of F to the economic variables, or to interest rates. The reaction of the other variables is maximised though. But the reverse order

(4.1b) $$\begin{bmatrix} Y & M & F \end{bmatrix}' \text{ or } \begin{bmatrix} M & Y & F \end{bmatrix}'$$

implies a complete crowding-out effect of government spending on GDP and interest rates. Either of these assumptions is probably too extreme. The range between the most "liberal" estimate of the effects of fiscal policy, and the most "conservative" estimate then gives an indication on how robust our findings are. To that end, the impulse response functions of the interest rate variable following upon a 1% fiscal deficit or debt to GDP shocks are

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[16]The short-term rate is mainly influenced by day-to-day monetary policy decisions, and its reaction to fiscal imbalances has hardly ever been found significant. The long-term rate may capture inflation expectations, however. Mehra (2001) argues that by reacting precisely to inflation scares in these expectations, monetary policy can pre-empt inflationary bursts.

summarised in a single graph for all four possible choleski orders. They are plotted over a 10-year horizon, together with the maximum and averages of the four bootstrapped 90% confidence intervals.[17]

The detection of crowding-out would be favourable for the no-bail out clause, as it succeeds in separating different bond markets. A necessary condition for market discipline to work is then fulfilled. A non-significant response on the other hand, might be consistent with no interest effects of fiscal imbalances at all – in support of Ricardian equivalence. However, the reaction still accrues the responses in a closed economy with any attenuating influences of international capital flows and monetary union. A non-significant response could also be consistent with strong spillover effects. We therefore model an open economy fiscal VAR to net out the spillover of fiscal policy settings abroad on domestic long term rates. This answers the second question of this chapter:

> **QUESTION 2**: *What is the <u>net</u> crowding-out effect of shocks to deficits – and the accumulation of debt – on domestic long-term interest rates, in addition to the spillover effect of other countries' deficits and debt accumulation?*

That is, is there any relevant crowding-out effect of deficit accumulation on a country's long-term interest rates, once the effects of foreign fiscal policies are accounted for? With the simple VAR-models we propose, we just control the complete crowding-out effect for foreign debt and interest rate spillover. We do not attempt to distinguish the spillover arising from financial integration from those coming from the moral-hazard channel of no-bail out or contagion effects. A significantly positive response to fiscal expansion at home is consistent with the existence of each of these spillover effects. An insignificant crowding-out effect is evidence for the Ricardian Equivalence proposition.[18]

To examine the second question, we adopt the same specification for the VAR, and consider two strategies for modelling open economies. Empirical open economy models have to struggle with the burden of over-parameterisation. Ideally, one would analyse the reciprocal interest rate effects of changes in fiscal policies in both the home and foreign country (Marcellino, 2002). The paucity of fiscal data for European countries renders this infeasible, and we need to make some simplifying assumptions.

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[17] The VAR model always includes a constant and two lags of each endogenous variable.

In first instance, we scale down the model by assuming identical transmission mechanisms in all countries. We express all variables in country i as a difference to the same variable for the euro area.[19] This identifies asymmetric shocks across countries only. It expresses the idea that only country-specific deviations from average economic and fiscal conditions in the euro area matter for the effect of changes in fiscal policies on interest rates. We can write the model concisely, as in (4.2a), for the various orderings of the fiscal, interest rate and economic bloc:

$$(4.2a) \qquad \begin{bmatrix} F-F* & M-M* & Y-Y* \end{bmatrix}' \text{ or } \begin{bmatrix} F-F* & Y-Y* & M-M* \end{bmatrix}' \text{ or }$$

$$\begin{bmatrix} Y-Y* & M-M* & F-F* \end{bmatrix}' \text{ or } \begin{bmatrix} M-M* & Y-Y* & F-F* \end{bmatrix}'$$

We can then indirectly assess the importance of spillover from any stronger domestic crowding-out effect. Note that the interpretation of the results differs from the "closed economy" version. There, fiscal shocks lead to some percentage point change in interest rates. In this model, fiscal shocks are relative to euro area fiscal developments, and have domestic interest rate effects that are relative to euro area wide interest rate changes. We therefore measure the relative change in interest rates. Also, shocks cannot be scaled to GDP and the impulse responses follow upon a one standard deviation shock now.

In second instance, we adopt a small open economy assumption by adding the benchmark euro area interest rate i^* and/or public debt B^* as exogenous variables to the VAR of country i. That is, we control for the marginal effect on domestic fiscal policies. We take the benchmark variables i^* and/or B^* as exogenous, but leave the order of the other variables otherwise unchanged, as in (4.2b):

$$(4.2b) \qquad \begin{bmatrix} i* & D* & | & F & M & Y \end{bmatrix}' \text{ or } \begin{bmatrix} i* & D* & | & F & Y & M \end{bmatrix}' \text{ or }$$

$$\begin{bmatrix} i* & D* & | & Y & M & F \end{bmatrix}' \text{ or } \begin{bmatrix} i* & D* & | & M & Y & F \end{bmatrix}' \text{ .}$$

This benchmarking method loosens the restriction that all data enter in differences, but becomes less realistic for larger economies.[20] This interprets any variation in domestic interest

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[18] Only the yardstick comparison of relative debt levels would also mitigate crowding-out effects.
[19] Where the own country's contribution has been taken out.
[20] Under an alternative assumption, a subset of countries could be analysed. This limits spillover and the role of common shocks (Prasad and Lumsdaine, 2003). One may also restrict the VAR coefficients for all countries. With heterogeneous fiscal stances, this may not be realistic.

rates, for given conditions at the euro area level. In other words, it tells by how much domestic rates would increase, given the rates at the euro area level.

Seen in combination with model (2a) this then allows inferring upon the importance of spillover. If – for given euro area rates – fiscal shocks change the country spread (model 2b), but do not lead to significant responses in relative interest rates following country-specific fiscal shocks (model 2a), then this interest gap measures the attenuation of interest rates due to spillover.

Data

It suffices to look at the large number of studies, to see that various choices on the data specification are possible. Limited availability of fiscal data constrains the choice of sample and frequency. The data that we use in the empirical models mainly come from the annual database of AMECO of the European Commission. This is the highest frequency at which a standardised dataset covering fiscal data for EU countries over a maximum time span from 1960 to 2004 is available.[21] The analysis focuses on the entire euro area, the largest EMU economies (Germany, France and Italy) and a group of smaller ones (Austria, Belgium, Finland and The Netherlands). We also consider the United Kingdom, for it provides a check on the euro area results.

Regarding the deficit, we consider total net lending of the general government expressed as a ratio to GDP for at least three reasons.[22] First, total net lending is of direct interest to fiscal policy-makers. Second, the spurious relation that exists between the overall deficit and interest rates is taken account of in the specification of the VAR. The reverse causality problem of rising interest rates that induce compensation for higher interest payments on outstanding debt is entirely included in our specification. Third, debt – which we take to be the general government debt ratio to GDP – is arguably a more endogenous variable than the primary deficit. The latter reacts to output and perhaps inflation, whereas debt and total deficits are also influenced by interest rates. Placing debt before total deficits in (1a-b) thus is less problematic then.

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[21] See Table 17 and Table 18 in Appendix 2c for details.
[22] General government data consolidate across government levels, regardless the country-specific devolution of fiscal powers.

The variables describing the economy are taken to be the CPI inflation rate, and the output gap relative to potential GDP. As inflation is already included in the model as a separate variable, the long-term interest rate on 10-year government bonds is deflated by realised CPI. One might prefer using expectations of inflation in order to maintain consistency with the term structure. Surveys or forecasts for inflation are not available at that horizon for European countries. Ardagna et al. (2004) use trend inflation to approximate inflation expectations but find little differences in results between nominal, real or expected long-term rates. We therefore use the current realised rate.

For the open economy model, we also need to specify the benchmark data. We suppose the offsetting spillover effects to come from intra-euro area capital flows only. This is a debatable choice. First, there is some evidence for global linkages rather than regional spillover (Tanzi and Lutz, 1993). Second, the fiscal framework of EMU pertains to both euro area and other Member States of the EU. The Stability and Growth Pact and the no-bail out clause apply to both groups. Nevertheless, the consequences of fiscal free riding carry more weight for those countries that share the same currency. We therefore limit our attention to the spillover internal to EMU. The benchmark open economy variable is a euro area aggregate. The data for this artificial euro area economy come from both the AMECO and the quarterly ECB-EAS database.[23] A given country i cannot always be assumed small relative to EMU. The larger the country, the smaller the difference with the euro area average will be. We therefore need to correct the euro area aggregate. For net lending and public debt, we simply subtract country i's series from the euro area aggregate, and scale it with the relevant output variable. The other variables for the hypothetical EU-11 are obtained by subtracting series i and then rescaling the GDP-weighted aggregate. Unfortunately, aggregate data are not always available: data on French public debt before 1978 are simply absent. The aggregate public debt has therefore been constructed from those countries that represent together two thirds of euro area GDP.

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[23] End of period data have been used to construct yearly data.

4.4   Crowding-out effects of fiscal policies

This section first discusses the results on the crowding-out effects in closed economies. We then assess these effects for the entire EMU so as to prepare the ground for the discussion of spillover between euro area countries.

Let us consider first the results of model (4.1a-b). For the various Choleski-orderings, Figure 6 summarises the effects of a 1% shock to the net lending and debt ratio. The gross effect of a positive 1% shock to the deficit is to temporarily increase long-term interest rates by about 20 basis points in all countries, except Finland. This increase is insignificant, except for the Netherlands, in the very first years after the expansion.[24] The crowding-out effect is much more relevant in the long run for a shock to the public debt ratio. Its size is nevertheless generally smaller, and the reaction is only really significant in the more indebted countries as Belgium, the Netherlands and Italy. When debt has clearly derailed, rates rise much more over a longer horizon. This result is common to the literature. Ardagna et al. (2004) find large effects on interest rates only in countries with above-average levels of debt.[25] The contrast between the larger – but insignificant – short run impact of deficits, and the smaller long run impact of debt, is also consistent with evidence in the literature (Engen and Hubbard, 2004). Our evidence rather supports the hypothesis of Feldstein (1986) that interest rates should respond to the permanent creation of deficits that accumulate in higher debt in the long term, and not to temporary changes in fiscal policies. Having included both deficit and debt probably explains why we do not find the (counterintuitive) negative impact of debt on long-term interest rates that other authors have documented. Ardagna et al. (2004) find a cumulative reaction to shocks in (primary) deficits of up to 66 basis points, but owe the decline in interest rates upon debt shocks to liquidity effects.

We do not really document a significant crowding-out effect domestically. But even if the spillover between open economies within in the euro area is large, in a relatively homogeneous and closed area as EMU these effects cancel out on aggregate. Any crowding-out effects could become more evident again at the euro area level. To gain some sight on the relevance of the spillover channels internal to EMU, question 1 can be reexamined for the entire euro area. As can be seen in Figure 7, crowding-out effects on European interest rates

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[24] All results are also rather robust to the ordering of the variables in the VAR, as all responses follow the same pattern.
[25] There is no evidence for different responses of real economic variables under different levels of indebtedness, as shown in chapter 5.

do not become much more pronounced. The impulse responses to debt shocks in the same domestic VAR model show a robust long-term rise in the interest rate. Its size is small, however, and not always significant. Deficit shocks have a shorter run impact in the order of 20 basis points, but these results are hardly significant. Of course, we have assumed that the offsetting effects come from intra-European capital flows only. Global spillover on international financial markets may be more relevant. This result indicates that spillover may rather be due to financial integration than to an incredible no-bail out clause per se.

What about the role of fiscal policy in explaining variability in interest rates?. Table 1. displays the percentage contribution of deficit and debt shocks in explaining the variance of the real long-term interest rate at various horizons (1, 5 and 10 years). The overall contribution of fiscal policy is rather small, but gets larger at longer horizons. In the euro area as a whole, only 7% is explained by deficits and public debt. This outcome is to a large extent determined by German fiscal policy, whose contribution is also rather small. The picture for other countries is less clear. There is no evidence for a larger driver of fiscal policy in highly indebted countries. Similarly, there is no larger role for debt in these countries. Rather, deficits may signal incipient problems in highly indebted countries, and therefore provoke a stronger reaction in interest rates (see e.g. Italy) (Drudi and Prati, 2000).

4.5   Spillover effects of fiscal policies

We are now ready to look into the crowding-out effects in an open economy. By concentrating on the deviation of fiscal and economic conditions from the euro area benchmark, we may recover a significant domestic crowding-out effect, and indirectly infer on the importance of the spillover. As we examine euro area aggregates, we do not consider the United Kingdom anymore.

The results from expressing the data in differences to the base country, following model (42a), are summarised in Figure 8. The crowding-out effect is more mitigated than the response in the closed economy. Neither deficit nor debt shocks produce any significant response. This result tells us that any deviation from the average fiscal conditions specific to that country, does not affect the relative country spread. In other words, asymmetric fiscal shocks do not translate in relative rises in financing conditions. Given that we detect some small but significant crowding-out effect in closed economies, this would indicate rather strong spillover effects of any fiscal shock onto the aggregate interest rates, and little to no

effect on country-specific variables, a result reminiscent of Faini (2005). As differences to the benchmark are taken, the forecast error variance decomposition attributes a somewhat larger role to fiscal policy deviations in explaining long-term rates. Again, the contribution of deficits is larger than the one of debt for the highly indebted countries (Table 2).

These results can give a false picture if asymmetric shocks do not play an important role. Instead of imposing the restriction of variables entering in differences, we now consider the small open economy assumption. As specified in (4.2b), we control for the euro area debt ratio, euro area real long-term interest rates, or both, by adding these to the domestic model. Figure 9, Figure 10 and Figure 11 display the results for this open economy SVAR. Controlling for aggregate public debt seems to matter little: we nearly replicate the results of the domestic model (4.1a-b) are basically confirmed. Debt shocks have large cumulative effects on interest rates, but these are again significant in highly indebted countries only. A more promising approach seems to benchmark the domestic interest rate to the corresponding euro area rate. Table 3 sums up the graphical evidence from Figure 10 by setting out the point estimate and the error bounds, as well as the peak effects, for a horizon of up to 5 years. There is now a significant increase in the long-term rates in response to a 1% shock in the debt ratio. The effect is also rather precisely estimated, and robust to the chosen choleski order. It can be seen that this effect is again more pronounced for the highly indebted countries, but is also much stronger for the other countries. The size of the effect is moreover sizeable. For most countries, the peak effect is between 30 and 40 basis points, and is reached after 4 years. For the highly indebted countries, this goes even up to 60 or 70 basis points, as for example in the Netherlands and Belgium. Deficit shocks do not have significant effects. Only in Germany and Austria is no crowding-out found back at all. This indiscernible effect may be explained by the weight of Germany in the euro area. With a combination of euro area debt and interest rates, the same results are obtained. Euro area debt adds little in explaining crowding-out domestically. This again favours the hypothesis that capital market linkages are crucial for the spillover of fiscal policies, rather than the fiscal framework.

Not surprisingly, debt contributes relatively more to explaining the variance of interest rates when it is the only variable added to the domestic VAR (Table 4). When euro area interest rates are incorporated, its contribution to the variance of the long-term rates is much smaller than that of deficits. This holds even if the effects of net lending shocks are not relevant. It rather supports the signalling effect of deficits for unsustainable longer-term fiscal policies.

Overall, neither net lending nor public debt is an important determinant of real long-term rates, and certainly not at short-term horizons.

The results for the United Kingdom also give an indirect answer as to whether spillover is more relevant for EMU than EU. The open economy model is only slightly less successful for the United Kingdom in finding significant effects of debt accumulation than in other countries. There is nevertheless a change similar to other EU countries. A tentative conclusion is that the spillover of financial integration is relatively more important than that related to EMU.

How do we square the significant effect in the marginal open economy VAR with the evidence for strong spillover effects in the first open economy model? In the first case, we consider a relative fiscal shock that has a non-significant impact on relative spreads. If we keep the benchmark interest rate fixed, there is, ceteris paribus, a large impact on the domestic interest rate. This indicates that changes in the fiscal stance do not affect so much the country spread, but rather affect the aggregate level of interest rates. This confirms the interpretation in Faini (2005). Actually, the point estimates in Faini (2005) are very close to ours. A one percent expansion in EMU primary balances raises the EMU rate on average by 41 basis points in his study. Our country-specific results show such effects to lie between 30 and 70 basis points. The insignificant effect on relative spreads is also corroborated by the small 5 basis points rise in Faini (2005), or in studies that investigate default premia (Favero et al., 1997; Codogno et al., 2003). Any consolidation that an individual country undertakes, will thus largely spillover to euro area interest rates. The eventual gain for each country in terms of lower interest rates is rather small, even for the highly indebted countries. A coordinated action for bringing down debt ratios across the EU would pay off with substantially lower long-term interest rates.

The results may be sensitive to the specification we have considered. A novelty we have introduced is to make debt endogenous in the empirical model. In this case, the VAR equation for debt describes the accumulation of deficits via past fiscal imbalances. Alternatively, debt could be specified as an exogenous constraint on the economic model, reflecting initial fiscal conditions. The VAR equation in the deficit can still be considered a fiscal rule then. This model is examined in Appendix 2a. The main lesson is that imposing the stock of public debt as a control variable insufficiently accounts for the persistence of deficits, and the

accumulation of fiscal imbalances over time. There are hardly any significant responses to 1% shocks in the net lending ratio, except in Belgium and the Netherlands. Modelling both debt and deficits, and retrieving "Permanent deficit" from debt and "Temporary deficit" shocks from net lending, helps in the identification.

Another robust check concerns the specification of the interest rate. We have chosen to include a real long-term rate, but many studies consider the yield instead. Laubach (2003) argues that taking into account both ends of the term structure may improve inference on crowding-out effects. Ardagna et al. (2004) find little differences, however, for any of the various measures of interest rates that they examine. We re-estimate all the specifications of closed and open economy models by using the yield between long and short-term rates. The results are summarised in Appendix 2b. There is a consistent swap of the impulse response across all specifications, as is demonstrated in Figure 43. That is, debt accumulation causes negative interest responses instead of positive ones, or weakens the significant response of long-term rates. This result, also found in Ardagna et al. (2004), must be due to the stronger responses of short-term rates, and can probably be explained by restrictive countercyclical responses of monetary policy.[26] Other results are relatively unaffected. There is also some doubt on the stability of some of these specifications. By considering spreads, fundamental determinants of interest rates are to a large extent cancelled out, and are affected more by fiscal conditions. In this case, the deficit and debt shocks obviously explain more of the variance in the yield. The results stand in contrast with specifications that include both short and long-term rates separately. Both Tavares and Valkanov (2001) or Canzoneri et al. (2002) find large and positive effects on market returns.

4.6   Summary and policy recommendations

The fiscal policy paradigm in EMU is strongly based on the crowding-out effect of fiscal expansions on long-term interest rates. Fears of fiscal profligacy underlie the fiscal rules of EMU, however. The mitigating effect of financial integration on domestic interest rates is only enhanced by the expectations of fiscal or monetary bailouts under a common currency. Such spillover effects would only exacerbate crowding-out effects at the EMU level, while insufficiently disciplining fiscal policy in individual Member States.

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[26] An alternative explanation is given by Caporale and Williams (2002) that attribute it to a portfolio effect. Investors switch from bad quality debt issues to those of more creditworthy issuers, decreasing the yield even if total outstanding debt rises.

This chapter first constructs an empirical model to examine crowding-out effects of deficit and debt accumulation in individual EU countries and the entire euro area. The VAR supplements rules-based fiscal policy with a simple economic model and interest rates. This model is then modified for examining spillover effects between open economies.

The main result is that spillover masks the effects of fiscal policy on long-term interest rates. With the exception of some highly indebted countries, there are hardly significant interest rate responses to changes in domestic fiscal policies as such. Changes in the fiscal stance do not affect so much relative country spreads, but rather spillover to aggregate euro area interest rates. There is some indirect evidence that this spillover is not related to EMU as such, but derives from financial markets. We deduce this from responses for the euro area as a whole being only slightly stronger than for the individual Member States. Also, there is no obvious difference in the interest rate responses in the United Kingdom.

The consequence is that a single country would not even benefit partially from consolidation of its own public finances. The drop in domestic interest rates is insignificant. The interest rate spread is only marginally affected, while the decline in interest rates is thinly spread out over all euro area economies. Even for the highly indebted countries, the gain is rather small. A coordinated action for bringing down debt ratios across the EU would pay off with overall substantially lower long-term interest rates. Take for example a permanent 1% consolidation of the total deficit. This brings down interest rates by about 30 basis points, and even more so for highly indebted countries.

The results have some further implication for the design of fiscal rules. Evidence in this chapter reveals that permanent deficits create stronger crowding-out effects than temporary fiscal imbalances. Evidence for highly indebted countries is rather clear cut on the large impact on long-term rates. Fiscal rules should focus on the long-term objective of sustainable public finances. Nevertheless, there are considerable benefits from concerted action of fiscal policymakers that goes beyond simply constraining fiscal discretion. Coordinated action could avoid free-riding on consolidation efforts in other countries. The political and economic costs of unilateral coordination may well be larger than the longer run benefits from lower interest rates. Joint consolidation of public finances could bring about quicker the desired beneficial economic effects.

However, this is subject to four important caveats. First, coordination may be difficult to achieve if the distribution of economic benefits is uneven. It is mainly the highly indebted countries that would benefit from consolidation, even if the results show that the marginal gain is negligible (about 10 basis points).[27] Second, we find that spillover mainly comes from global capital markets. The eventual lowering of interest rates may be smaller than our estimates suggest. Nevertheless, it should not be underestimated that EMU is one of the large players on global bond markets. Third, the argument for coordination is perhaps not so convincing when spillover comes from capital markets. After all, the mitigating effect of financial markets is a purely pecuniary externality that does not really require international coordination. The allocation of savings to the public or private sector, at home or abroad, is efficient. The ongoing integration of financial markets under EMU can only have increased this spillover. Finally, the contribution of fiscal policy to long-term interest rates is rather small, and we find this to be a robust result. Other drivers of interest rates seem more important. This needs some closer examination. If spillover is mainly related to capital market integration, one hypothesis is that fiscal policies probably have global rather than regional effects. Results in Tanzi and Lutz (1993) and Ardagna et al. (2004) go in this direction too. An extension of the results to incorporate the fiscal stance in other OECD countries, especially the United States and Japan, could shed some light on this. The evidence on crowding-out effects in the entire euro area does not run counter to such an interpretation, as financial integration has deepened substantially in the EU. The benefits of coordinated consolidation have probably become larger over time. Monetary union is indeed a complete overhaul of the monetary and the fiscal policy regime, however. The incentives on governments' financing decisions have changed completely, and are regulated by a combination of deficit rules and the no-bail out clause. Our estimates are probably a conservative lower bound on the importance of spillover. Evidence in Faini (2005) points to somewhat stronger spillover effects since 1999, albeit for the highly indebted countries only. In order to extrapolate the evidence to EMU, we need to construct an empirical benchmark that mimics the effect of monetary union. Uniform monetary policy settings could be simulated as in Beetsma and Giuliodori (2004).
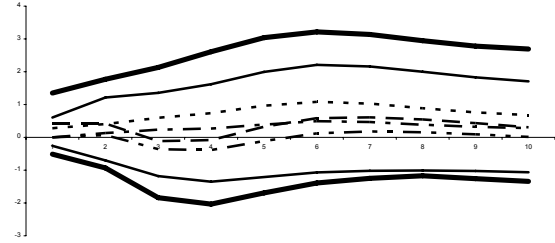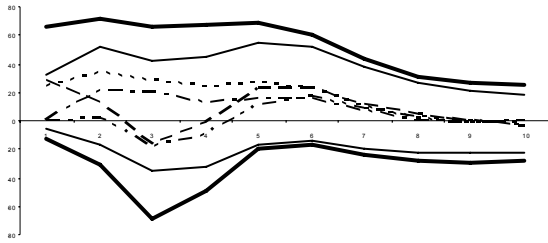
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[27] This reflect the difference in the decline in interest rates when highly indebted countries undertake a unilateral domestic consolidation (as in model 4.1a-b), as compared to the spread relative to the exogenous euro are rates (as in model 4.2b).

Figure 6: Domestic economy, SVAR model (4.1a-b): impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending and debt ratio
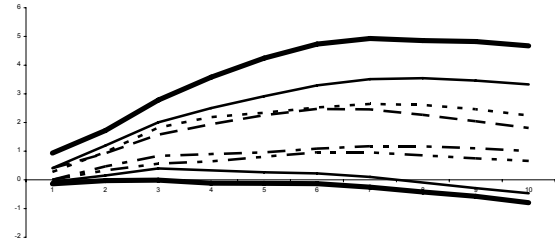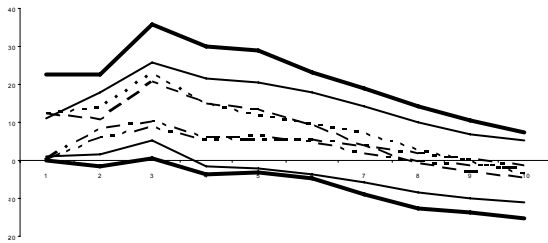
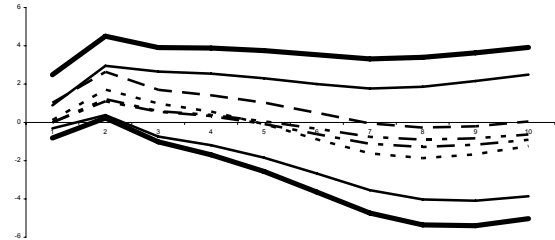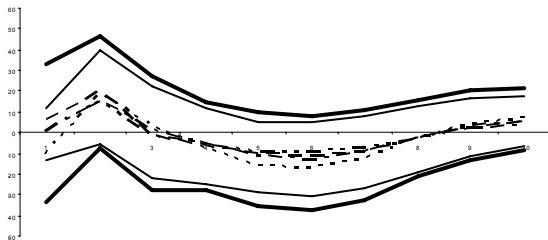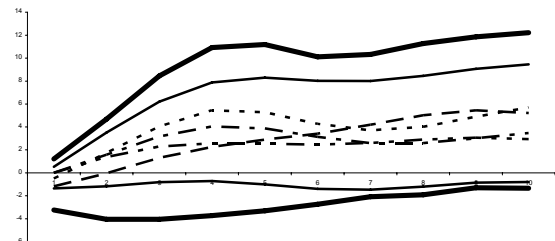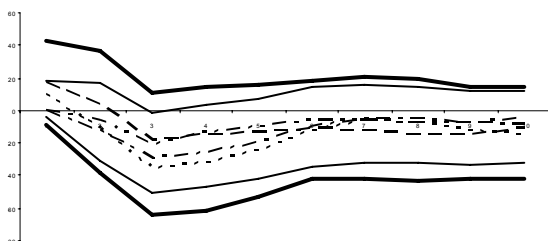*shock to net lending ratio*   *shock to debt ratio*

Austria

Belgium

Germany

Finland

shock to net lending ratio   *shock to debt ratio*

France
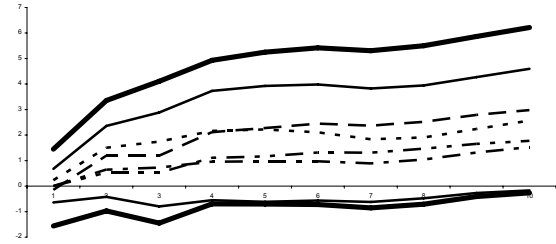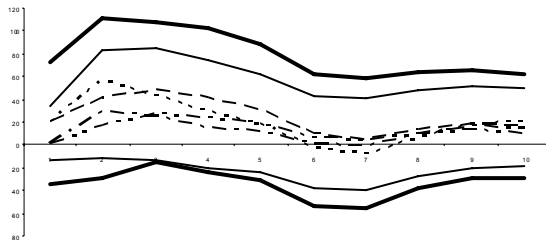
United Kingdom
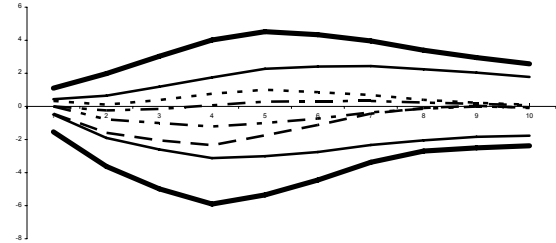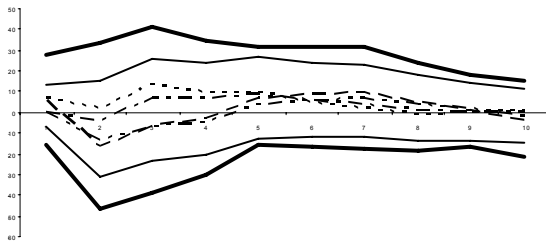
Italy
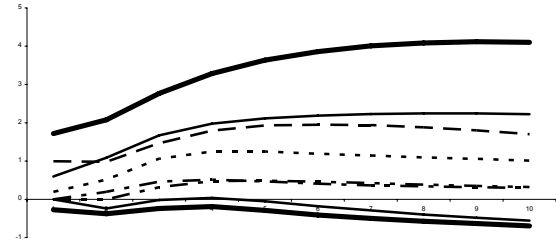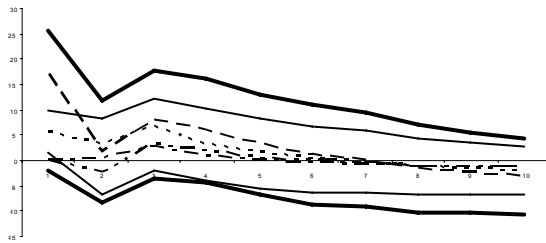
The Netherlands
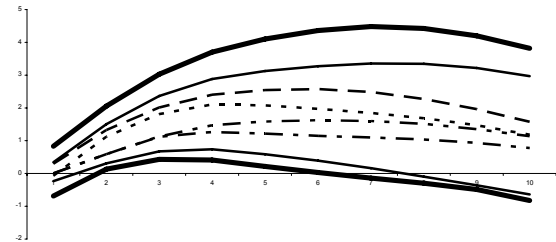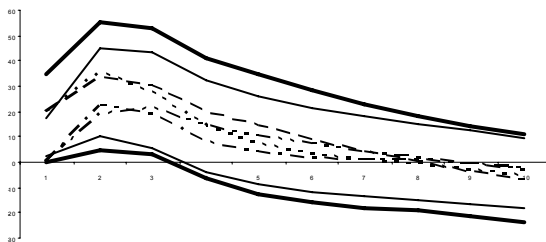
Notes: (a) graphs display percentage point impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Figure 7: Euro area economy, SVAR model (4.1a-b): impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending and debt ratio

shock to net lending ratio

shock to debt ratio
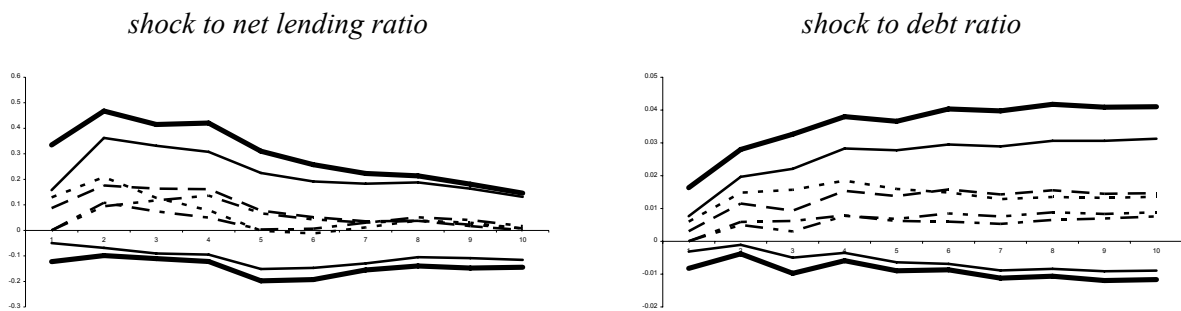
Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Figure 8: Open economy, SVAR model (4.2a): on difference of country i to euro area; impulse responses of real long-term interest rates to standard deviation shocks in the net lending and debt ratio

shock to net lending ratio   *shock to debt ratio*

Austria

Belgium

Germany

Finland

France

shock to net lending ratio   *shock to debt ratio*

Italy

The Netherlands

Notes: (a) graphs display impulse responses of the interest rate measure, in response to a 1 standard deviation shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Figure 9: Open economy, "marginal method", SVAR model (4.2b): conditioned on euro area debt ratio; impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending and debt ratio

shock to net lending ratio   *shock to debt ratio*

Austria

Belgium

Germany

Finland

shock to net lending ratio   *shock to debt ratio*

France
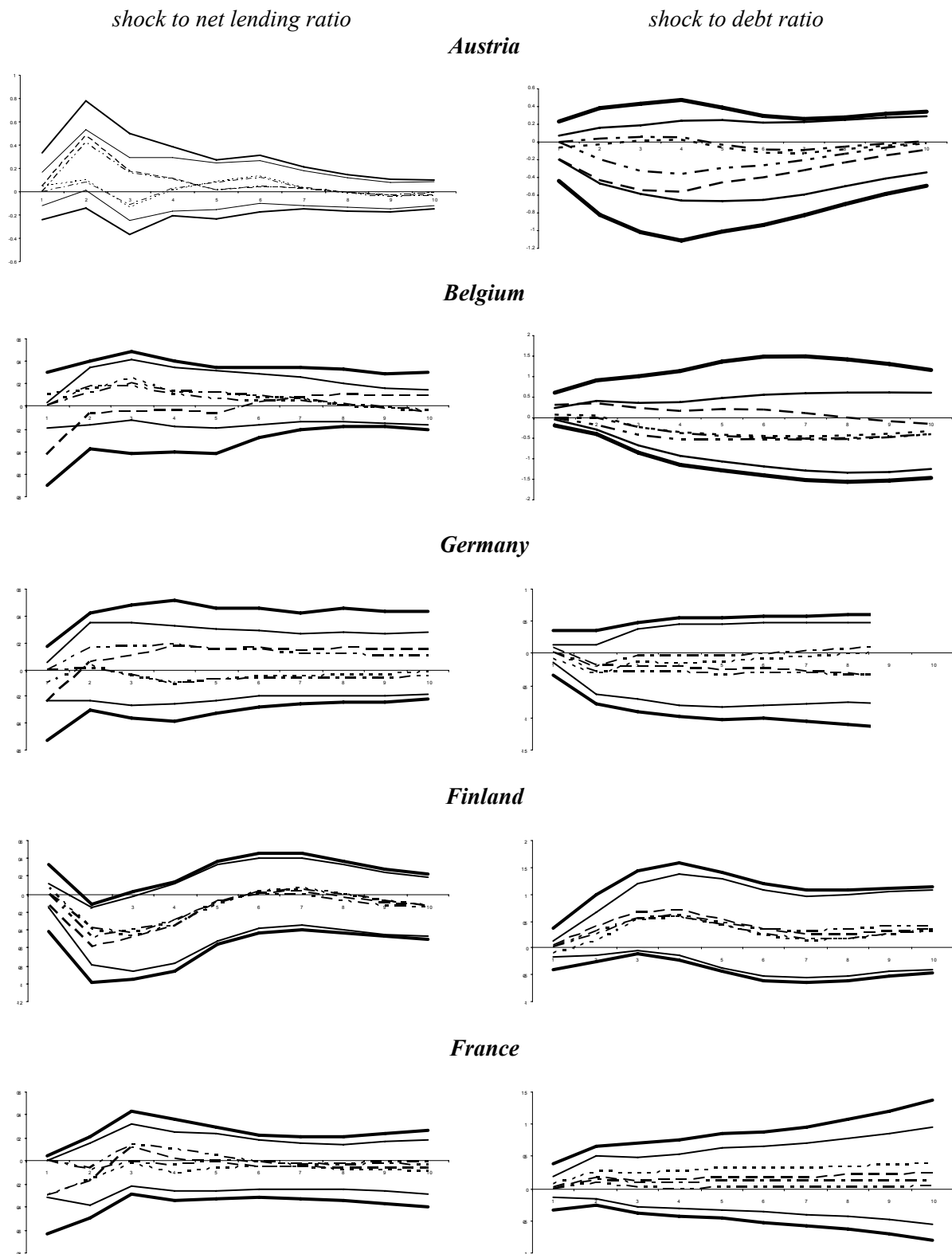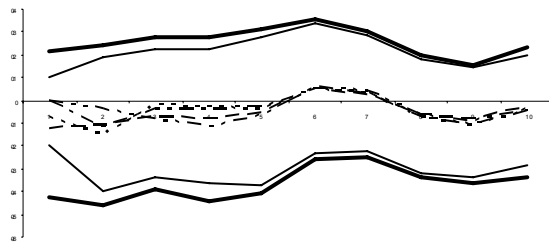

Italy
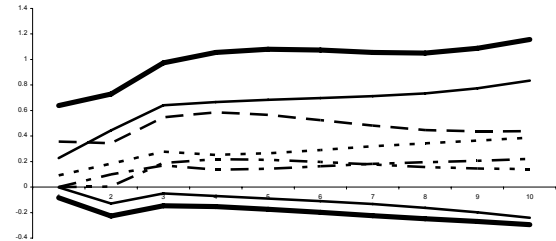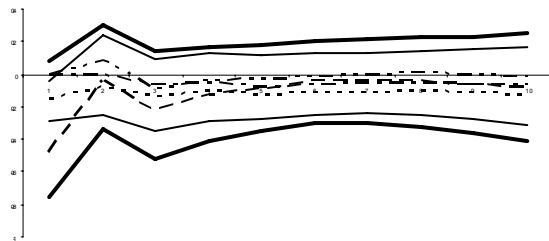
The Netherlands
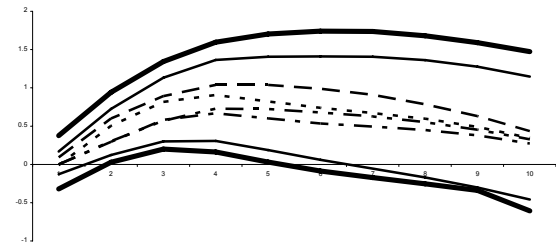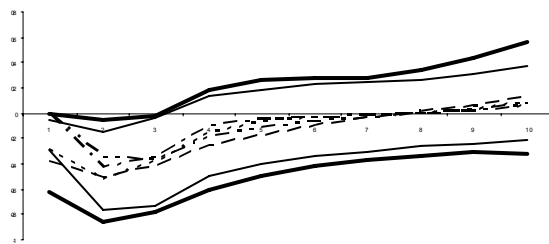
United Kingdom
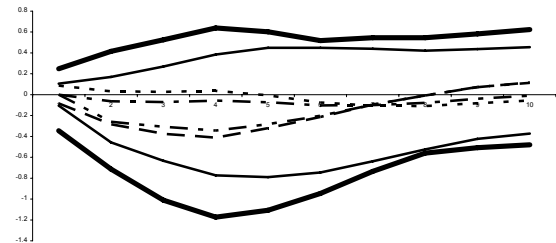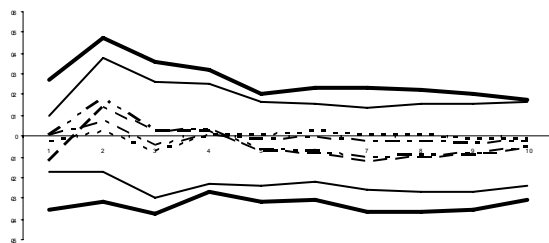
Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.
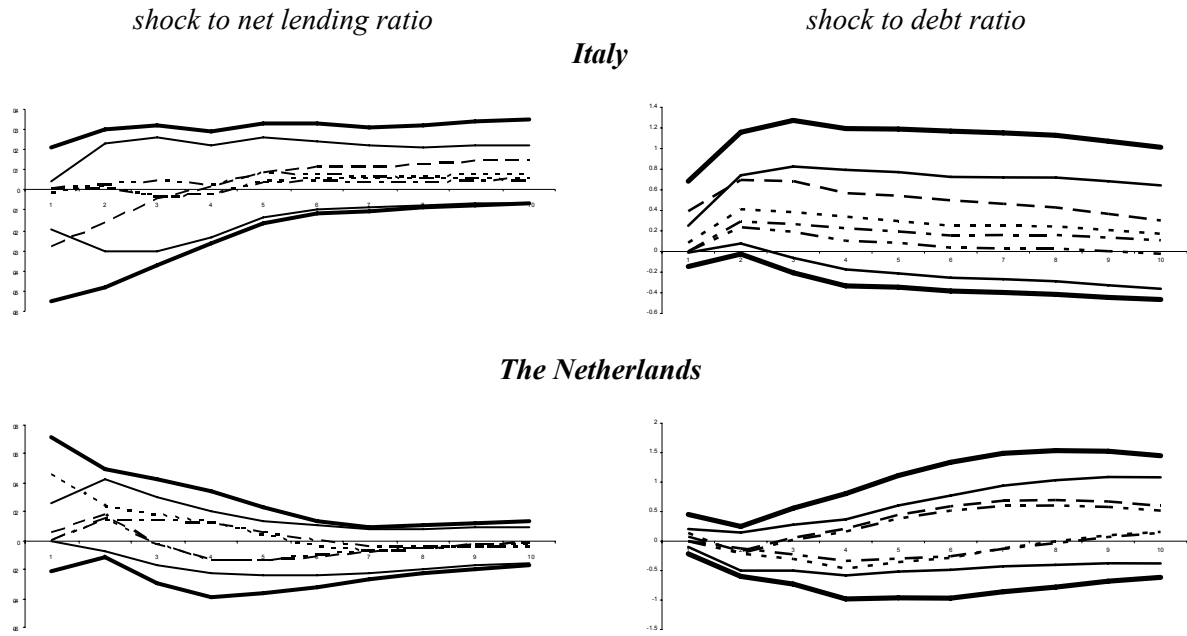
Figure 10: Open economy, "marginal method", SVAR model (4.2b): conditioned on euro area real long-term interest rate; impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending and debt ratio

shock to net lending ratio   *shock to debt ratio*

Austria

Belgium

Germany

Finland
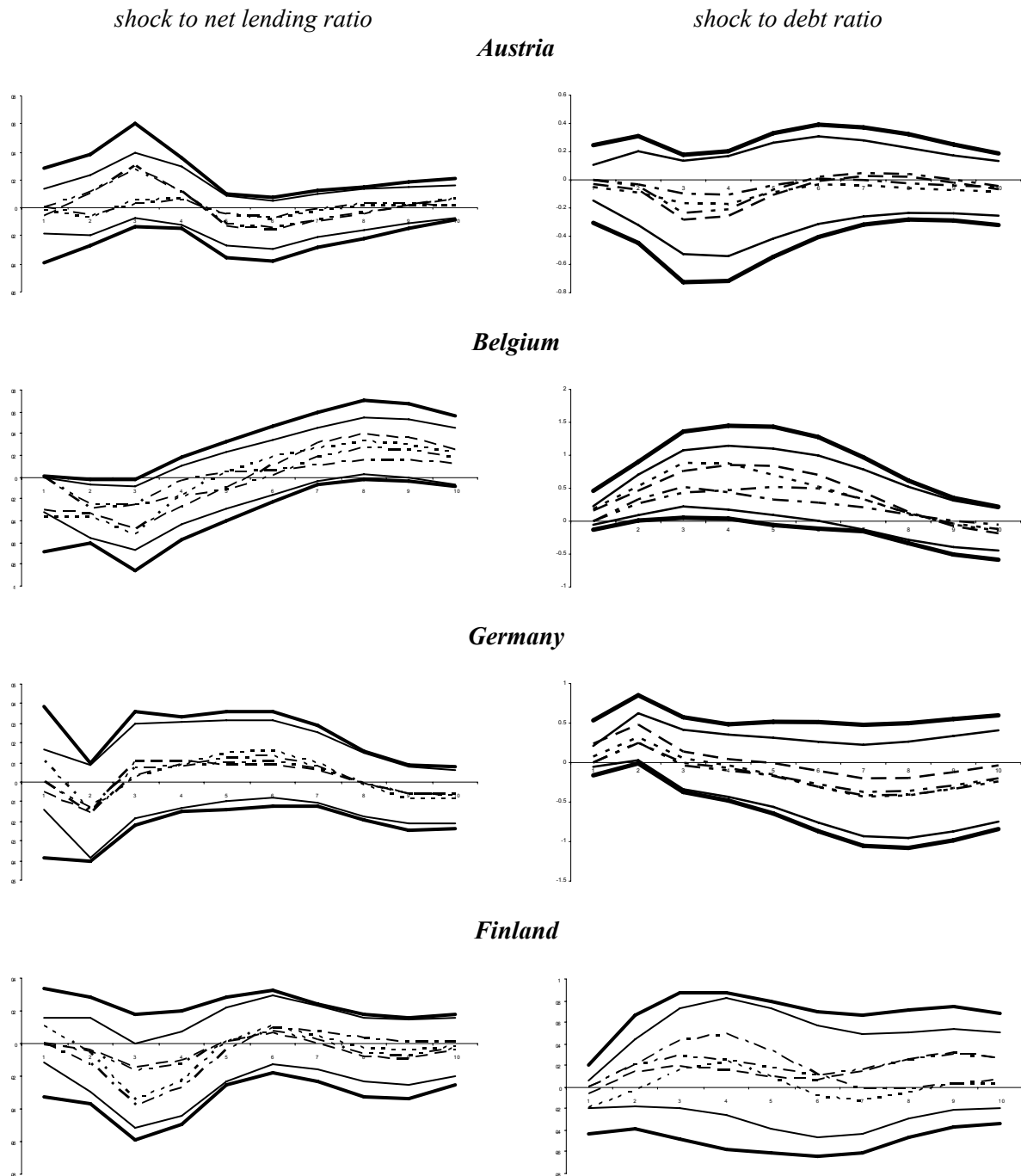
shock to net lending ratio   *shock to debt ratio*

France
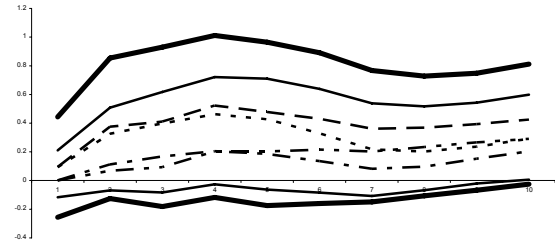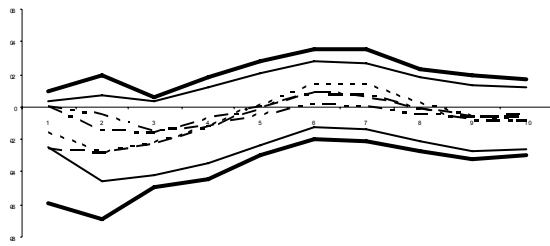
Italy
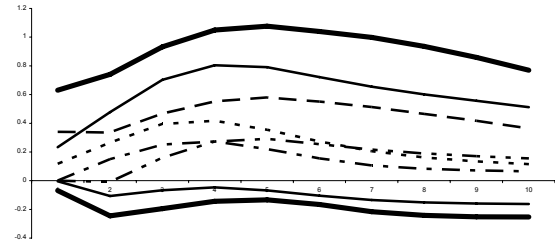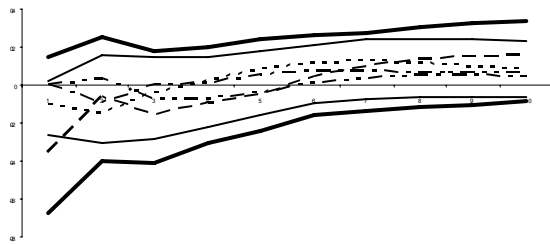
The Netherlands
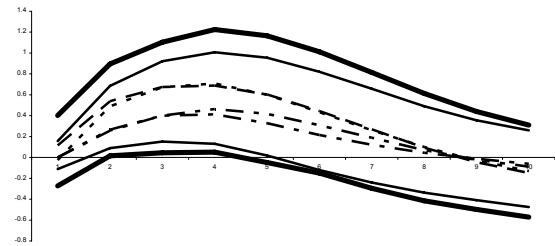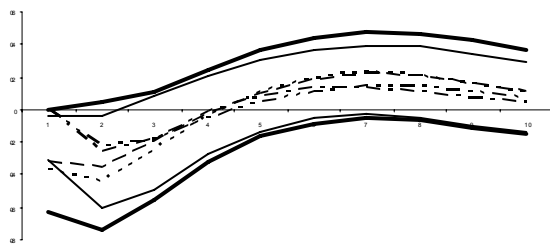
United Kingdom
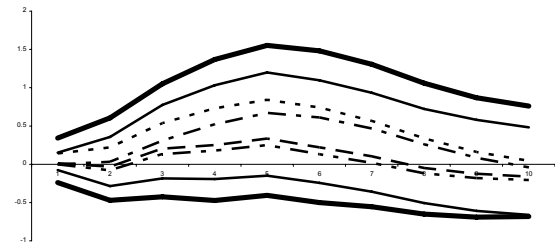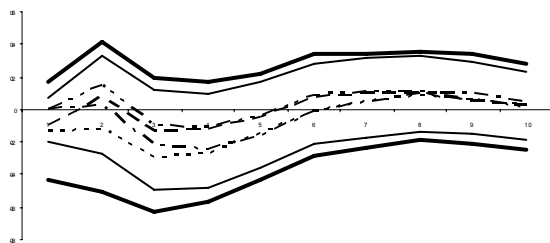
Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.
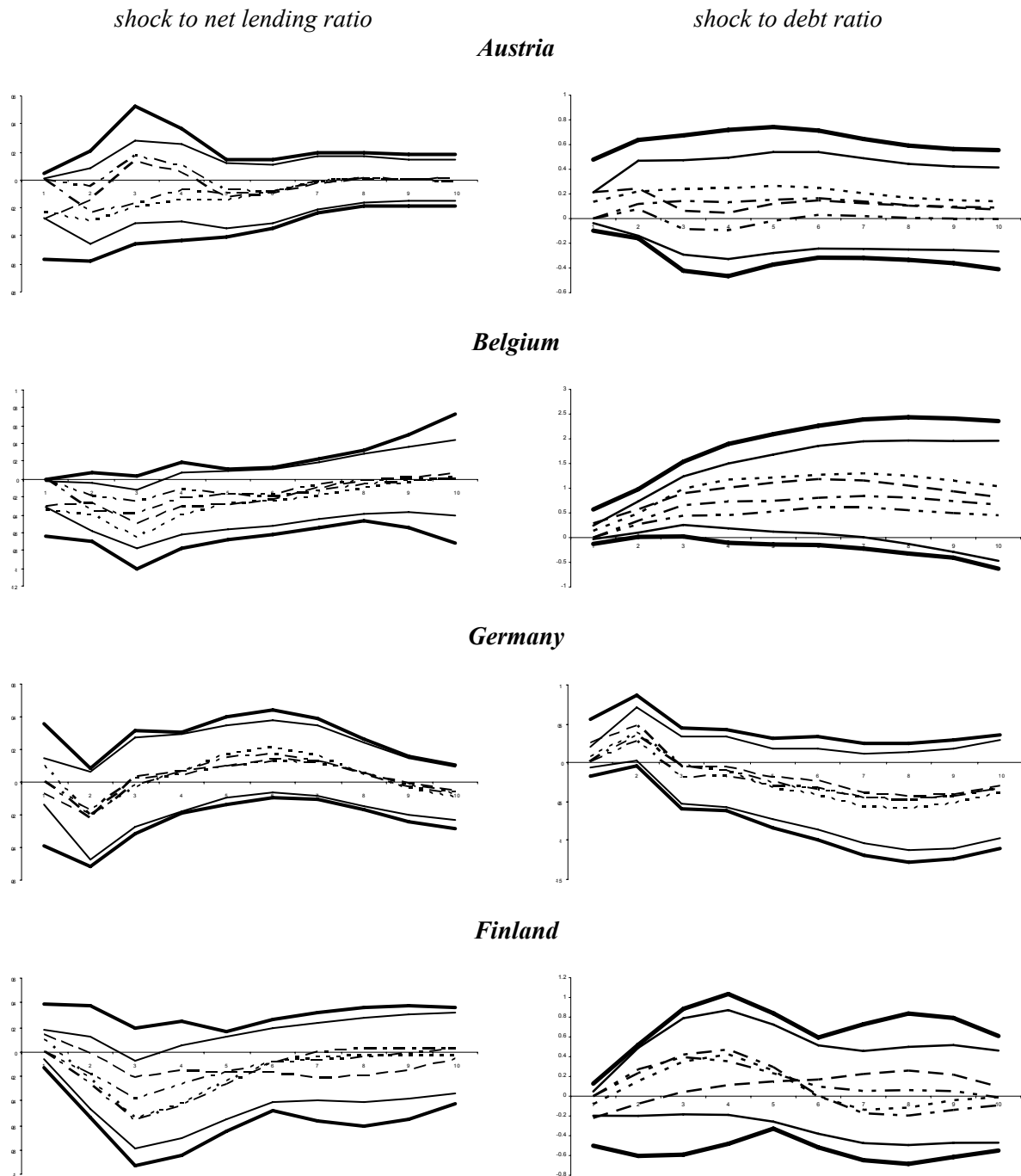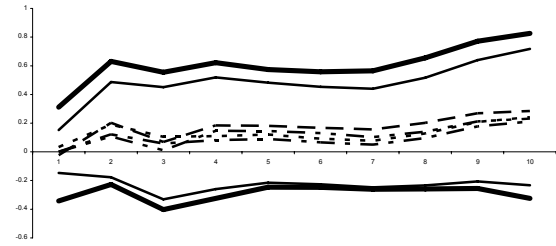
Figure 11: Open economy, "marginal method", SVAR model (4.2b): conditioned on euro area debt ratio and euro area real long-term interest rates; impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending and debt ratio

shock to net lending ratio   *shock to debt ratio*

Austria

Belgium

Germany

Finland
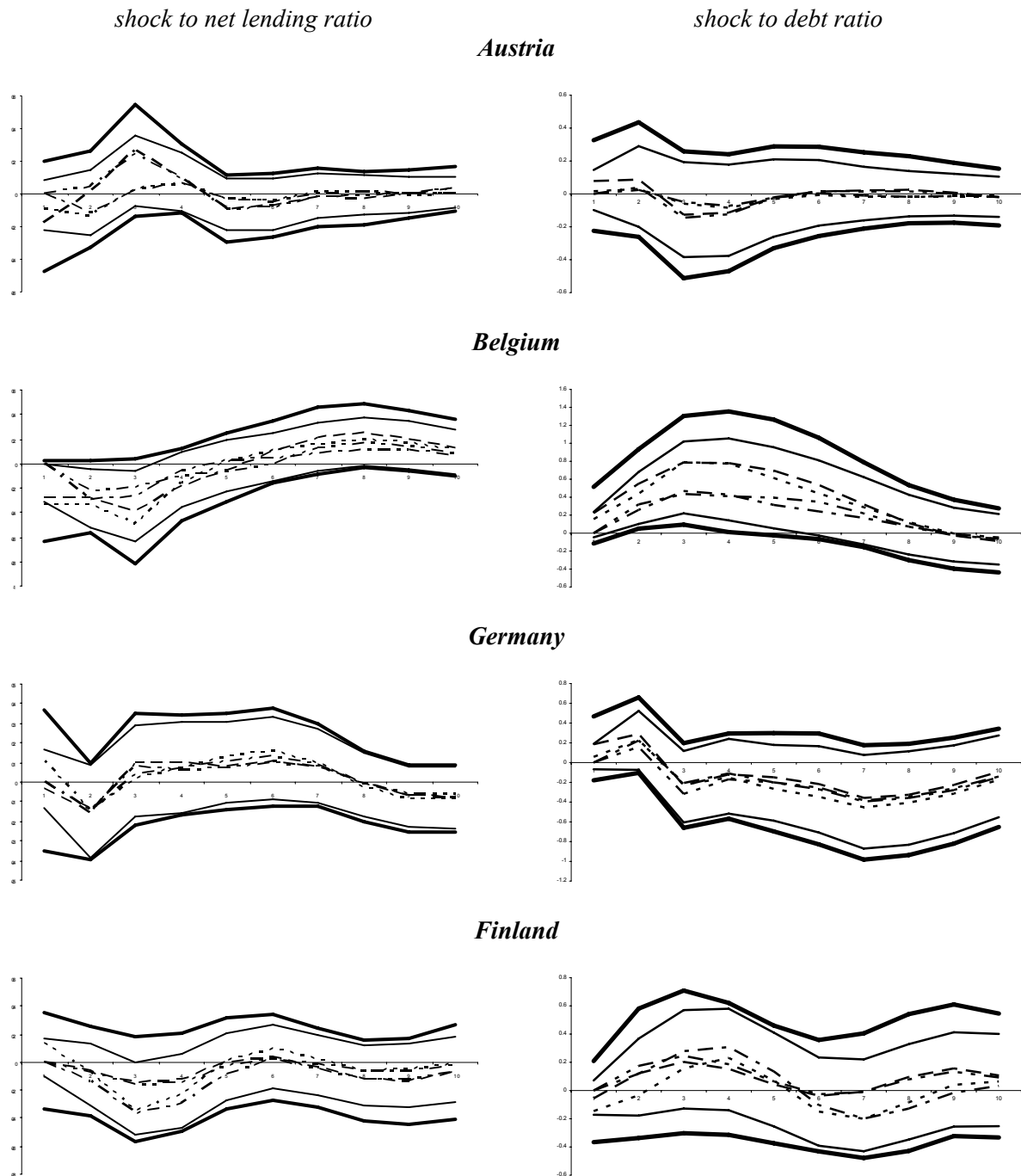
shock to net lending ratio   *shock to debt ratio*

France
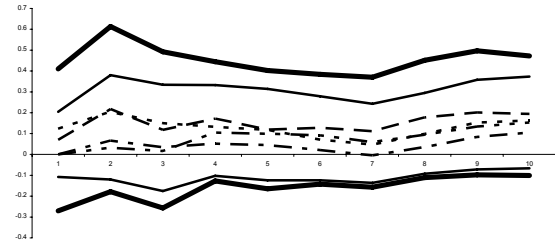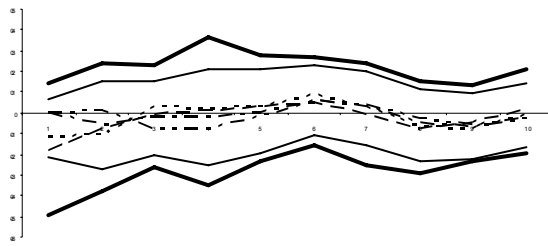
Italy
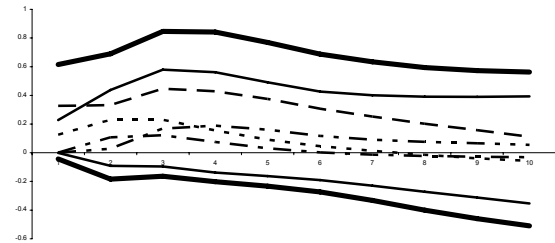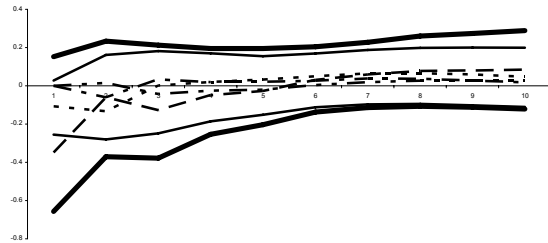
The Netherlands
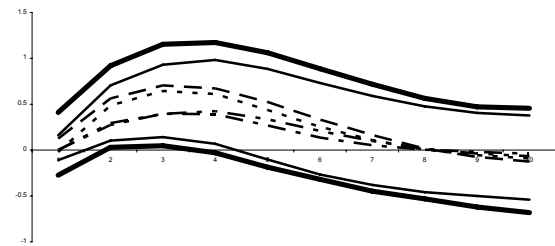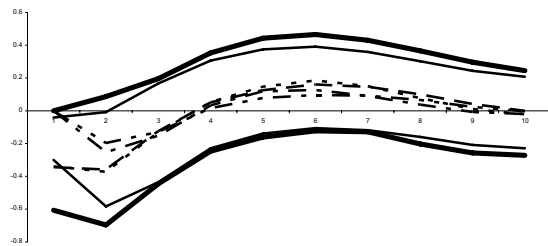
United Kingdom
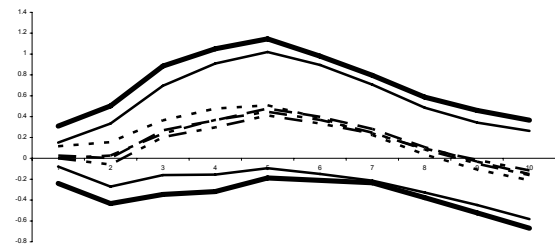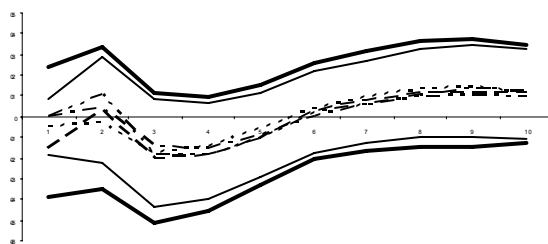
Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Table 1: Domestic economy, SVAR model (4.1a-b): forecast error variance decomposition of real long-term interest rates (see Figure 6, Figure 7)

country	horizon year	debt endogenous debt	net lending
euro area	1	3.60	4.39
	5	2.09	3.34
	10	2.69	4.83
Germany	1	0.20	2.57
	5	0.31	3.70
	10	0.37	3.49
France	1	24.02	4.07
	5	22.47	4.59
	10	25.53	4.98
Italy	1	2.84	1.14
	5	4.20	7.06
	10	4.30	17.01
United Kingdom	1	1.37	0.23
	5	2.65	4.60
	10	4.15	4.42
Austria	1	1.28	1.77
	5	14.38	2.35
	10	14.23	1.93
Belgium	1	0.23	0.39
	5	1.98	0.67
	10	1.71	0.64
Finland	1	1.21	8.99
	5	6.53	7.47
	10	6.02	6.35
Netherlands	1	4.82	2.31
	5	5.45	2.71
	10	9.37	2.03

Table 2: Open economy, SVAR model (4.2a): difference of country i to euro area; forecast error variance decomposition of real long-term interest rates (see Figure 8)

country	horizon year	debt endogenous debt	debt endogenous net lending
Germany	1	0.60	1.17
	5	5.76	12.34
	10	18.24	10.03
France	1	0.43	5.77
	5	4.78	8.64
	10	7.08	8.44
Italy	1	5.04	2.49
	5	11.02	10.06
	10	12.96	17.77
Austria	1	1.75	0.12
	5	8.77	2.81
	10	14.51	5.25
Belgium	1	0.01	0.03
	5	3.72	7.65
	10	6.93	7.11
Finland	1	0.06	0.15
	5	1.25	7.37
	10	1.34	8.20
Netherlands	1	1.63	10.97
	5	0.93	4.50
	10	2.50	3.90

Table 3: Open economy, "marginal method": average point estimated response +/- 1.95 standard error bounds of impulse response to a 1% shock to the debt ratio (from Figure 10)

horizon				horizon			
	Austria				*France*		
1	-0.15	**-0.02**	0.11	1	-0.12	**0.05**	0.21
2	-0.32	**-0.06**	0.20	2	-0.07	**0.22**	0.51
3	-0.53	**-0.20**	0.14	3	-0.08	**0.27**	0.62
4	-0.54	**-0.19**	0.17	4	-0.03	**0.35**	0.72
5	-0.42	**-0.08**	0.26	5	-0.06	**0.32**	0.71
	Belgium				*Italy*		
1	-0.05	**0.09**	0.23	1	0.00	**0.11**	0.23
2	0.09	**0.40**	0.71	2	-0.11	**0.19**	0.48
3	0.22	**0.65**	1.08	3	-0.07	**0.32**	0.70
4	0.17	**0.66**	1.15	4	-0.05	**0.38**	0.80
5	0.09	**0.60**	1.10	5	-0.07	**0.36**	0.79
	Germany				*The Netherlands*		
1	-0.05	**0.08**	0.21	1	-0.11	**0.02**	0.16
2	0.03	**0.33**	0.62	2	0.09	**0.39**	0.69
3	-0.34	**0.04**	0.42	3	0.15	**0.54**	0.92
4	-0.43	**-0.04**	0.35	4	0.13	**0.57**	1.01
5	-0.56	**-0.12**	0.31	5	0.02	**0.49**	0.95
	Finland				*United Kingdom*		
1	-0.19	**-0.06**	0.06	1	-0.08	**0.04**	0.15
2	-0.18	**0.13**	0.45	2	-0.29	**0.04**	0.36
3	-0.20	**0.26**	0.73	3	-0.18	**0.30**	0.78
4	-0.26	**0.28**	0.83	4	-0.19	**0.42**	1.03
5	-0.39	**0.17**	0.73	5	-0.15	**0.52**	1.20

Notes: bold entries are point estimates; shaded cells indicate the peak effect.

Table 4: Open economy, "marginal method", SVAR model (4.2b): forecast error variance decomposition of real long-term interest rates (see Figure 9, Figure 10, Figure 11)

country	horizon year	domestic debt endogenous; euro area debt exogenous		domestic debt endogenous; euro area real long-term rate exogenous		domestic debt endogenous; euro area debt and real long-term rate exogenous	
		debt	net lending	debt	net lending	debt	net lending
Germany	1	0.01	1.32	3.78	5.74	0.59	2.54
	5	0.41	3.34	4.41	10.55	2.08	8.02
	10	0.37	3.29	4.52	9.96	2.01	7.52
France	1	24.72	5.09	16.30	0.00	7.72	7.37
	5	23.47	4.80	14.40	7.11	5.76	35.26
	10	25.98	4.66	13.94	8.71	5.15	31.04
Italy	1	3.77	1.95	0.75	0.57	1.11	0.40
	5	3.30	15.05	1.27	1.25	6.20	2.85
	10	15.67	10.24	1.43	1.53	13.11	2.34
United Kingdom	1	0.26	0.00	0.48	1.18	0.00	4.04
	5	1.62	5.23	1.80	6.63	1.40	8.56
	10	2.24	5.47	2.56	6.20	2.09	9.60
Austria	1	0.81	0.36	1.19	0.00	2.06	0.85
	5	19.42	1.80	0.91	13.13	3.71	13.88
	10	18.26	1.54	2.96	13.15	5.23	14.44
Belgium	1	0.81	0.12	0.33	3.42	0.00	0.89
	5	2.78	1.55	0.37	7.96	0.76	2.40
	10	1.94	1.63	0.56	8.37	1.56	2.43
Finland	1	0.40	13.53	0.04	8.82	0.64	7.75
	5	10.84	23.73	8.46	9.84	11.34	8.30
	10	24.19	12.57	7.51	11.48	11.41	10.02
Netherlands	1	6.75	3.84	5.68	2.57	6.71	2.67
	5	10.34	6.62	8.00	3.24	9.19	3.80
	10	16.46	5.22	7.45	4.20	8.05	4.77

5   Budgetary stabilisation and the level of public debt

5.1   Introduction

In the previous chapters it is implicitly assumed that the relationship between the different variables in the analysis is (close to) linear. This assumption is potentially controversial for two key reasons. Firstly, the SVAR analysis used in the previous chapters may not perform optimally in the presence of non-linearities. Secondly, the structural model used in the remainder of this report is based on linear approximations of key macroeconomic relationships.

In view of these concerns, this chapter provides a robustness check on the assumption of linearity. It focuses on one potential source of non-linearity: the impact of a fiscal contraction (expansion) and the initial level of public debt. If a relationship exists between these two variables, then the impact of a change in government revenues or expenditure on the economy (and, hence, through potential spillover effects on other economies) will vary from one Member State to another.

The remainder of this chapter is divided into two parts. The first part presents an overview of the literature on fiscal stabilisation and the level of public debt. The second empirically examines whether the real effects of fiscal policy depend on the level of public debt.

5.2   A short overview of the literature

Traditional Keynesian thinking links a tighter fiscal policy to a reduced aggregate demand. If a government raises taxes or cuts transfer payments, disposable income, and thereby also private spending, is reduced. If a government decreases its consumption or investment, aggregate demand is directly reduced. Multiplier-accelerator mechanisms will reinforce the initial negative impact.

However, this basic Keynesian theory cannot explain why severe fiscal contractions in Ireland and Denmark in the 1980s coincided with an economic boom (Giavazzi and Pagano, 1990). Many potential explanations for these non-Keynesian effects were formulated, including expectations, wealth and credibility effects, as well as crowding-out. In addition, the macroeconomic effects of fiscal contractions depend on the composition (the impact of

raising taxes differs from that of cutting expenditures), the magnitude and the timing of a fiscal contraction.

Furthermore, the debt level might be an important determinant of the outcome of a fiscal consolidation. Firstly, a high debt level implies high future taxes. When debt increases, the tax rate needed to stabilise the debt also increases. Blanchard (1990) postulates that taxes become disruptive (in the sense that they reduce potential output) if they exceed a certain critical level, known to the public[28]. Thus, the tax rate is a function of the debt level and a rise in this tax rate is non-linear in its effects on output. He concludes that the higher the current tax rate, the larger the potential output loss because of an excessive tax rate and the nearer the 'catastrophe' (i.e. a debt level close to the critical level) has come, the more a society has to gain from a consolidation. In that "critical" context the effects of stabilising the debt will be less negative than those predicted by Keynesian theory. To be able to predict the effects of a fiscal policy action, it is important to know how much 'fiscal space' is left: i.e. how far away the tax rate is from its critical level.

Secondly, a high debt level might also be a good predictor for the timing of the next consolidation. Bertola and Drazen (1993) consider a government that gradually increases its consumption until the government spending-to-GDP ratio reaches a critical level (the so-called "trigger point"). At that point the government cuts drastically in its consumption. In this model, the pre-stabilisation situation must deteriorate markedly to induce an inevitable stabilisation. The closer "unsustainability" comes, the larger the probability of a fiscal contraction in the next period becomes. When spending levels are already high, a further unexpected increase raises the necessary expenditure cut even more, so the present discounted value of future government expenditures (and future taxes) diminishes. As an agent bases his consumption on expected future government spending, he will consume more. An increase in government expenditures may be expansionary if people expect that expenditures will be cut soon. By bringing the country on the edge of collapse, the prospects become less dark.

Note that in this set-up, agents react in a more Keynesian manner when the trigger point is reached and more Ricardian when the debt situation is "as it should be". However, when the

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[28] Dalamagas (1993) argues that in countries with a high debt-to-GDP ratio the public is less prone to suffer from some kind of debt-illusion. It will less likely consider government bonds to be net wealth, as they are more likely to be informed about the perverse consequences accompanying an expansionary fiscal policy. Journalists and the political opposition clearly have a motive to inform the public. In the model by Blanchard (1990) this could assure that the public will be capable to determine the critical level of taxation.

trigger point is crossed and a consolidation does not occur, then a strong contraction of private consumption will occur. People realise that they made an error in estimating future spending (taxes) and they need to correct for it. An anticipated consolidation has no contractionary effects. It is, however, difficult to imagine that consumers will spend more if a government acts very profligate. This counter-intuitive result stems from the assumption that agents are either infinitely lived or value their own well-being no more than that of future generations.

Sutherland (1995) assumes a more realistic approach. Agents are especially concerned about the present. In normal times, i.e. when debt levels are moderate, consumers expect the next budget consolidation to be far away. They do not adjust their expectation about future taxes in response to a fiscal stimulus as the burden of such a consolidation will likely be put on the next generations. So the current generation will react in a Keynesian way. However, when debt levels are high (a critical level of government debt is reached), every new fiscal expansion brings a consolidation alarmingly near. The "bill" is then likely to be presented while the current generation is still alive. So they will have to carry the burden themselves. As the cost of a fiscal consolidation outweighs numerous times the gain from the expansion, any additional expansion will cause a contraction. So the link between current fiscal policy and future expected taxes and the distribution of these expected future taxes across generations will determine whether a fiscal policy is expansionary or contractionary. In this model, agents react in a Keynesian manner under "normal circumstances" and in a non-Keynesian[29] manner in "crisis situations".

Perotti (1999) integrates different aspects of these previous models. He looks at the share of credit constrained people in a society[30]. For those people an unanticipated increase in taxes will always lower their consumption, and a positive shock to government expenditures will always increase it. Their consumption is completely determined by disposable income. Hence, they resemble the agents in the Sutherland model. On the other hand, agents who are not credit constrained will not always decrease consumption after an unexpected increase in taxes. If government spending has not changed, the increase in current taxes will be exactly equal to the drop in the present discounted value of expected future taxes (so consumption will not be

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[29] But also in a non-Ricardian manner. People will actually reduce their expenditures by a larger amount than the government increases its expenditures.

[30] Afonso (2001) shows with a theoretical model that the bigger the proportion of non-rationed consumers, the more likely non-Keynesian effects will occur. The existence of non-Keynesian effects will also be more likely when interest rates are more responsive to changes in public revenues.

altered). These agents act in accordance with the Bertola and Drazen model. Finally, Perotti incorporates the Blanchard model. By raising current taxes, current distorting effects of taxation are strengthened. On the other hand, as future taxes are reduced, future distortions form taxation also decrease. The net effect of these two opposite movements will determine the impact on the unconstrained agents' consumption. An unexpected increase in government consumption will always depress private consumption as the present discounted value of future taxes increases.

The combined effects of credit constrained and unconstrained agents determines the total effect on private consumption. According to Perotti (1999) the sign of the total effect switches at higher levels of government debt. An expenditure shock will be positive if (1) the debt level is still low, (2) the probability that the same government will still be in office is large and (3) the group of credit constrained people in the society is 'large enough'. A low level of debt also means a low level of future taxes, so slightly higher future taxes will still not be too distorting. If the same government stays in office, taxes are likely to be lower than if a new government is installed (as new preferences and priorities also lead to new expenditures). These two factors limit the negative response of unconstrained agents' consumption on a fiscal expansion. Hence, the extra consumption by credit constrained people will keep the upper hand. The percentage of credit constrained agents is crucial in this model. Their increased (decreased) liquidity will produce a Keynesian outcome in case of an expansion (contraction). Only if the 'counter-reaction' of unconstrained people is vigorous, the results will be non-Keynesian.

To summarise: economic theory suggests that the effects of fiscal policy actions on economic activity are influenced by the level of public debt. The nature of the relationship is dependent on the degree of "Ricardianism" in economic life. However, since it is safe to assume that agents discount the well-being of future generations and it is well known that market imperfections exist, one expects that the effects of fiscal policy will be more Keynesian in low debt times. Non-Keynesian effects are more likely in high debt episodes.

Although theory assigns an important role to the initial conditions, strong empirical evidence confirming this notion has yet to be provided. Zaghini (1999) notes that in the recent European experience, the level of debt before successful consolidations was on average twice as high as before unsuccessful ones. Alesina and Ardagna (1998) and Ardagna (1999) detect

only a weak (small and statistically insignificant) link between the lagged debt-to-GDP ratio and the probability of a successful consolidation in OECD countries. Heylen and Everaert (2000) reach the same conclusion.

The above studies cannot really verify or falsify the theoretical models, as they define neither the critical debt level nor the available fiscal space. Theory only predicts that there will be some kind of regime shift when a certain amount of debt accumulation is reached. The reason for the difficulty in finding the importance of the debt level for the effects of fiscal policy may be given by the fact that there are too few observations of these 'critical debt situations' within the sample. One has to face a difficult but essential question: from what level on can the debt level be considered as being problematic?

In recent work, different possibilities were explored:

(i)   Perotti (1999) uses the sum of the present discounted value of future government expenditure and the cyclically adjusted government debt. If the observed value is above the ninetieth percentile of the distribution of the sample, the situation is labelled as problematic.

(ii)   A second indicator proposed by Perotti (1999) is based on the budget deficit. If the cyclically adjusted deficit as a share of trend GDP has exceeded a certain value in the two previous years, a government is said to be in fiscal distress.

(iii)   Gobbin and van Aarle (2001) use an indicator based on the Domar conditions on fiscal sustainability. This indicator shows whether economic growth, interest rates, primary deficit and government debt are consistent with achieving a 'steady state level' of debt.

(iv)   Gobbin and van Aarle (2001) derive an indicator from the Maastricht-criteria concerning fiscal convergence. If a country does not comply with one of these two criteria, it is said to be in fiscal distress.

All of the above indicators make sense, but they are not without criticism. The first three indicators just shift the problem: one still has to choose, respectively, the percentile, an acceptable value for the deficit or the correct steady state debt level. The fourth criterion is more objective. Countries that did not satisfy the Maastricht-criteria could not join the EMU. So stakes were high. However, it is only applicable to a limited number of countries (EU), and only for a short period in time.

The empirical set-up of the papers by Perotti (1999) and Gobbin and van Aarle (2001) is similar: in both contributions a consumption function specification is estimated, in which fiscal variables interact with a dummy for fiscal distress. Perotti (1999) finds support for the different effects of government spending in good times and in bad times (but not for taxation). The results of Gobbin and van Aarle (2001) do not confirm this finding.

Höppner and Wesche (2000) use a Markov-switching approach to determine non-conventional fiscal periods in Germany. They can identify two distinct regimes: one in which the effects of fiscal policy are Keynesian and one in which they are rather non-Keynesian. However, the shift between the regimes cannot be explained by a rise in the debt level or a consolidation programme. If the debt situation worsens, the probability of remaining in the Keynesian regime even increases.

5.3   The importance of the debt level: an empirical contribution

In this empirical contribution, we focus on the impact of the initial debt level on the outcome of fiscal policy actions. Recently, it has been noted that the effects of fiscal policy actions can differ across countries (Hogan, 2004). However, using individual countries is not a viable solution since it strongly reduces the variability in the debt rate data. Therefore, we test for non-linearities in a panel of EMU countries. By doing so, we implicitly impose a homogenous impact of fiscal policies in those countries. This choice resembles the estimates in the previous chapters in which we looked for the effects of the aggregate euro area economy on the individual Member States.

Data

We use data from the 'OECD economic outlook quarterly' data set, with the exception of inflation which was derived from the 'OECD main economic indicators' data set. In a quarterly panel we include Finland, France, Ireland, Italy and the Netherlands. For most countries we have data series from the first quarter of 1970 up to the first quarter of 2005. Unfortunately, the available data do not allow the inclusion of (among others) Germany in this analysis. To obtain a sample that is more representative for the entire euro area, we use annual instead of quarterly data in the second part of this empirical contribution. It is also commonly known that the quality of annual fiscal data is higher than that of quarterly data. In this yearly panel Greece, Luxembourg and Portugal are excluded due to data limitations.

Methodology

If the debt level determines the impact of fiscal policy on private consumption (or investment), consumption (investment) functions will not be identical across countries. Because we have no a priori knowledge as to how the coefficients of the fiscal policy variables vary with the level of debt, we apply the endogenous threshold estimation technique developed by Hansen (1997, 1999, 2000). The literature survey shows that previous work suffers from the arbitrariness of the definition of the critical debt level. This is especially problematic since the results are not robust to marginal changes of this definition. We avoid this problem by determining the threshold debt level endogenously. The main problem is that, since the threshold is unknown, it has to be estimated, meaning that the standard econometric theory of estimation and inference is not valid. We estimate a consumption function of the following form:

$$
\begin{aligned}
(5.1) \quad & \Delta C_t = \alpha_0 + \alpha_1 r_{t-1} + \alpha_2 \Delta r_t + \alpha_3 Y_{t-1} + \alpha_4 \Delta Y_t + \alpha_5 C_{t-1} + \beta' F_{t-1} \\
& + \gamma_{LD} I(debt < crit.)' \Delta F_t + \gamma_{HD} I(debt > crit.)' \Delta F_t + \varepsilon_t
\end{aligned}
$$

in which C denotes private consumption, r the real long-term interest rate, and Y disposable household income. F is a vector containing all fiscal policy variables (all variables are in real terms). I is and indicator function that depends on the debt level. The coefficients of the changes in the fiscal variables (the γ-vector) depend on the debt level. The subscript '*LD*' ('*HD*') refers to a debt level below (above) the critical one.

Given the near-consensus in the literature that the composition of fiscal policy matters for its outcome, we do not use the budget deficit as a proxy for the fiscal stance. Instead, we introduce different components of the budget. On the expenditure side we include government investment (*INV*) and the sum of government consumption, subsidies and current transfers (*EXP*). On the revenue side we use the sum of direct and indirect taxes (*REV*).

In addition to consumption, investment is also an important part of economic activity. If we want to capture the impact of fiscal policy actions on the total economy, we need to broaden the scope of the analysis. The specification of the investment function is similar to the one of the consumption function (replacing consumption by investment). However, we attach more weight to the estimates of the consumption function as the specification of the investment

function might be too elementary to really account for the complexity of investment behaviour.

The threshold estimation technique jointly estimates the coefficients and the threshold level. It selects the value of the threshold that minimises the sum of squared errors of the equation. It is important to note that this does not mean that one cannot get significant results based on an alternative value of the threshold variable. But if one believes that the coefficients on the fiscal variables change once a certain level of debt is reached, then the threshold estimate is the most likely suspect for the turning point given the available data. By means of bootstrapping techniques we next determine whether the threshold effect is significant (see Hansen, 1997, 1999, 2000).

Results

We construct a quarterly euro area panel that includes Italy, Finland, France, the Netherlands and Ireland. Unfortunately, we lack data for Germany. Still the panel has some interesting features: it comprises two large economies (France and Italy), it includes a country with an interesting fiscal past (Ireland), and the debt rate has a wide range: from 8% to 135% of GDP.

We do not allow for a value of the threshold below 35% or above 95%. Doing so would imply that the coefficient estimates for the smallest category would be based on less than 10% of the data points (i.e. less than 55 observations). These results would not be sufficiently robust to the presence of outliers. Note that for the highest debt levels almost all observations above the debt threshold are found in only two countries, Italy and Ireland.

Our consumption (investment) function specification includes a lagged endogenous variable, which means that fixed effects panel estimators could be biased and inconsistent (Nickell, 1981). However, Judson and Owen (1999) show that this bias is small if the cross-section dimension is small in relation to the time dimension of the panel. This is clearly the case for our euro area panel, which covers only 5 countries and at least 81 quarters. A comparison (not shown) of the GMM-estimates with the fixed effects estimates of the consumption function without thresholds confirms that the results are very similar. Hence, we continue to use the fixed effects estimation method.

Below, we present two figures plotting the estimated coefficients of, respectively, changes in government revenues and expenditure for different values of the threshold variable. The best estimates are obtained for a debt ratio of about 90% (which means that in 131 episodes the debt ratio is above the threshold).

From Figure 12 it is clear that the effect of revenue changes on private consumption does not differ a lot between high debt and low debt times. Only near the upper bound (from a debt ratio of 80% onwards) there seems to be a slight indication of non-Keynesian effects: the impact of taxes on consumption first becomes less negative, then it is no longer significant. Recall that the situation in Italy, and to a lesser extent in Ireland, will largely determine this result.

Figure 12: Quarterly EMU panel: the impact of tax changes on private consumption
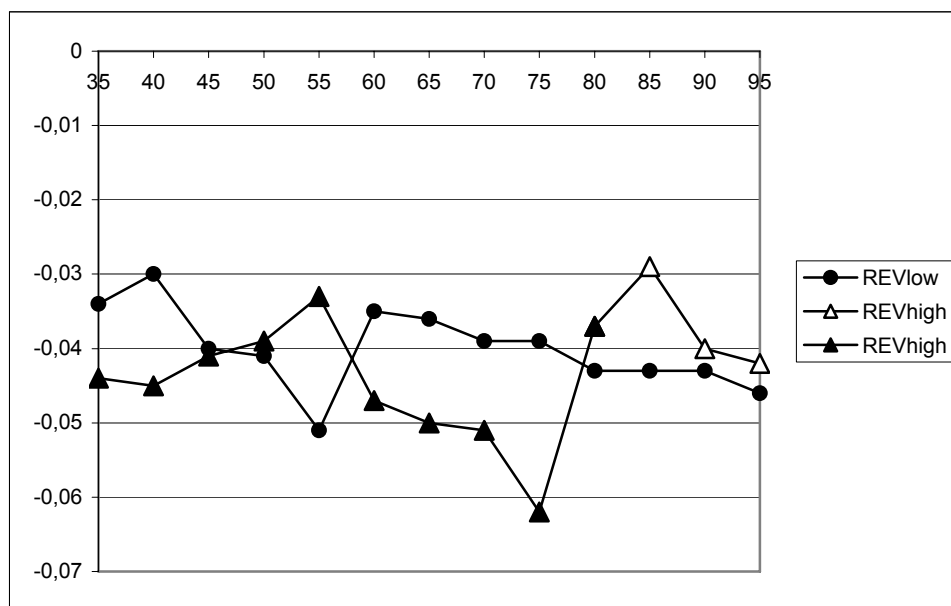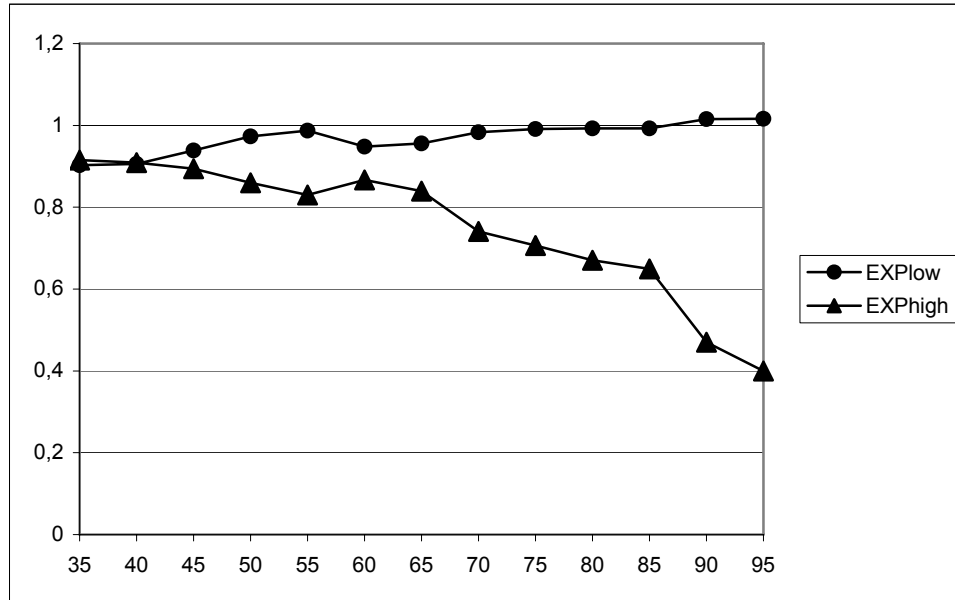

Note: X-axis: debt rate that is used as threshold level
         Y-axis: coefficient of a change in government revenues in the consumption function
         "REVlow": estimate below the threshold
         "REVhigh": estimate above the threshold
         Black marks indicate significant coefficients, hollow marks indicate insignificant coefficients.

The impact of changes in government spending on private consumption (Figure 13) is more in line with the literature on non-Keynesian effects. For low debt levels the impact is similar above and below the threshold. However, for higher debt levels, the impact of government spending on private consumption is much smaller above than below the threshold. The effects of government investment on private consumption display a pattern similar to the one of

taxes: the effects above and below the threshold are almost identical (but the estimated coefficient above the threshold is insignificant in many cases).
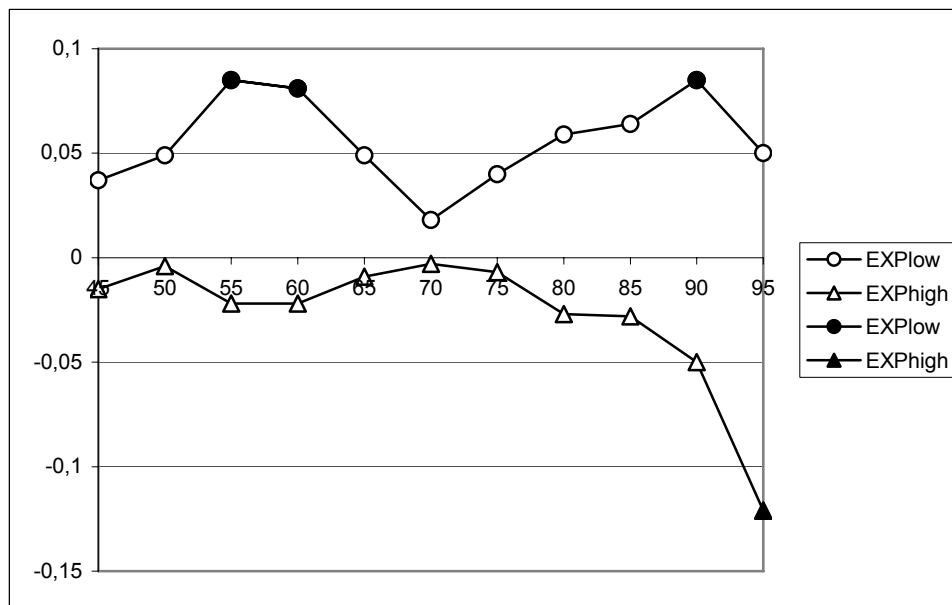
Figure 13: Quarterly EMU panel: the impact of spending changes on private consumption

Note:　X-axis:　debt rate that is used as threshold level
　　　　Y-axis:　coefficient of a change in government spending in the consumption function
　　　　"EXPlow": estimate below the threshold
　　　　"EXPhigh": estimate above the threshold.

Next, we construct a yearly panel of euro area countries. Moving from quarterly to yearly data allows us to include more countries in the data set. We can expand the cross-section dimension of the panel (to the detriment of the time dimension). The new panel consists of 9 countries: Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands and Spain. We cover the period 1977 to 2004. In the yearly panel the best estimates are obtained for a debt ratio of 50% of GDP. We obtain similar (significant) results for the impact of tax changes in times of low and high debt ratios.

Figure 14: Yearly EMU panel: the impact of spending changes on private consumption

Note: X-axis: debt rate that is used as threshold level
        Y-axis: coefficient of a change in government spending in the consumption function
        "EXPlow": estimate below the threshold
        "EXPhigh": estimate above the threshold
        Black marks indicate significant coefficients, hollow marks indicate insignificant coefficients.

The results for changes in government spending are presented in the graph above. Below the threshold level the impact is always positive. Above the threshold it is always negative. This picture more or less confirms the analysis based on the quarterly data (although the threshold is lower). However, the estimated coefficients are now almost always insignificant. The impact of changes in government investment are always negative (above and below the threshold).

The estimates seem not very sensitive to changes in the threshold debt ratio. In the yearly panel the explanatory power of the model (the R^2) moves within the range of 0.683 (debt ratio of 35%) to 0.703 if one gradually increases the threshold value of the debt ratio from 35% to 100% of GDP. In the quarterly panel the threshold is only slightly more important for the quality of the model (the range of the R^2 is then between 0.711 and 0.807).

Figure 15: The ratio of debt to GDP: descriptive statistics, yearly EMU panel
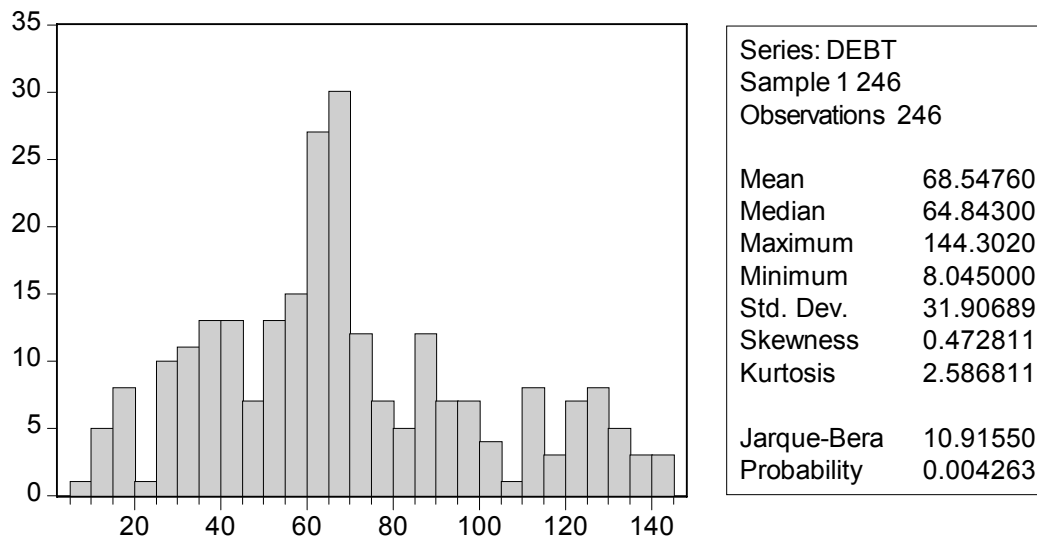
The above figure shows that a lot of observations for the debt ratio in the yearly panel are located between 60 and 70% of GDP. If we gradually move from 35% to 100%, a lot of observations 'switch camp' with each 5%-increase. Hence, if the debt ratio were very important to explain the impact of fiscal policy actions, one would expect that the explanatory power of the model would strongly improve once we reach the neighbourhood of the relevant threshold value. The fact that we do not observe this jump seems to imply that, even if there are different regimes for the impact of fiscal policies, these regimes do not depend on the debt ratio. An alternative explanation might be that changes in fiscal policy actions have only a marginal impact on private consumption. But in that case one would still not expect an almost continuous change in the explanatory power of the model.

5.4   Conclusion

Although we detect some limited evidence in favour of non-Keynesian effects of government spending, our analysis does not confirm the hypothesis that the debt rate is very important for the real economic effects of fiscal policy actions. The results seem to imply that, although there are different regimes of fiscal policy outcomes, regime switching is not triggered by changes in the debt level. This result is in line with the outcome of previous empirical work (e.g. Höppner and Wesche, 2000). The impact of a change in the debt level on, e.g., GDP will not be different in (during) a high and a low debt country (period).

The inclusion of the debt rate in a linear estimation technique, such as a VAR, seems justified in the light of our results. Of course, we cannot exclude the existence of other sources of non-

linearity in the relationship. This was most evident in chapter 4, where long-term interest rate responses to fiscal policy changes are much stronger in highly indebted countries. Although the results so far cast little doubt on the reliability of the analysis in the remaining chapters of the report, exploring other potential sources of non-linearity remains an avenue for future research.

6   Spillover from economic reform

6.1   Introduction

This chapter analyses the benefits of structural reforms to factor and product markets and identifies possible spillover arising from these reforms. According to the existing literature (e.g. Griffith and Harrison, 2004) the main way in which (de-)regulation and reforms influence the macroeconomic outcome is via the level of economic rents available in the market. This in turn affects price levels, the allocation of inputs and outputs as well as incentives to engage in efficiency enhancing-activity and innovation. The level of economic rents is usually measured by the mark-up or price-cost margin, i.e. the deviation of prices from marginal cost.

Rather than providing an isolated study of structural reforms, the ultimate aim of this chapter is to derive a basis for the estimation of the macroeconomic and welfare effects of structural reforms. Thus, the main results of this chapter will be taken as inputs for simulations with the dynamic, intertemporal, general-equilibrium multi-region model MSG3. These simulations will be addressed in the next chapter. Nonetheless, some macroeconomic effects of structural reforms, in particular regarding the labour market, are already addressed in the present chapter. As the MSG3 model is to a large extent an equilibrium model, employment and unemployment tend towards their "natural" levels. Thus, in this model, context reforms only have lasting effects if they reduce the natural rate of unemployment while effects on actual employment and unemployment are only temporary.

Following the approach in, e.g., Griffith and Harrison (2004), for a panel of nine euro area countries (Austria, Belgium, Finland, France, Netherlands, Germany[31], Ireland, Italy, Spain)[32], the influence of product and factor market regulation on the macroeconomic performance is measured by a two-stage procedure. Firstly, the link between the mark-up and the macroeconomic performance, i.e. total factor productivity growth, labour productivity growth, employment, and unemployment is analysed. Secondly, the influence of product and factor market institutions on the mark-up of prices over cost is estimated. The ultimate effects of product market regulations and reforms on macroeconomic outcomes, as mediated via the level of rents, can be evaluated by combining the estimation results from the first and second

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[31] West Germany until 1990, the unified Germany from 1991 onwards
[32] For Greece, Portugal and Luxemburg, not all relevant data was available.

stages. The results of these panel analyses will then be used as inputs for simulations with the MSG3 model.[33]

The model simulations are intended to shed light on the following issues:

i.   What effects on the macroeconomic performance and on fiscal policies arise from structural reforms?

ii. Will reforms on the goods and factor markets undertaken in one particular euro area country affect the macroeconomic outcome and fiscal policies in other countries, i.e. will there be international spillover from these reforms?

iii. Can benefits from coordination, both between different kinds of policies (in this case fiscal and structural policies) and between countries, be expected?

In the estimation of the mark-ups, the United Kingdom and the United States are included as benchmarks so as to estimate the potential for decreasing the mark-up in the euro area by implementing structural reforms. In particular in the 1990s, the US economy, characterised by more liberal markets, exhibited a significantly lower mark-up and a better macroeconomic performance than the euro area. The UK, while being an EU member, has in some respects more liberal markets than most of the continental EU countries. In the last decade, the UK has experienced higher GDP growth and a better labour market performance than many euro area countries, in particular the larger ones.

In the following sections, the determinants of the mark-up and the influence of the mark-up on the macroeconomic performance will be analysed. This requires, in a first step, the determination of the mark-up ratios.

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[33] Alternatively, it would have been possible to find significant direct links from institutional variables to macroeconomic performance indicators. For reasons of compatibility with the model simulations, we used this indirect way via the mark-ups.

6.2   Determination of mark-up ratios

Following Roeger (1995)[34], the starting point of the calculation is the definition of the Lerner index B (6.1), from which the relative mark-up μ of the price P over marginal cost MC can be derived (6.2):

(6.1) $$B = \frac{P - MC}{P} = 1 - \frac{1}{\mu}$$

with $$MC = \frac{W\Delta L + R\Delta K}{\Delta Q - \theta Q}$$

and

(6.2) $$\mu = \frac{1}{1 - B},$$

with the following notation:

B	Lerner index
MC	marginal cost
W	wage rate
L	number of employees (or working hours)
R	user cost of capital
K	capital stock
Q	real output
P	output price
θ	technical progress
μ	mark-up

Under perfect competition, the output price is equal to marginal cost, i.e. $\mu = 1$, and the share of labour and capital, respectively, in the total value added equals the elasticity of output with respect to these inputs. With constant returns to scale[35], output q develops according to the following expression (lower case letters denote natural logarithms):

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[34] This method has been widely applied in the literature, see, e.g., Martins et al. (1996) and Badinger (2004).
[35] Martins et al. (1996) showed that the presence of increasing (decreasing) returns to scale induces a downward (upward) bias in the estimation of the mark-up ratio. In this case the estimated mark-up by means of the Roeger equation will be too low (high). The presence of sunk costs could also generate a downward bias. If a fraction of

(6.3) $\Delta q = \mu \alpha \Delta l - (1 - \mu \alpha) \Delta k + \Delta \theta$

From (6.3) the Solow residual *SR*, i.e. the growth rate of output not accounted for by increases in labour and capital, can be derived:

(6.4) $SR = \Delta q - \alpha \Delta l - (1 - \alpha) \Delta k = (\mu - 1) \alpha (\Delta l - \Delta k) - \Delta \theta = B (\Delta q - \Delta k) + (1 - B) \Delta \theta$,

where α denotes the production elasticity of labour, and $(1-\alpha)$ is the production elasticity of the capital input, assuming constant returns to scale. Equation (6.4) illustrates that under perfect competition, i.e. $\mu = 1$, or $B = 0$, the Solow residual equals technical progress. Roeger (1995) showed that a similar expression can be derived for the nominal or price-based Solow residual (*SRP*):

(6.5) $SRP = \alpha \Delta w + (1 - \alpha) \Delta r - \Delta p = -B (\Delta p - \Delta r) + (1 - B) \Delta \theta$.

By subtracting (6.5) from (6.4), the following equation for the estimation of the mark-up ratio can be derived:

(6.6) $\Delta y_t = B \Delta x_t + \varepsilon_t$

with $\Delta y = (\Delta q + \Delta p) - \alpha (\Delta l + \Delta w) - (1 - \alpha) (\Delta k + \Delta r)$
        $\Delta x = (\Delta q + \Delta p) - (\Delta k + \Delta r)$

The dependent variable Δy is the nominal Solow residual, and the explanatory variable Δx is the nominal output-capital ratio. ε denotes the residuals of the equation, and t is the time period.

The following variables[36] have been used for the econometric estimations of the mark-ups: The dependent variable Δy, i.e. the nominal Solow residual, has been calculated by subtracting the labour and the capital inputs from output. Each variable has been entered into the calculation at current prices. Output is given by GDP. Total compensation of employees

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the capital stock is sunk, this has to be subtracted from the total capital stock leading to lower marginal cost and a higher mark-up ratio.
[36] All data originates from the OECD Economic Outlook and has been extracted via the online database of the Austrian Institute of Economic Research (WIFO).

has been used as the nominal labour input. Under perfect competition, the production factors are paid for according to their respective production elasticities. Though market imperfections cause deviations from the ideal of perfect competition, weighting labour input by the share of compensation of employees in total income seems a reasonable approximation to reality. Assuming constant returns to scale, capital input was weighted by the share of capital income in total income, i.e. one minus the share of labour income. Capital input has been calculated by multiplying the capital stock in the business sector by the user cost of capital. Ideally, the user cost of capital would consist of the interest rate, the depreciation rate and an average company tax rate. Since consistent data on the latter two variables is not available for all the countries in the sample, the user cost of capital has been approximated by the long-term interest rate.[37] Consistent capital stock data for the considered countries is only available for the business sector, but not for the entire economy.

The explanatory variable, i.e. the nominal output-capital ratio Δx, is defined as GDP at current prices, divided by the nominal capital input. As above, the capital input has been calculated by multiplying the capital stock in the business sector by the nominal long-term interest rate, the latter again approximating the user cost of capital.

The following table shows the estimated Lerner index and the mark-up ratios for the panel of nine euro area countries (EUR 9) as well as for the UK and the US. The estimations have been carried out for the period 1970 to 2004. In order to identify the development over time, the total period has been split into two sub-periods: the period 1970 to 1992, i.e. before completion of the Single Market Programme of the European Union, and the period 1993 to 2004. The table also shows the rates of change of the mark-up ratios between the two sub-samples. According to the estimation results, in the most recent sub-period prices in the euro area on average exceed marginal cost by about 50 percent, compared to 46 percent in the UK and 39 percent in the US.

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[37] Thus, in the estimations the user cost of capital are too small, implying that the mark-up ratios are probably biased upwards.

Table 5: Lerner indices and mark-up ratios

	1970 - 2004		1970 - 1992		1993 - 2004		change between 1st and 2nd sub-period	
	Lerner index	**Mark-up**	Lerner index	**Mark-up**	Lerner index	**Mark-up**	Lerner index	**Mark-up**
EUR 9 (Panel)	0.34	**1.52**	0.35	**1.53**	0.34	**1.51**	-2,9%	**-1.3%**
UK	0.32	**1.48**	0.33	**1.48**	0.31	**1.46**	-6,1%	**-1.4%**
USA	0.29	**1.40**	0.29	**1.41**	0.28	**1.39**	-3,4%	**-1.4%**
EUR 9/UK (%)	5.9%	**2.6%**	5.7%	**3.3%**	8.8%	**3.3%**		
EUR 9/US (%)	14.7%	**7.9%**	17.1%	**7.8%**	17.6%	**7.9%**		

In the period after completing the Single Market Programme, the Lerner index and the mark-up ratio declined in the euro area and, more pronouncedly, in the United Kingdom. Thus, the liberalisation and the intensification of trade in the EU seem to have fostered competition, bringing prices closer to marginal cost. Nevertheless, according to the above estimates, the mark-up ratio in the euro area still exceeds the US level by 7.9 percent and the UK mark-up by 3.3 percent.

The estimated values of the mark-up ratios are broadly in line with results reported in the literature. Based on a literature review, Bayoumi et al. (2004) assume for their simulations that the average price mark-up in the euro area is around 10 percent above the US level (1.35 in the euro area, compared to 1.23 in the US). Thus, the estimates of the above table are somewhat higher, but the relation between the euro area and the US is comparable. For the period 1970 to 1992, Martins et al. (1996) estimate mark-up ratios in the manufacturing industries of a number of OECD countries. Their estimates are about 20 percent above our results, but again the relation between US and euro area levels is comparable. Furthermore, the fact that Martins et al. focus on manufacturing while the results shown in the above table cover the entire economy may cause a bias. Griffith and Harrison (2004) estimate mark-up ratios for 13 EU countries (EU 15 excluding Luxembourg and Greece) over the period 1980 to 2002. They measure the mark-up as the ratio of value added to the sum of labour and capital costs. Their mark-up ratios are comparable in size to our results. Regarding the development of the mark-up ratios in individual countries over time, the authors conclude that Austria, Germany, Belgium, France, the Netherlands, Portugal and the UK experienced declining mark-up ratios since the 1990s. In contrast, for Finland, Italy, and Sweden they find mark-ups rising over the 1990s.

Summing up, while the levels of our mark-up ratios seem to be at the upper bound of values found in the literature, the relation between the euro area and the US is broadly in line with findings in existing studies.

As a complement to the summary results of table 4, the following figures show the trajectories of the mark-up ratios in the nine euro area countries in the panel over the period 1971 to 2004. For comparison, the evolution of the mark-ups in the UK and the US is also displayed. For this analysis, time series of the mark-up ratios for the countries under consideration are needed. The mark-up ratios shown in the table above have been estimated for two sub-periods. For the subsequent analyses, rolling regressions have been performed for each country in the panel. The estimations were based on equation (6.6) above. The first regression was run for the ten-year period 1961 to 1970, and the value of the mark-up was assigned to the final year of this period. In each of the subsequent regression runs, the starting and the terminal point were moved forward by one year, and the result was again assigned to the final year of the respective period. This procedure resulted in time series for the mark-up ratios from 1970 to 2004.[38]

In order to remove outliers in the time series and to derive smoother time paths for the following figures, moving four year averages have been calculated. The first values shown in the graphs cover the period 1971 to 1974.

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[38] Due to data availability, the mark-up time series for Finland and Ireland start in 1977.

Figure 16: Evolution of mark-up in selected euro area countries
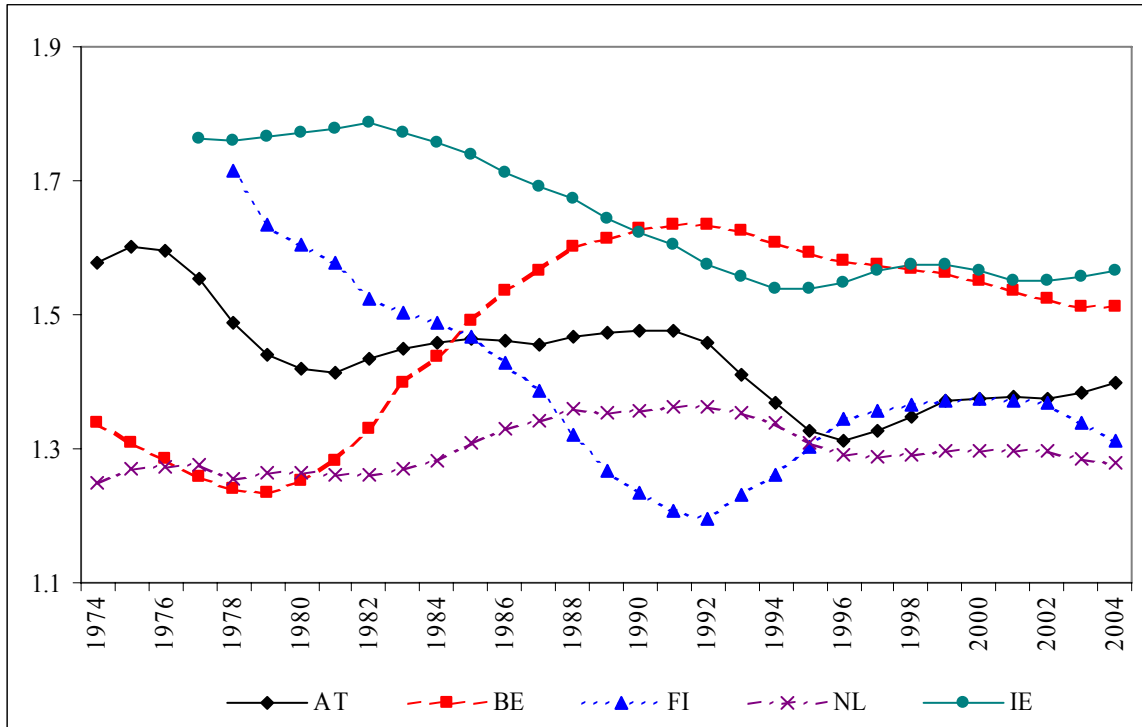
AT - Austria, BE - Belgium, FI - Finland, NL - Netherlands, IE – Ireland

Figure 17: Evolution of mark-up in selected euro area countries, cont'd
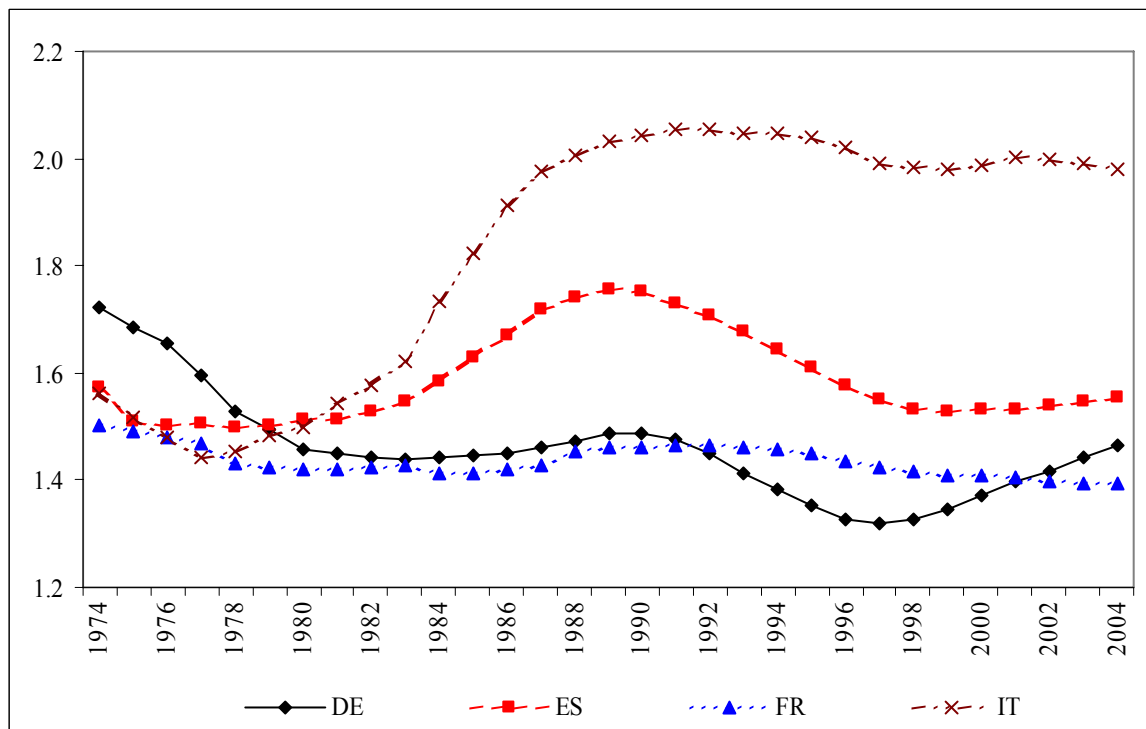
DE - Germany, ES - Spain, FR - France, IT - Italy

Figure 18: Evolution of mark-up in the euro area, the US and the UK
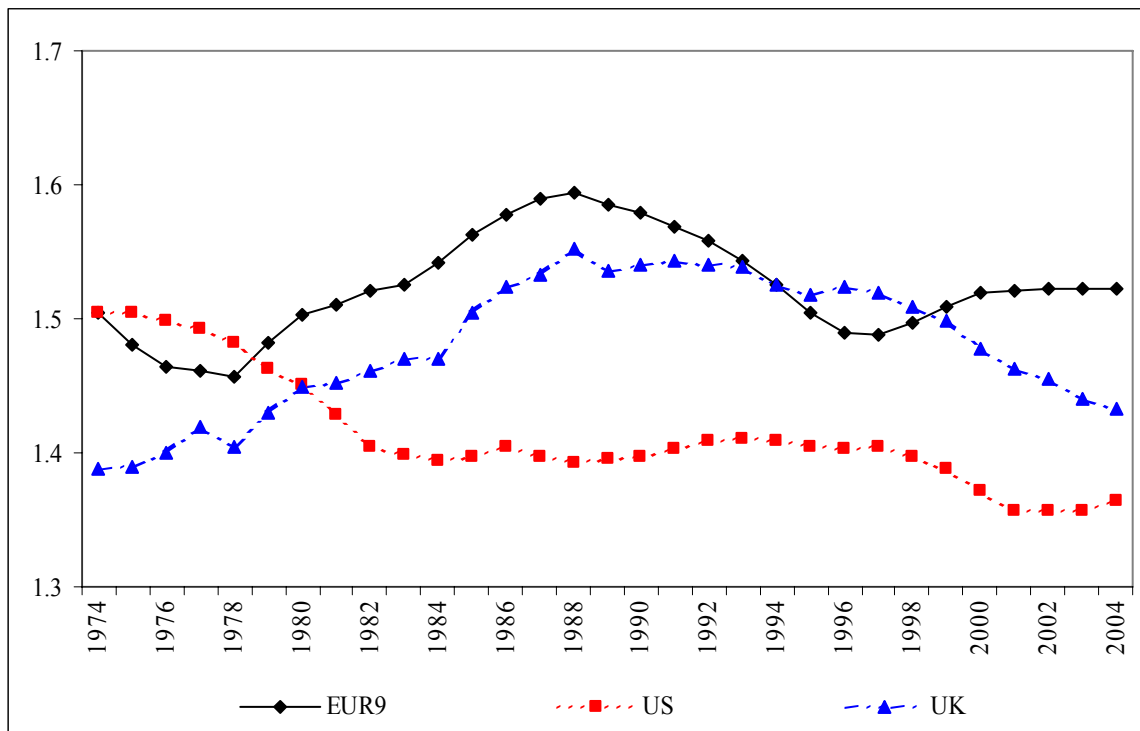
EUR9 - panel of the nine euro area countries of the previous figures, US - United States, UK - United Kingdom

In Austria, Ireland, and France, the mark-up ratios exhibit clearly negative trends over the entire period. In Belgium, Italy, and, albeit to a much lesser extent, in Spain, the mark-up first declined, then rose remarkably around the middle of the period, before decreasing again towards the end of the period. In the Netherlands, the mark-up has remained virtually constant and low as compared to the other euro area countries. For Finland, we find a significant decrease of the mark-up until the beginning of the 1990s. Afterwards, it rose again somewhat, but remained at the lower end of the spectrum. In Germany, the mark-up ratio increased somewhat in the most recent period, after having been on a decreasing trend until the middle of the 1990s. The German pattern might be related to the restructuring of Eastern German industry after unification. Despite the increase in the most recent years, the mark-up in Germany has remained relatively low. As can be clearly seen, the mark-up in the US has been below European levels since the beginning of the 1980s, and the downward trend has been more distinct as compared to the euro area. The UK exhibits increasing mark-up ratios until the beginning of the 1990s and a downward trend afterwards. In the continental European countries, the decrease in the mark-up ratios began in the second half of the 1980s.

The following sections analyse the influence of the mark-up on the macroeconomic performance as well as the link between product and factor market institutions and the mark-up ratios.

6.3   The link between the mark-up and macroeconomic performance

In this section, the influence of the mark-up ratio on important macroeconomic indicators is analysed by means of panel estimations[39]. Macroeconomic indicators comprise total factor productivity growth, labour productivity growth, employment and unemployment. The subsequent estimations have been performed for the panel of nine euro area countries. The starting point is 1976 (1975 in some cases), i.e. after the recession caused by the first oil price shock. The termination points of the estimations depend on data availability. While macroeconomic variables are available until 2004, the time series of product and factor market indicators end in 2002, in some cases in 1999.

Previous studies conclude that structural reforms such as the Single Market Programme could increase the long-run level of total factor productivity in the EU by 0.5 to 1 percent (European Commission, 2004). Simulating a 10 percentage point cut in the mark-up brought about by product market reforms, the IMF (2003) concludes that in the long-run, GDP could increase by 4.3 percent. Also based on model simulations, Bayoumi et al. (2004) estimate that reducing the mark-up in the euro area to the US level would raise GDP in the long run by 8.6 percent.

Total factor productivity growth

The analysis of the link between the mark-up of prices over marginal cost and the macroeconomic performance begins with total factor productivity (TFP) growth. TFP can be viewed as an indicator for technical progress and is an important determinant of economic growth. According to IMF estimates, GDP per capita in the euro area grew in the period 1995 to 2003 by 1.7 percent per annum, compared to 2.4 percent in the United States. This gap between the two areas can to a large extent be traced back to a divergent development of total factor productivity. In the period under consideration, TFP growth reached 0.8 percent per annum on average in the euro area, far behind the 1.4 percent per annum recorded in the United States (Estevao, 2004). Not only does the TFP growth rate in the euro area lag behind the US, total factor productivity growth in most of the euro area countries has also declined

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[39] The estimations have been performed with the software package EViews 4.1.

over time. According to our calculations, TFP growth in the aggregate of the nine euro area countries under consideration decreased from nearly 5 percent per annum in the 1970s to less than two percent per year in the period 1995 to 2004. In the four largest euro area economies (Germany, France, Italy, and Spain), TFP growth fell from more than 5 percent per annum in the 1970s to only 1¼ percent annually in the most recent decade.

One important source of the rather unsatisfactory growth performance of the euro area, in particular compared to the United States may be found in the less competitive environment, visible in higher mark-up ratios. TFP growth can be interpreted as an indicator of dynamic efficiency. The level of competition, reflected in the mark-up ratio, influences dynamic efficiency through incentives to engage in innovation activities (Griffith and Harrison, 2004). However, from a theoretical point of view it is not unambiguously clear that lower economic rents positively affect dynamic efficiency. This is because a higher degree of competition reduces the gains from innovation. Early publications on endogenous growth and industrial organisation suggested that increased product market competition negatively influences innovation and thus TFP growth as more competition diminishes possible rents to be accrued by innovators. These results rest upon the assumption that only outsiders engage in innovation activities. Thus, in these models, rents prior to innovation are zero, and the total extra profit to be earned by innovation is equal to post-innovation rents. Therefore, incentives to innovate are positively correlated with rents. Under these assumptions, product market reforms that reduce rents decrease innovation and thus dynamic efficiency.

More recent endogenous growth models extend the basic Schumpeterian model by allowing not only outsiders but also incumbent firms to innovate. As insiders also innovate, pre-innovation rents are not zero, but positive. In this case, fostering competition may reduce pre-innovation rents by more than post-innovation rents. Thus, mark-up reducing reforms may have a positive influence on dynamic efficiency, i.e. raise TFP growth.

As these theoretical considerations have shown, the link between the degree of competition and dynamic efficiency may either be positive or negative. Thus, in this section the relationship between the mark-up ratios in the EUR 9 and TFP growth are investigated empirically.

The calculation of TFP growth was based on the growth accounting framework, assuming a Cobb-Douglas production function with constant returns to scale. TFP growth can be identified as that part of real GDP growth which is not explained by increases in the production factors., Labour, capital, and technical progress, i.e. TFP, have been taken into consideration as input factors. Capital input was approximated by the capital stock in the business sector, deflated by the GDP deflator. As already mentioned above, consistent OECD data on capital stocks are only available for the business sector, but not for the entire economy. For reasons of consistency, employment was approximated by the number of employees in the business sector only.

Total income is given by the sum of "compensation of employees" and "income from property and other", the latter approximating capital income. Thus, labour input was derived by multiplying the number of employees by the share of compensation of employees in total income, while capital input is given by the real capital stock, multiplied by the share of income from property and other in total income. The residual GDP growth not accounted for by labour and capital input, i.e. the Solow residual, can be identified as TFP growth.

The estimation was performed with fixed country effects and with the lagged endogenous variable.[40] Using random effects resulted in an insignificant coefficient of the mark-up. Random effects would only work without the lagged endogenous variable, but in this case there would be problems with serial correlations of the residuals. The results in the box below show that the influence of the mark-up ratio of prices over marginal cost on TFP growth is significantly negative. According to the estimates presented, and taking into account the average values of the mark-ups in the countries under consideration, a reduction of the mark-up in the euro area by around 10 percent (which, according to the estimates presented in section 6.2, is about the gap to the US level) would raise average TFP growth in the euro area by 0.57 percentage points (pp). Looking at the Member States, the effect ranges from 0.5 pp in Finland and the Netherlands to 0.75 pp in Italy.

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[40] As already mentioned in chapter 5, including a lagged endogenous variable in a fixed-effects model may result in biased and inconsistent estimates However this bias is small if the cross-section dimension is small in relation to the time dimension of the panel. This is clearly the case here

Dependent variable: TFP growth rate (GTFP)

Variable	Coefficient	t-statistic (absolute value)
GTFP$_{-1}$	0.240**	4.033
MARKUP	-3.448**	3.169

Fixed Effects

Austria	6.797	
Belgium	6.464	
Germany	6.230	
Spain	6.925	
Finland	7.583	
France	6.966	
Ireland	8.953	
Italy	9.006	
Netherlands	6.306	

Sample	1976 - 2004	Observations	257
R²	0.234	F-statistic	8.816
Durbin-Watson	1.897		

** denotes significance at the 1 percent level.

Employment

In addition to TFP, employment can be expected to be influenced by the degree of competition as captured by the mark-up ratio. Blanchard and Giavazzi (2001) consider a model with a product market which is characterised by monopolistic competition. The elasticity of demand is assumed to depend negatively on the degree of product market regulation. This negative relationship can be explained by the notion that demand elasticity is an increasing function of the number of firms. The latter in turn depends negatively on the cost of entry. Thus, removing barriers to entry increases the number of firms, which raises the elasticity of demand and thus lowers the level of rents in the economy. In this context, firms choose labour to maximise the present discounted value of future cash flow. Changing employment causes adjustment costs. The authors assume that these adjustment costs can be affected by product market regulation. The model generates predictions about the relationship between product market regulation, the mark-up (or the level of rents) and the level of employment. Deregulation, by reducing the mark-up, leads to a higher demand for labour.

Another reason for a negative relationship between the mark-up and employment is that economies of scale should disappear as a result of emerging new technologies (Coppens and Vivet, 2004). If sunk costs are low and entry and exit barriers are reduced, the number of firms increases, entailing a positive impact on job creation. Employment is also supported by

the fact that lower profit margins are accompanied by lower real wage claims and thus by reduced structural unemployment. More competition in product markets tends to lead to lower wage mark-ups. Thus, the price mark-up and the wage mark-up are generally positively related, and reforms diminishing the former also lead to declines of the latter.

For the panel of nine euro area countries, the following box shows that employment is indeed negatively influenced by the mark-up.[41] The low Durbin Watson statistic in combination with the high coefficient of determination points to some problems with the regression. However, using the growth rate instead of the level of employment or including the lagged dependent variable resulted in an insignificant coefficient of the mark-up. The regression has been performed with fixed country effects. A random effects estimation leads to almost exactly the same results. Based on the Hausman test, the specification with fixed effects was preferred. Bringing the mark-up in the countries of the euro area to US levels would raise employment in the euro area by about 2.7 percent. In the first quarter 2005, about 137.2 million people in the euro area were in paid employment. The simulated cut of the mark-up by 10 percent could therefore raise employment to about 141 million.

Dependent variable: logarithm of employment ln (emp)			
Variable	**Coefficient**	**t-statistic (absolute value)**	
ln (MARKUP)	-0.251**	2.853	
Fixed Effects			
Austria	15.260		
Belgium	15.272		
Germany	17.377		
Spain	16.492		
Finland	14.722		
France	17.023		
Ireland	14.199		
Italy	17.000		
Netherlands	15.794		
Sample	1976 - 2004	Observations	259
R²	0.991	F-statistic	3019.5
Durbin-Watson	0.067		
** denotes significance at the 1 percent level.			

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[41] Here, the logarithm has been used in order to take the different orders of magnitude of the variables into account.

Unemployment rate

An increase in employment brought about by enhanced competition and thus a decrease in the mark-up of prices over cost would also reduce unemployment. But the decline of unemployment is not symmetric to the increase in employment. When employment rises, more people engage in actively seeking employment as they see improving opportunities on the labour market. Therefore, the decline in unemployment is typically less pronounced than the increase in employment. Thus, a separate panel estimation has been performed for the relationship between the unemployment rate and the mark-up. Again, the model includes fixed country effects. A random effects estimation produced almost the same results; the Hausman test suggests that the fixed effects model is superior. The low Durbin Watson statistic points to problems with serial correlation. However, this phenomenon cannot be alleviated by including the lagged unemployment rate. Furthermore, in the latter case the mark-up becomes insignificant.

Taking the estimation results shown below into account, cutting the mark-up in the euro area by 10 percent would result in a decline in the average unemployment rate by about 0.5 percentage points. Among the member countries, the effect ranges from 0.4 percentage points in Finland to 0.65 percentage points in Italy.

In the first eight months of 2005, the average euro area unemployment rate amounted to 8.8 percent. According to the estimation results, a cut of the mark-up by 10 percent could thus reduce the unemployment rate to about 8.3 percent.

Dependent variable: unemployment rate (UR)

Variable	Coefficient	t-statistic (absolute value)
MARKUP	3.306*	2.214

Fixed Effects

Austria	-1.393
Belgium	3.607
Germany	1.755
Spain	8.154
Finland	3.817
France	4.020
Ireland	5.491
Italy	2.767
Netherlands	1.444

Sample	1975 - 2004	Observations	266
R²	0.493	F-statistic	29.615
Durbin-Watson	0.154		

*denotes significance at the 5 percent level.

Labour productivity growth

Besides total factor productivity and employment, labour productivity is an important macroeconomic indicator. If real wages increase in line with labour productivity growth, unit labour costs remain constant. Thus, rising labour productivity growth widens the scope for wage increases. According to IMF estimates, labour productivity growth in the euro area lags considerably behind the US (Estevao, 2004). Between 1995 and 2003, output per employee expanded by 1.2 percent per annum in the euro area and by 2.1 percent annually in the US. In addition, while in the US labour productivity growth accelerated in the second half of the 1990s, in the euro area it declined considerably.

Lack of competition in the goods and labour markets, leading to higher mark-ups of prices over cost may be a reason for the less favourable productivity performance in the euro area as compared to the United States. Griffith and Harrison (2004) find a *positive* relationship between the mark-up and the *level* of labour productivity, but a *negative* influence on the *growth rate* .The authors explain the positive influence of economic rents on the productivity *level* by recourse to the job creation effect of lower mark-ups. If new workers entering the workforce are less productive than incumbents, then the overall productivity *level* declines. The same effect can be observed if new jobs are created in less productive sectors. This notion seems realistic because the more productive workers and firms have already been in place at

higher mark-up levels. However, the link between economic rents and the *growth rate* of labour productivity may still be negative. If the productivity of newly created jobs is lower than that of existing jobs, then a rise in employment as a result of lower mark-ups will be associated with a reduction in labour productivity *growth*, but only while employment is growing. Once employment has reached its new - higher - level, the *growth rate* of labour productivity may rise again, even though the level of labour productivity may remain lower for some time.

The following section investigates the influence of the mark-up on the *growth rate* of labour productivity. The latter is defined as real GDP per employee. For the estimation, the cyclicality of labour productivity growth has been removed by taking the growth rate of trend rather than actual labour productivity. The trend has been determined by applying the Hodrick-Prescott filter. The following box shows the estimation results. Based on the Hausman test, the estimation was performed with fixed country effects. As in the employment equation, the low Durbin Watson statistic cannot be improved upon by including the lagged dependent variable. In addition, the latter results in an insignificant mark-up ratio.

Dependent variable: trend labour productivity growth rate (GTRENDPROD)			
Variable	**Coefficient**	**t-statistic (absolute value)**	
MARKUP	-1.015**	3.041	
Fixed Effects			
Austria	3.515		
Belgium	3.307		
Germany	2.479		
Spain	3.211		
Finland	3.698		
France	3.116		
Ireland	5.025		
Italy	3.685		
Netherlands	2.466		
Sample	1976 - 2004	Observations	259
R^2	0.547	F-statistic	35.556
Durbin-Watson	0.039		
** denotes significance at the 1 percent level.			

As can be seen, the negative influence of the mark-up on the development of trend labour productivity is highly significant. According to the above results of the panel estimation, a reduction of the mark-up in the euro area by 10 percent would raise the growth rate of trend

labour productivity by 0.15 percentage points (pp). The effect would lie in the range of 0.13 pp in the Netherlands to 0.2 pp in Italy.

6.4   The influence of regulation on the mark-up

After having analysed the influence of the mark-up on the macroeconomic performance, this section looks at the link between institutions and the mark-up ratios. The institutional framework is an important determinant of the degree of competition. The latter in turn determines the scope for setting prices significantly above marginal cost and thus exploiting economic rents. According to previous studies, institutional reforms could lead to mark-up reductions in the European Union of between 0.5 and 0.9 percentage points (European Commission, 2004).

Labour market institutions used in the subsequent regression comprise the unemployment benefit replacement rate (BRR), the benefit duration index (BD), and an index measuring the degree of wage bargaining coordination (CO). The benefit replacement rate is defined as the unemployment benefit in the first year as a percentage of average earnings before tax. The benefit duration index is a weighted average of the ratio between the unemployment benefit in the second and first years and the ratio between the unemployment benefit in the fourth and first years. The wage bargaining coordination index lies in the range of 1 to 3, increasing in the degree of coordination in the wage bargaining process on the employers' as well as on the unions' side. Details on the definition and construction of these indicators can be found in Nickell and Nunziata (2001) and in Nickell (2003).

A highly regulated labour market allows employers' and employees' associations to share economic rents. Labour market regulations protecting workers or providing generous benefits to unemployed persons tend to increase the reservation wage, thus leading to higher wage claims. As a result, wages tend to be higher and employment would be lower than under more intensive competition; the deviation of prices from marginal cost widens (Nunziata, 2001). In a more competitive environment, the scope for such behaviour would be smaller. Thus, both the benefit duration index and the benefit replacement rate should positively influence the mark-up. In contrast, a higher degree of wage bargaining coordination would allow account to be taken of economy-wide developments in the wage negotiations. Thus, a higher degree of coordination would reduce the wage pressure and thus the mark-up (see, e.g., Nunuziata, 2001). On the other hand, not only a high but also a low level of wage bargaining

coordination may lead to wage restraint as in this case firm-specific developments can be taken into account. Thus, both a highly centralised and a largely decentralised wage bargaining process seem to dominate the intermediate case, where the advantages of both systems cannot be fully exploited and wages tend to be too high (Calmfors and Driffill, 1988). In addition to labour market institutions, an index measuring the openness to international trade (TRADE) has been included in the estimation. This index was taken from the Fraser Institute database (Gwartney and Lawson, 2004). Including this indicator is based on the notion that a high degree of actual or potential international competition reduces the scope for companies to set prices above marginal cost, and therefore a negative influence on the mark-up is to be expected.

Other labour market indicators that are published by Nickell and Nunziata (2001), such as union density, an indicator measuring the degree of employment protection, or the tax wedge on labour income, proved to be insignificant or had an economically implausible sign.

The following box shows the estimation results. The regression was run with fixed country effects. If random effects were used, the benefit duration and the trade variables become insignificant. Including the lagged mark-up also resulted in insignificant coefficients. As was to be expected, both higher benefit replacement rates and longer unemployment benefit durations lead to larger mark-up ratios. On the other hand, more openness to international trade and thus international competition reduces the mark-up. The respective coefficient is almost significant at the 1 percent level. In addition, a higher degree of coordination in the wage bargaining process negatively influences the mark-up. The hump shaped hypothesis, i.e. the notion that both lower and higher degrees of wage bargaining coordination are superior to an intermediate solution could not be confirmed.

Dependent variable: mark-up		
Variable	**Coefficient**	**t-statistic (absolute value)**
BRR	0.486**	5.085
BD	0.376**	3.209
CO	-0.084**	2.965
TRADE	-0.047*	2.397
Fixed Effects		
Austria	1.521	
Belgium	1.562	
Germany	1.605	
Spain	1.719	
Finland	1.435	
France	1.486	
Ireland	1.855	
Italy	2.277	
Netherlands	1.360	
Sample	1976 - 1999	Observations 214
R^2	0.688	F-statistic 40.110
Durbin-Watson	0.416	
*, ** denotes significance at the 5, 1 percent level.		

In 1999, the last year for which data on labour market institutions is available in Nickell (2003), the benefit replacement rate BRR in the nine euro area countries considered in the estimation amounted to 0.52 on average. This value compares to 0.29 in the United States and just 0.17 in the United Kingdom. Thus, not only compared to the US, but also to the UK, unemployment benefits are more generous in the euro area. Simulations show that a reduction of the benefit replacement rate in the euro area by 25 percent would result in a decline of the mark-up ratio by 4.3 percent on average. In 1999, the average value of the benefit duration index BD took the value 0.56 in the euro area, compared to 0.22 in the US. A 25 percent reduction in the benefit duration variable would lead to a decline of the average euro area mark-up by 3.7 percent. Both the wage bargaining coordination and the openness to international trade are already comparatively high in the euro area.

As an alternative to using detailed variables measuring the labour market regulation, an overall index could be applied. Such a summary index is contained in the database of the Fraser Institute. This indicator (LREG) takes values between 1 and 10, rising with the degree of economic freedom, i.e. the index decreases with increasing labour market regulation. It consists of the following five sub-indices (Gwartney and Lawson, 2004):

i. Impact of minimum wage: the minimum wage, set by law, has little impact on wages because it is too low or not obeyed.

ii. Hiring and firing practices: hiring and firing practices of companies are determined by private contract.

iii. Share of labour force whose wages are set by centralised collective bargaining.

iv. Unemployment benefits: the unemployment benefits system preserves the incentive to work.

v. Use of conscripts to obtain military personnel.

In the nine euro area countries under consideration, the index had an average value of 4.3 in 2002, compared to 7.3 in the US. Thus, labour markets in the euro area are more regulated than in the United States. In the UK, the indicator amounts to 6.7. Thus, the UK labour market is more flexible than the labour markets in the euro area countries, but it is significantly more regulated than its US counterpart. Although over time the indicator has risen in the euro area countries, in the UK and in the US it increased to a larger extent. In the latter two countries, the share of the labour force whose wages are set by centralised wage bargaining has declined, and the unemployment benefit system has become less generous. As a result of the former development, economic conditions of the individual companies can better be taken into account, while the latter effect reduces the reservation wage. Both effects reduce the scope for workers to exploit economic rents, thus decrease wage pressure.

Using this summary labour market regulation indicator instead of the more detailed variables taken in the previous regression resulted in significant coefficients with the economically correct sign only if country-specific time trends were included.[42] Other variables on product and factor market regulation that are also published by the Fraser Institute, such as the openness to international trade, ease of starting a new business, overall business regulation, size of government or the overall freedom of the world index are either available for too short a time span or resulted in coefficients that were insignificant or had an economically implausible sign.

The following box shows the estimation results. Again, the low Durbin Watson statistic points to problems with serial correlation. However, including the lagged dependent variable cannot alleviate this problem. If the lagged mark-up but not the time trends are included, the labour

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[42] All other estimations discussed in this chapter have been performed without country-specific time trends.

market regulation variable becomes insignificant. Overall, the estimation results show that the above specification with more detailed labour market regulation indicators is superior.

Dependent variable: mark-up		
Variable	**Coefficient**	**t-statistic (absolute value)**
LREG	-0.069**	3.587
Country-specific time trends		
Austria	-0.007**	3.624
Belgium	0.017**	7.079
Germany	-0.006**	3.097
Spain	-0.005*	2.154
Finland	-0.006**	2.656
France	-0.001	0.420
Ireland	-0.014**	5.841
Italy	0.022**	10.390
Netherlands	0.008**	2993
Fixed Effects		
Austria	1.950	
Belgium	1.275	
Germany	1.842	
Spain	1.727	
Finland	1.802	
France	1.681	
Ireland	2.494	
Italy	1.511	
Netherlands	1.306	
Sample	1975 - 2002	Observations 248
R²	0.809	F-statistic 59.167
Durbin-Watson	0.583	
*, ** denotes significance at the 5, 1 percent level.		

Taking, nevertheless, these estimation results into account, decreasing the labour market regulation in the nine euro area countries considered in the panel estimation to the US level would result in a decline in the average euro area mark-up by about 14 percent or 0.2 percentage points. Among the Member States the reduction ranges from 7 percent (0.11 percentage points) in Ireland to about 24 percent (0.33 percentage points) in Germany.

6.5 Summary of effects of structural reforms

This section summarises the results of the preceding panel analyses. Here, the effects of structural reforms on the macroeconomic performance are shown for the aggregate euro area. In the next chapter, the issue of international spillover between the euro area countries will be addressed by means of simulations of a multi-country model. The following table shows the effects of labour market deregulation on the mark-up.

Table 6: Effects of deregulation on the mark-up

	Reduction of benefit replacement rate by 25 percent	*Reduction of benefit duration index by 25 percent*
Mark-up	4.3 percent decline	3.7 percent decline

According to these results, making the unemployment benefit system in the euro area less generous could be expected to result in a decline of the average euro area mark-up ratio by around 4 percent.

 The following table summarises the influence of the mark-up on the macroeconomic performance. In particular, the effects of a 10 percent cut in the average euro area mark-up on TFP growth, labour productivity growth, employment, and unemployment are shown.

Table 7: Macroeconomic effects of a 10 percent cut in the euro area mark-up

Indicator	*Effect*
TFP growth rate	0.57 percentage points increase
Labour productivity growth rate	0.15 percentage points increase
Employment	2.7 percent increase
Unemployment rate	0.5 percentage points decline

As the table shows, a 10 percent reduction of the euro area mark-up, bringing prices closer to marginal cost, would boost total factor productivity growth by 0.57 percentage points. Labour productivity growth would increase by 0.15 percentage points. In addition, a positive employment effect can be expected: employment would rise by 2.7 percent, and the unemployment rate would be half a percentage point lower.

The issue of the way in which the macroeconomic performance and fiscal policies in the other euro area countries would be affected if only one euro area Member State implemented structural reforms will be one of the subjects to be discussed in the next chapter. There, the main results of the present chapter will be taken as inputs for simulations with the dynamic, intertemporal, general-equilibrium multi-region model MSG3. It will be assumed that either all euro area countries or only one euro area country at a time implements structural reforms

in such a way that the mark-up is reduced by 10 percent and thus TFP growth is raised. These simulations will be combined with the effects of fiscal discipline, i.e. a combination of structural reforms and budgetary consolidation.

The model simulations in the next chapter will focus on *TFP shocks* as results of structural reforms, as these supply side measures will induce general macroeconomic effects. According to the estimations in this chapter, cutting the *level* of the mark-up (a one-time though once-and-for-all change) has a positive effect on total factor productivity *growth*. The latter may mean a one-time effect on the growth of total factor productivity (TFP) or a permanent increase in the growth rate, which would imply cumulative increases of TFP forever. As we consider the assumption of an ever-increasing TFP *growth rate* as far too optimistic (as were some of the estimates of the European Single Market at the time of the Cecchini Report), it seems more realistic to assume that TFP will gradually increase to a *level* higher by 0.57 percent (for the euro area as a whole).

7 Macroeconomic and welfare effects of structural and budgetary policies: spillover in the MSG3 model

In this chapter, we aim at analysing and evaluating the macroeconomic effects of structural policy measures and of policies of budgetary consolidation. For the former, we build upon the results obtained in chapter 6 regarding the spillover from economic reforms that close the efficiency gap between the euro area and the US. For the latter, we start from the fact that at present, several euro area (and other EU) countries have difficulties in fulfilling the deficit and debt criteria of the Stability and Growth Pact and try to consolidate their budgets. In chapters 3 and 4, we have provided empirical estimates of the spillover from budgetary policies that increase the surplus of the public budget, and Appendix 4 gives the corresponding results for the MSG3 Model. These will be used to run simulations with the MSG3 Model (see Appendix 3 for more information on this model) that come close to what we consider as feasible policies. First, we consider structural and budgetary policies separately, and then we combine both of them. Both isolated (non-coordinated) policy actions of one country only and coordinated (joint) euro area policies will be investigated. Given the results of Appendix 4, we will concentrate on isolated policies by Germany and Italy only; effects for France are between these two, and spillover effects for a small economy (like Austria) are negligible. In order to arrive at policy recommendations, we will also provide some tentative welfare calculations comparing different scenarios.

7.1 Effects of structural policies

One of the main results of chapter 6 was an estimate of the effects of deregulation policies in the euro area on the mark-up in the euro area, which amounted to somewhere between 6 and 14 percent decline. Taking the mean of a 10 percent decline of the mark-up in the euro area, the effect of this on the total factor productivity growth rate was estimated as an increase by 0.57 percentage points, with some variation between the different countries (Germany 0.57, France 0.54, Italy 0.75, Austria 0.54 percentage points). We will use these estimates in the following as inputs into the MSG3 Model. Total factor productivity is an exogenous variable in this model that can easily be shocked. The other variables possibly affected by the deregulation reforms (labour productivity, employment, unemployment) are mostly endogenous variables that will be changed through the channels of the model by changes of total factor productivity. Estimates of the effects on these variables resulting from the MSG3 Model need not coincide with those from the econometric estimations obtained in chapter 6 because the effects in the MSG3 Model incorporate all kinds of feedbacks from other national

variables and from international spillover effects. Indeed, as we shall see, the effects vary within the MSG3 simulations depending on the assumptions made about the implementation of the structural policies under consideration.

Another problem arises from the fact that the econometric estimations of chapter 6 indicate an effect of cutting the *level* of the mark-up (a one-time though once-for-all change) on total factor productivity *growth*. The latter may mean a one-time effect on the growth of total factor productivity (TFP) or a permanent increase in the growth rate, which would imply cumulative increases of TFP forever. We consider the latter interpretation as by far too optimistic. To be on the safe side, it seems more realistic to assume that TFP will gradually increase over a period of 5 years to a level higher by 0.57 percent (for the euro area as a whole; the values for the individual countries are given above) than the baseline and grow from this higher level with the baseline growth rate later on. These simulations amount to an increase of TFP by 0.11 percent in the first period, by 0.23 percent in the second, by 0.34 percent in the third, by 0.46 percent in the fourth and by 0.57 percent in the fifth and all following periods as compared to the baseline solution (numbers for the euro area; numbers for individual countries differ slightly in accordance with the different long-run values given above). Alternatives like continued TFP growth by an additional 0.114 percentage points (the mean additional growth over the first five periods) for each period to follow forever or an additional growth rate of 0.57 percentage points forever were tried to be simulated, too, but we arrived at completely unrealistic effects in an unstable model solution, hence these attempts were discarded. Results from an unstable solution of the model (because the model is formulated in level terms) are not reliable, and it is highly questionable that one-time (though permanently upheld) structural reforms will result not only in ever-lasting but even in ever-increasing gains to the economies affected. Even if this were true, it is not clear whether we can rely on the results from a local linearisation solution procedure under such a severe structural change, quite apart from the Lucas critique counter-argument. For these reasons, we consider results from a TFP shift scenario as described above as much more reliable estimates of the macroeconomic effects of structural policy reforms. For all simulations in this section, we assume the policy rule of monetary targeting for euro area monetary policy. The reason for this is similar to the arguments given in Appendix 4 and will be argued in more detail in Section 7.4. The following diagrams give again the values of selected endogenous variables resulting from the simulations. Responses are shown for two countries, namely Germany and Italy, assuming that only one of these countries implements the deregulation policy leading to

the TFP growth according to the estimates, with the other euro area countries going on with "business as usual" (no economic reforms). Effects in the other countries are purely international spillover effects. These simulations can be regarded as non-coordinated structural policies. On the other hand, we also show the effects of a coordinated euro area economic reform, assuming that all euro area countries implement the policies leading to the lower mark-up and the higher TFP. The values for other variables as well as results for other countries and regions of the model are available on request. In the following, we show the time paths of a few key variables originating from each shock. All numbers are deviations from the baseline values of the MSG3 Model. In each case, we present (row-wise) the variables real GDP, current account, budget deficit (general government), public debt (general government), labour (employment), rate of inflation, short-term and long-term nominal rates of interest. Countries are denoted by the following symbols: Germany – square, France – triangle, Italy – asterisk, Austria – circle.

Figure 19: TFP shift, Germany
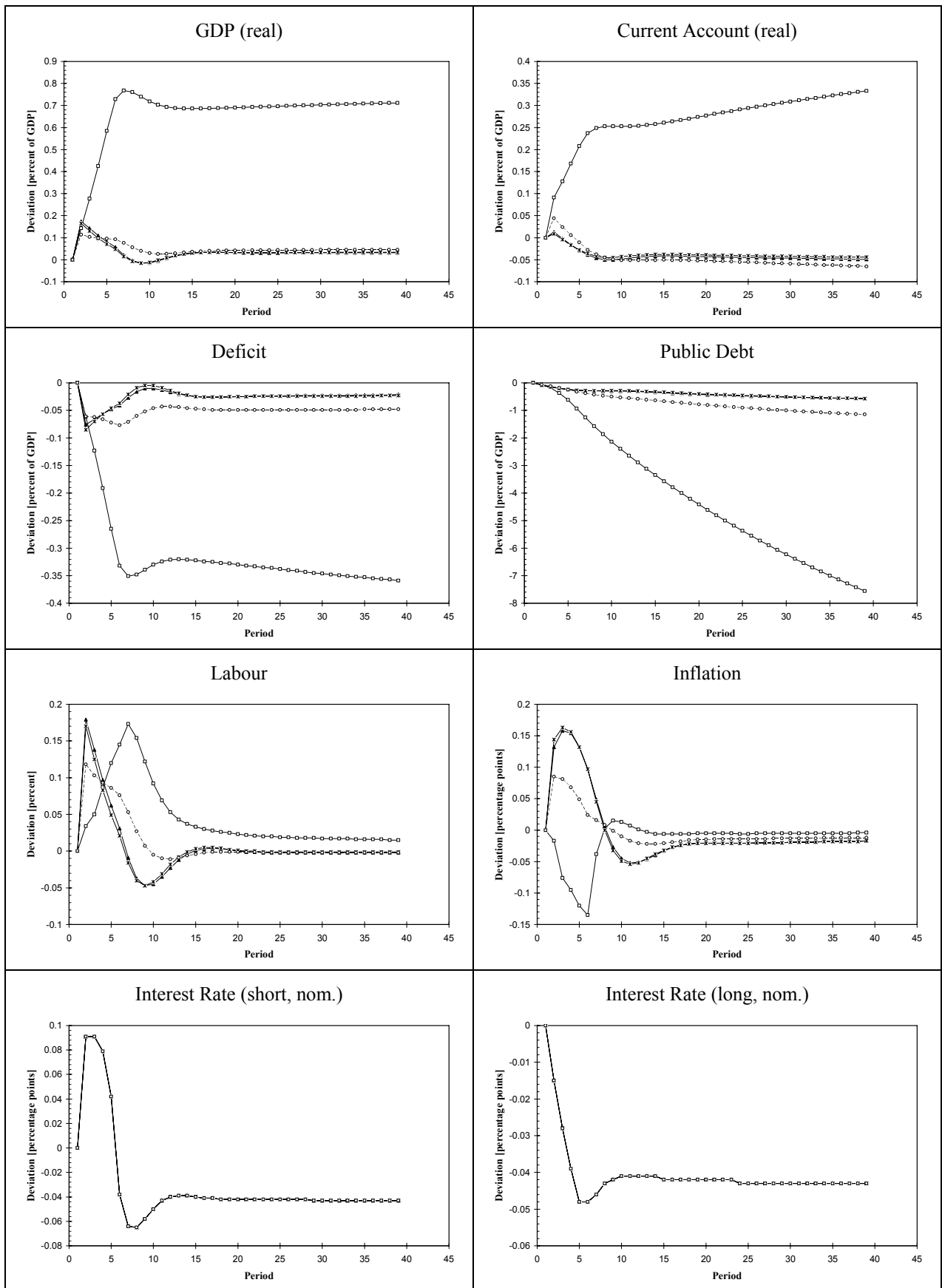
Figure 20: TFP shift, Italy

GDP (real)

Current Account (real)

Deficit

Public Debt

Labour

Inflation

Interest Rate (short, nom.)

Interest Rate (long, nom.)
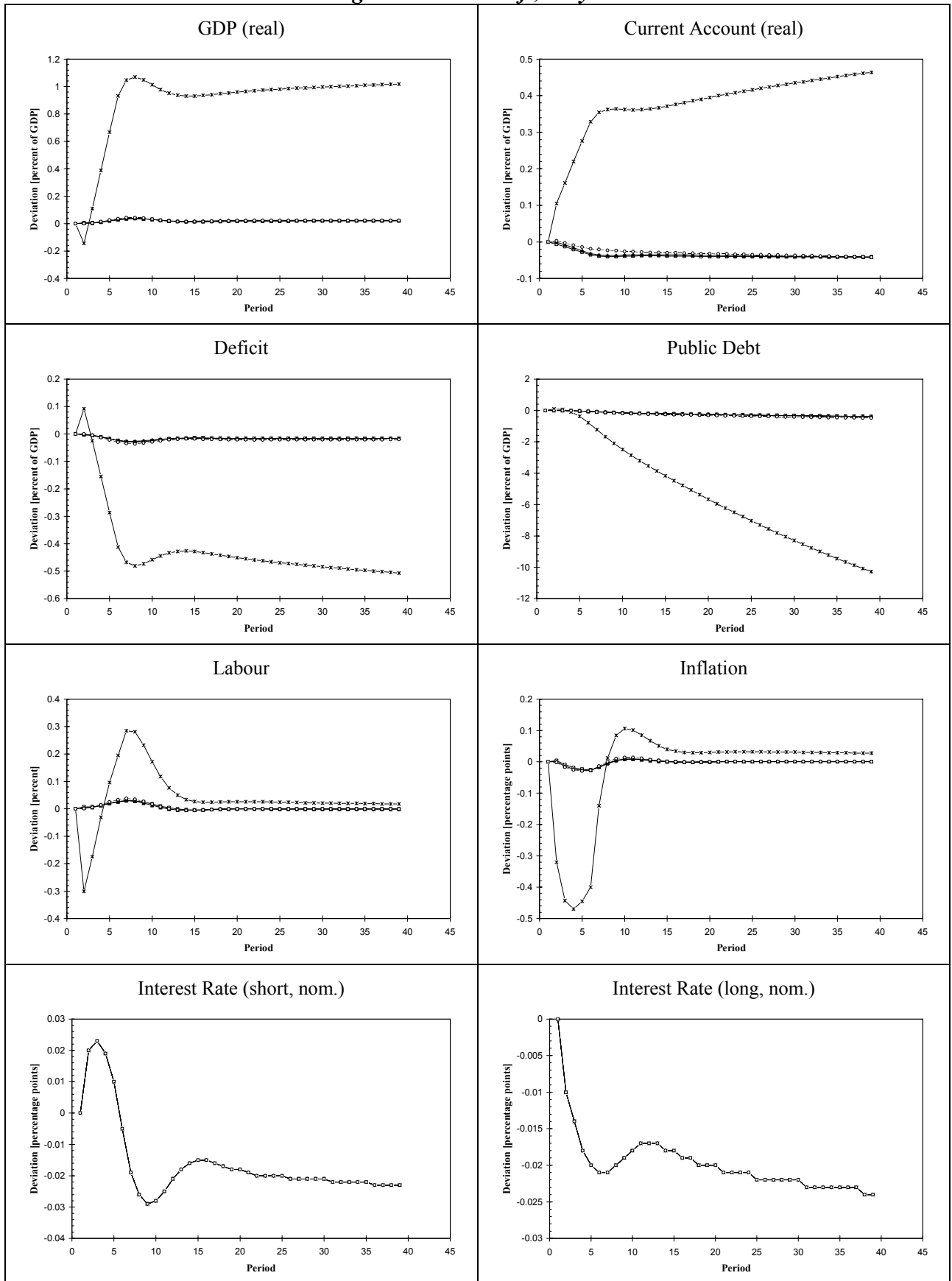
Figure 21: TFP shift, euro area (coordinated policy)
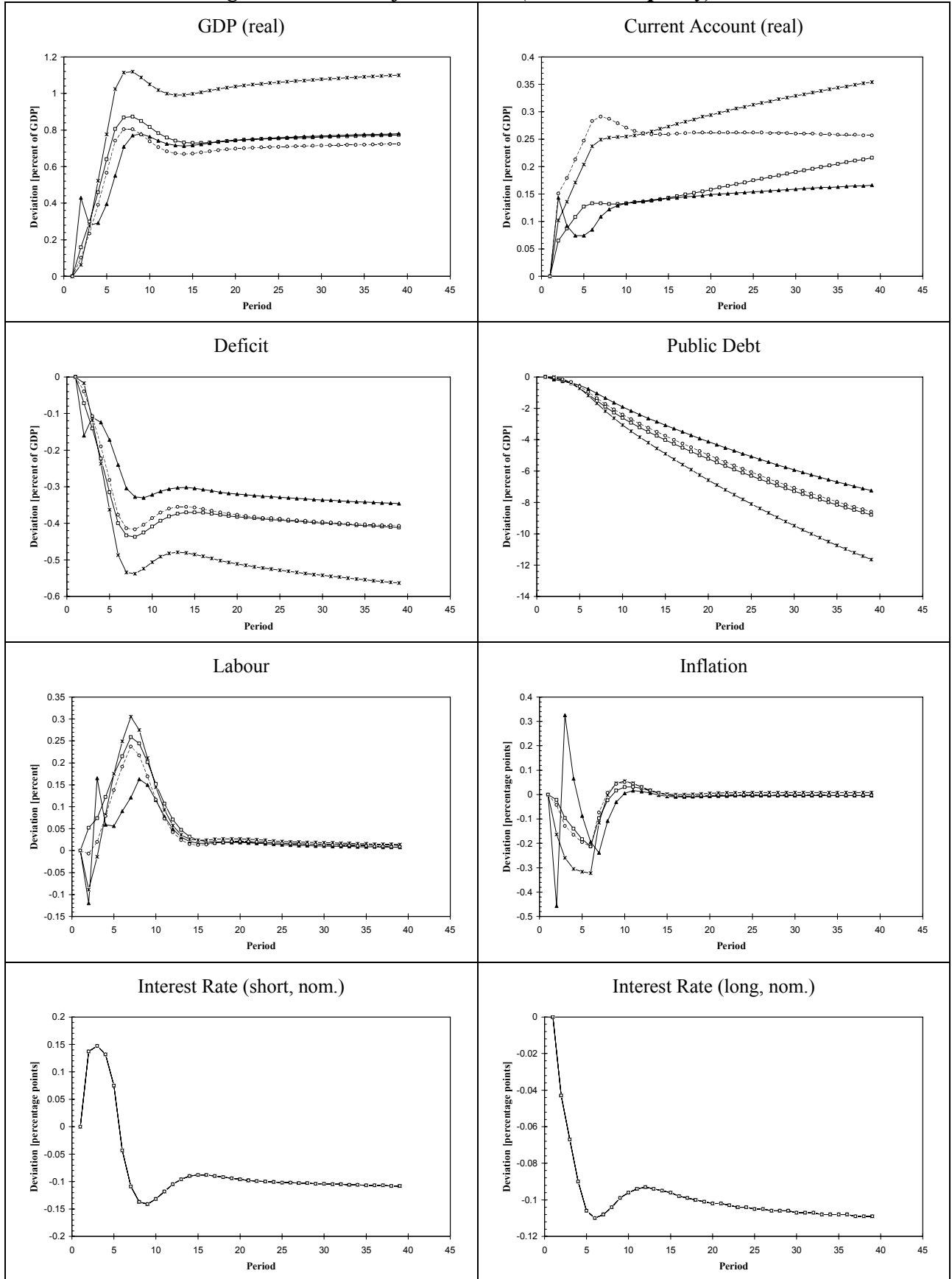
The results of these simulations can be summarised as follows: Under the TFP shock to a single country, real GDP of the country directly affected rises over 6 years and stays then at the higher level forever. Effects are stronger for Italy (GDP above baseline by 1 percent of baseline GDP) than for Germany (GDP above baseline by 0.7 percent). The current account improves permanently, the public-sector deficit remains below baseline values, causing public debt to fall indefinitely (in Italy, it is lower than baseline by 10 percent of baseline GDP after 40 years, in Germany by 8 percent). Employment rises slightly (with a minimal permanent effect), inflation falls temporarily. Euro area countries not directly affected exhibit only temporary positive spillover effects to GDP, small permanent negative ones to the current account and positive ones to the public deficit and public debt. Interest rates rise in the short run and fall below baseline in the long run. Spillover effects are stronger for Germany than for Italy due to the size of the economy affected directly. The shock to the entire euro area brings about positive effects for all euro area countries. Interestingly, also the effects on Germany and Italy are stronger than in the case where only one of these countries is affected. Hence, there are positive spillover effects from a coordinated structural policy in the euro area. For example, GDP remains at higher levels in Germany and Italy than in the case of isolated structural reforms, and the rates of interest remain below baseline by 0.1 percentage points, causing public deficits to improve more and public debt to fall by 6 to 12 percent of baseline GDP after 40 years. These effects are due to positive spillover from the respective other countries (including the rest of the euro area). For example, if labour market regulations or price distortions due to imperfect competition are reduced in, say, the Netherlands, this will support similar measures in Germany by increasing competition also in this country as Dutch products compete with German ones, inducing further positive supply effects. Hence, there are truly international feedback effects in addition to direct effects from structural policy changes.

These results allow a fairly positive evaluation of the effects of structural policies on the euro area economies. Output will rise to levels permanently above those that would occur without these reforms, the public deficit will be lower without additional budgetary policy measures, allowing public debt to decrease over a long time horizon. Spillover effects are not too strong, but there is some gain from coordinated policies that implement the structural reforms in all euro area countries as compared to scenarios where these policies are implemented in one or some countries only. A cautious estimate of a coordinated euro area structural reform scenario implies a level of GDP that is permanently higher by 1 percent than without these reforms,

virtually without negative effects on other politically relevant variables and with considerable positive effects on public finances (permanently lower budget deficit, hence cumulatively lower public debt).

7.2 Budgetary consolidation policies

In this section, we analyse some possibilities of policies for budgetary consolidation and their macroeconomic effects, using the MSG3 Model. It is well known that several euro area countries have difficulties in meeting the public deficit (3 percent of GDP) and debt (60 percent of GDP) criteria of the Stability and Growth Pact and the requirement to obtain a balanced budget or even a budgetary surplus over the business cycle and have therefore to consolidate their budgets. On the other hand, Keynesian macroeconomic theory predicts that reducing government expenditures or raising taxes in a not fully employed economy will increase unemployment and reduce economic growth; hence there may be undesirable side-effects of budgetary consolidation policies. Here we consider two instruments to reduce the public-sector deficit (and, by this, public-sector debt): decreases of public consumption and increases of lump-sum taxes (or, equivalently, decreases of lump-sum transfers). The use of lump-sum taxes is the easiest way to model a tax change within the MSG3 Model as this is a purely exogenous variable in the MSG3 Model. Simulating such a change shows the endogenous reactions of other variables that may, in reality, also be influenced by political actions, such as income or consumption taxes or taxes on particular goods (energy taxes can be changed in the MSG3 Model). A more elaborate and realistic analysis would simulate changes of these taxes, too, which would involve re-calibrating the model for each simulation as for these simulations, parameters (tax rates) instead of exogenous variables would have to be changed. Lack of time and space prevents such an analysis here; it should be borne in mind that raising (reducing) lump-sum instead of distortionary taxes underestimates welfare losses (gains).

As can be seen in Appendix 4, reducing public investment is not to be recommended as a means of reducing public deficits and debt and is therefore not taken into account here (although it is often used in actual political processes because it can be relatively easily changed). In addition to the two instruments mentioned, we also consider a third strategy that aims at diminishing the size of the public sector by reducing both public consumption and (lump-sum) taxes. In order to fulfil the aim of consolidating the budget, in this case public consumption has to be decreased more than taxes, of course.

As for other policies, the time pattern of the policy actions will determine the outcome in terms of macroeconomic target variables to a large extent. In principle, it is possible to reduce public expenditures (or raise taxes) by some amount or relative to GDP over a long period in

order to bring public debt down to low values. Such a policy experiment (aiming at diminishing the size of the public sector) is analysed in Haber et al. (forthcoming 2006) with unexpectedly strong long-run non-Keynesian effects. However, it may be more realistic to consider a shorter time horizon for budgetary consolidation. Here we consider a policy change over 12 years, which may be regarded as corresponding approximately to the length of a full business cycle or a sequence of three election periods. During the first four years, the budget deficit is gradually diminished. Then it is kept at lower values for another four years. Finally, during the last four years, the budget deficit is gradually brought back to the baseline values. This policy assumption amounts to a temporary budgetary adjustment. As the baseline solution is a stable adjustment path towards a steady state of the model, it results also in a permanent fiscal consolidation at a lower level of the debt-to-GDP ratio, which seems to depict an already ambitious but nevertheless not completely unrealistic program of a government or an agreement of governments aiming at reversing the growth trend of public debt that dominated most European countries' public finances since the first oil price shock in the 1970s.

In particular, for the first two simulations conducted with the MSG3 Model, we assumed public consumption to decline, and lump-sum taxes to rise, respectively, by 0.5, 1, 1.5, 2, 2, 2, 2, 2, 2, 1.5, 1 and 0.5 percent of baseline GDP during the 12 years of the budget consolidation episode. Afterwards, these variables stay at their baseline values forever. For the third simulation (simultaneous decrease of expenditures and taxes), we assumed reductions of the two variables in proportion 3:1, i.e., public consumption was decreased by 0.75, 1.5, 2.25, 3, 3, 3, 3, 3, 3, 2.25, 1.5 and 0.75 percent of baseline GDP, with lump-sum taxes declining at the same time by 0.25, 0.5, 0.75, 1, 1, 1, 1, 1, 1, 0.75, 0.5 and 0.25 percent of baseline GDP during the 12-years budget consolidation period. The three policy experiments are comparable as all of them intend to reduce the budget deficit by about 2 percent of GDP over six years, with a gradual phasing-in and phasing-out. Obviously, a lot of other time profiles are conceivable, but for the purpose of evaluating the three strategies and their macroeconomic consequences, we confine ourselves to these scenarios.

As in section 7.1, isolated (non-coordinated) policy actions of one country only and coordinated euro area policies will be investigated. Again, we concentrate on isolated policies by Germany and Italy only. Moreover, we assume again the policy rule of monetary targeting for euro area monetary policy for similar reasons as before. The following diagrams show the

values of the same endogenous variables resulting from the three types of simulations as in section 7.1. Responses are shown for Germany and Italy, assuming that only one of these countries implements the budgetary consolidation policy, with the other euro area countries going on with "business as usual" (no change of budgetary policies). Effects in the other countries are hence again purely international spillover effects. These simulations are interpreted as budgetary policies without coordination. On the other hand, we also show the effects of a coordinated euro area budgetary consolidation, assuming that all euro area countries implement the same budgetary policy strategies. As before, countries are denoted by the following symbols: Germany – square, France – triangle, Italy – asterisk, Austria – circle.

Figure 22: Budget consolidation, public consumption decrease, Germany
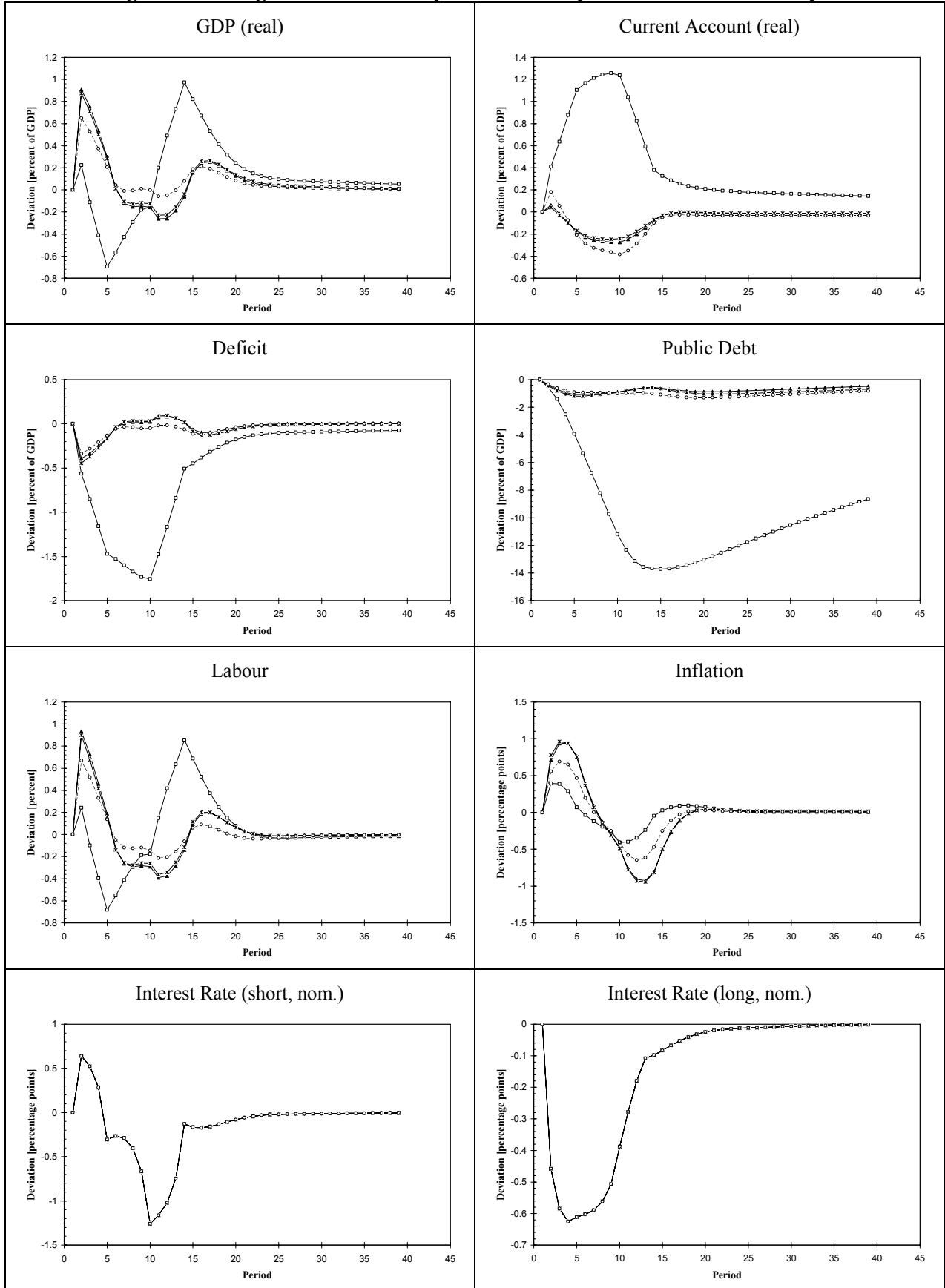
Figure 23: Budget consolidation, public consumption decrease, Italy
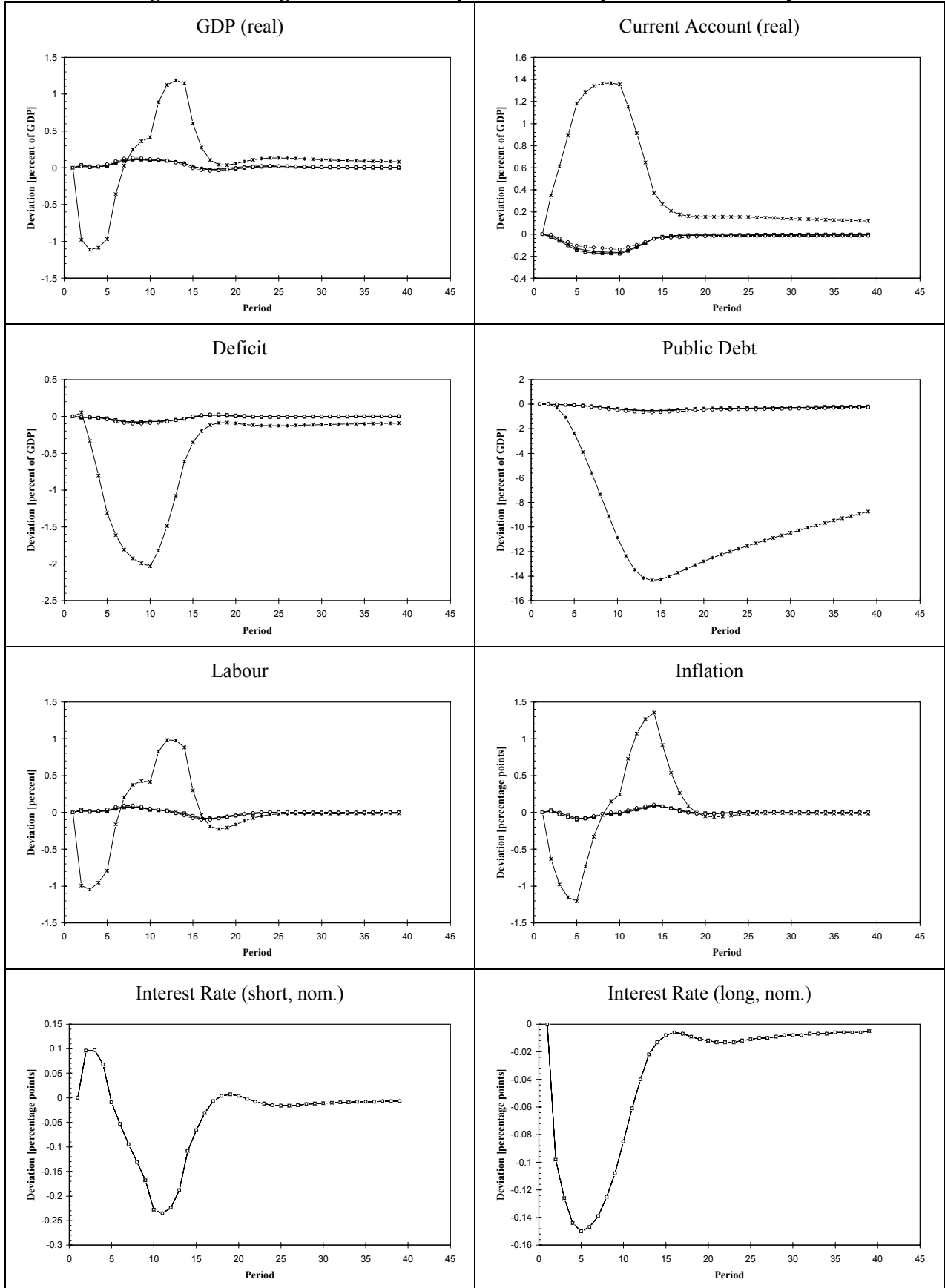
Figure 24: Budget consolidation, public consumption decrease, euro area
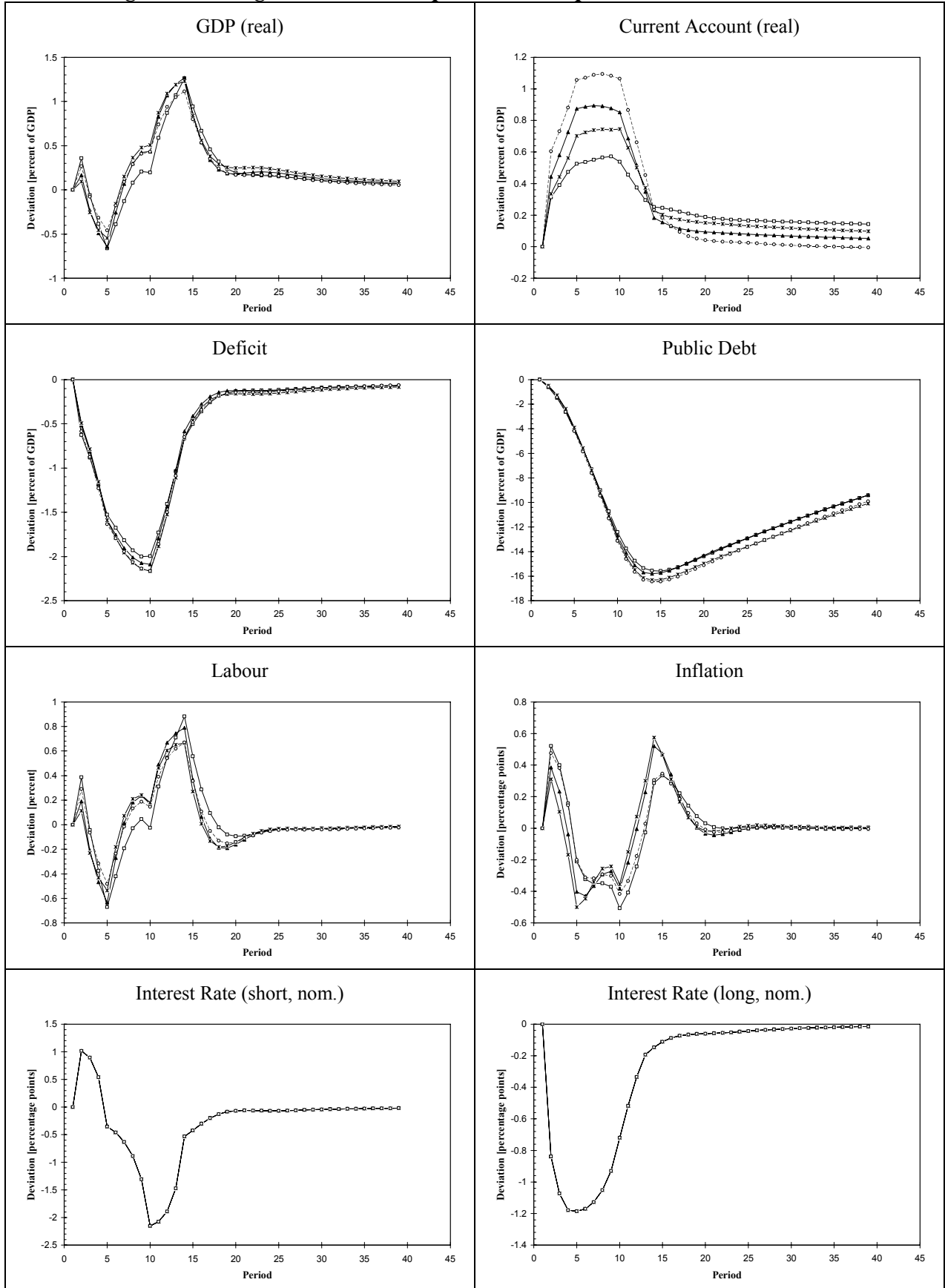
Figure 25: Budget consolidation, tax increase, Germany
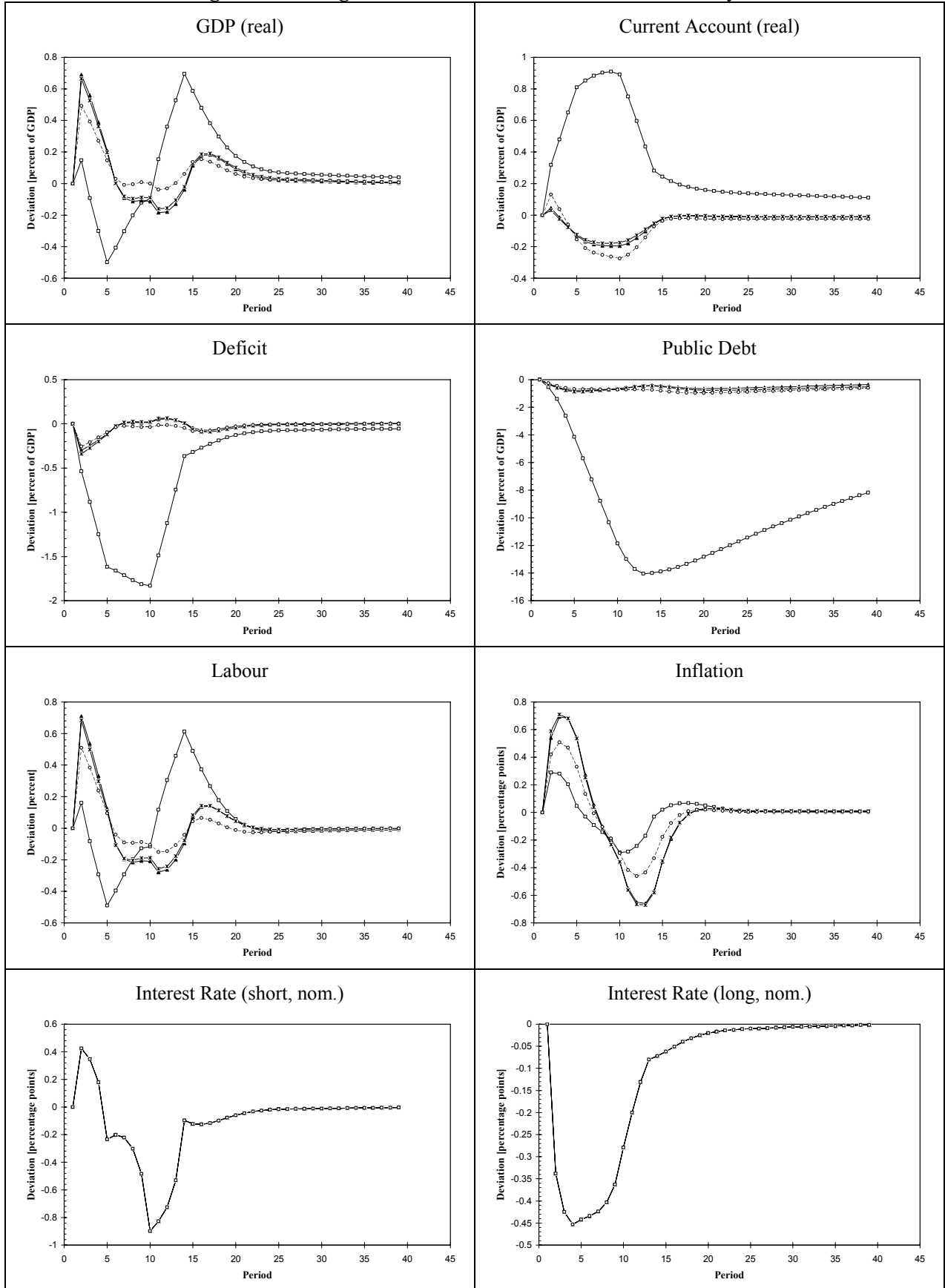
Figure 26: Budget consolidation, tax increase, Italy
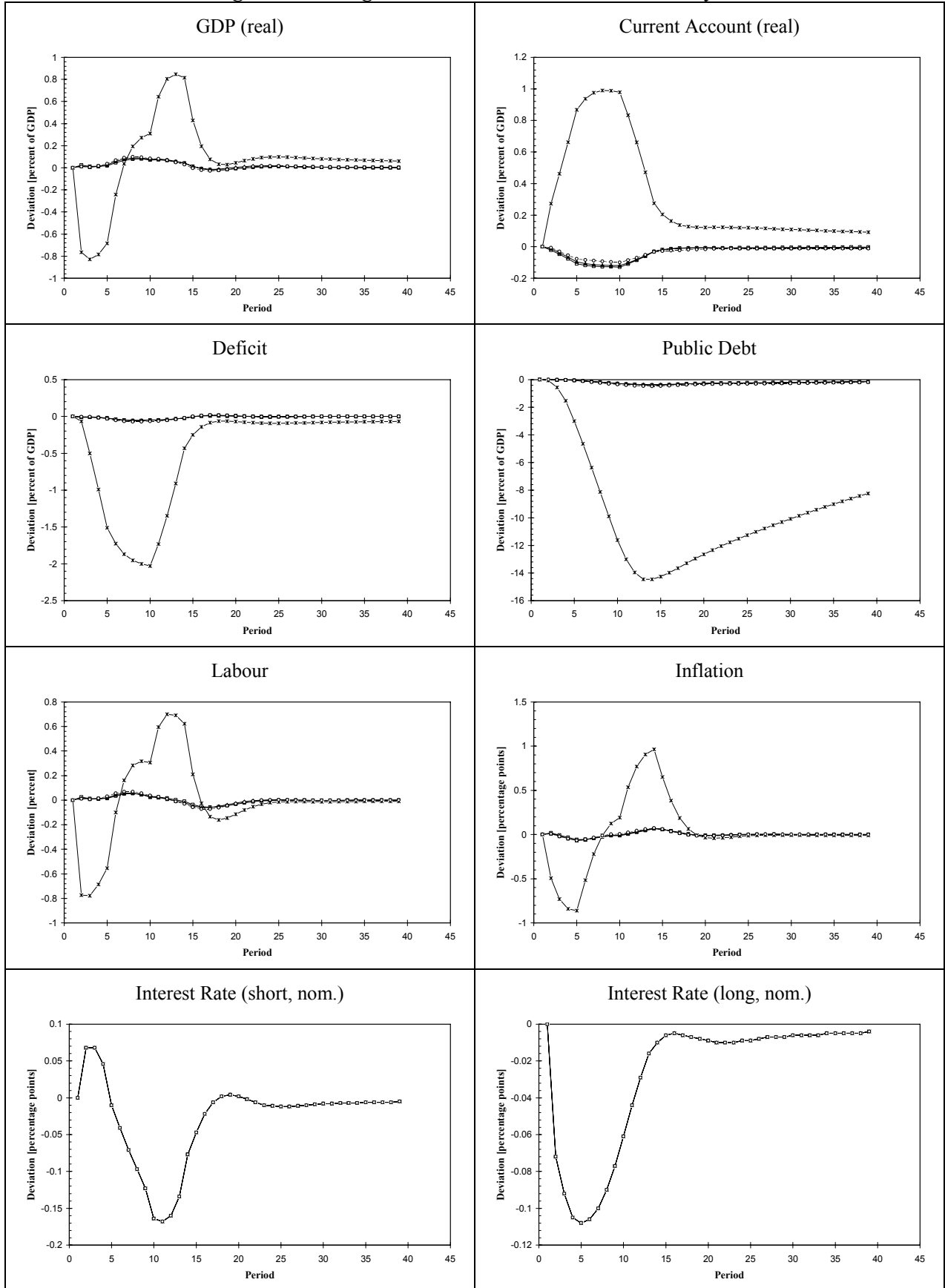
Figure 27: Budget consolidation, tax increase, euro area
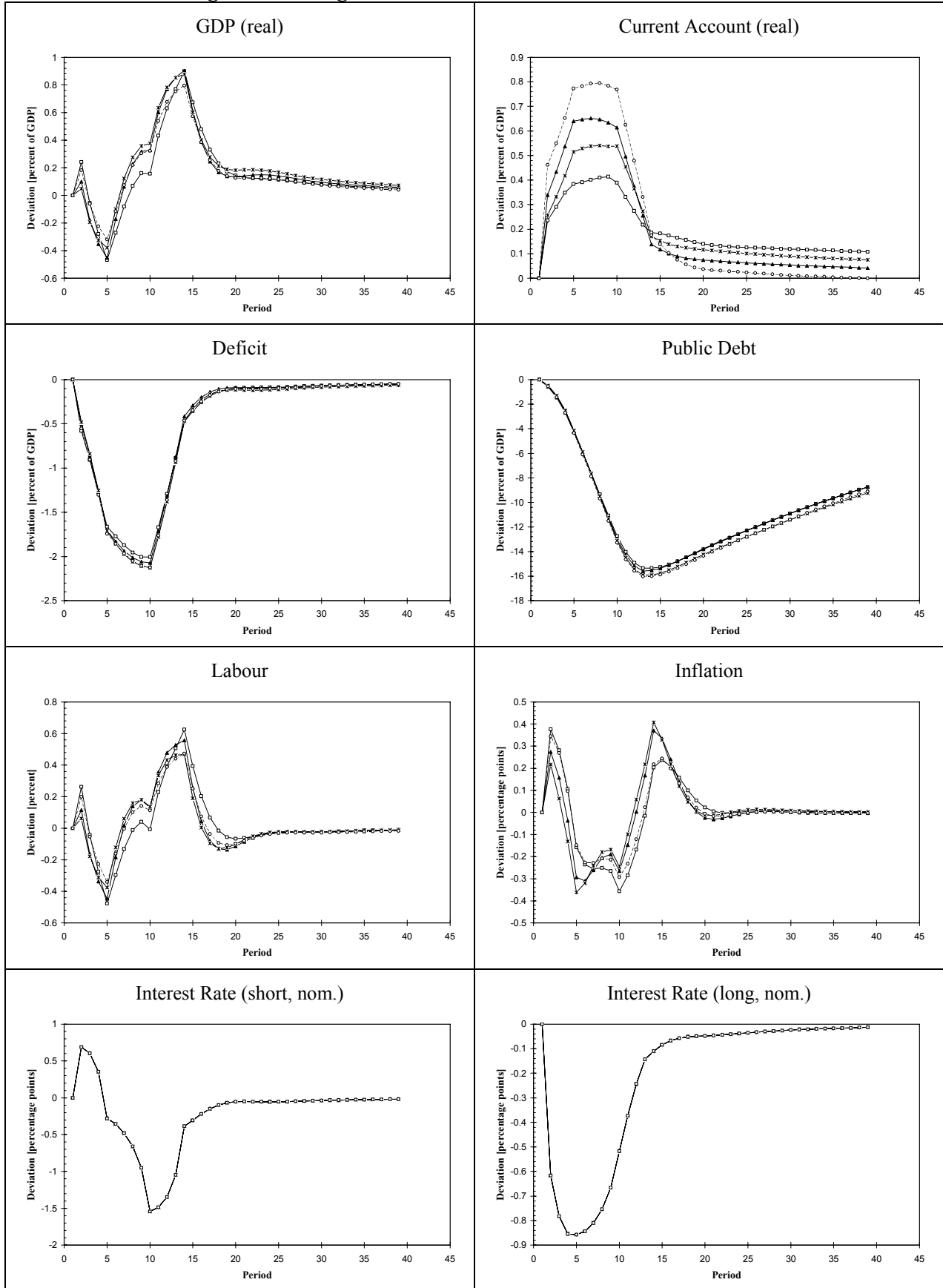
Figure 28: Budget consolidation, public consumption and tax decrease, Germany
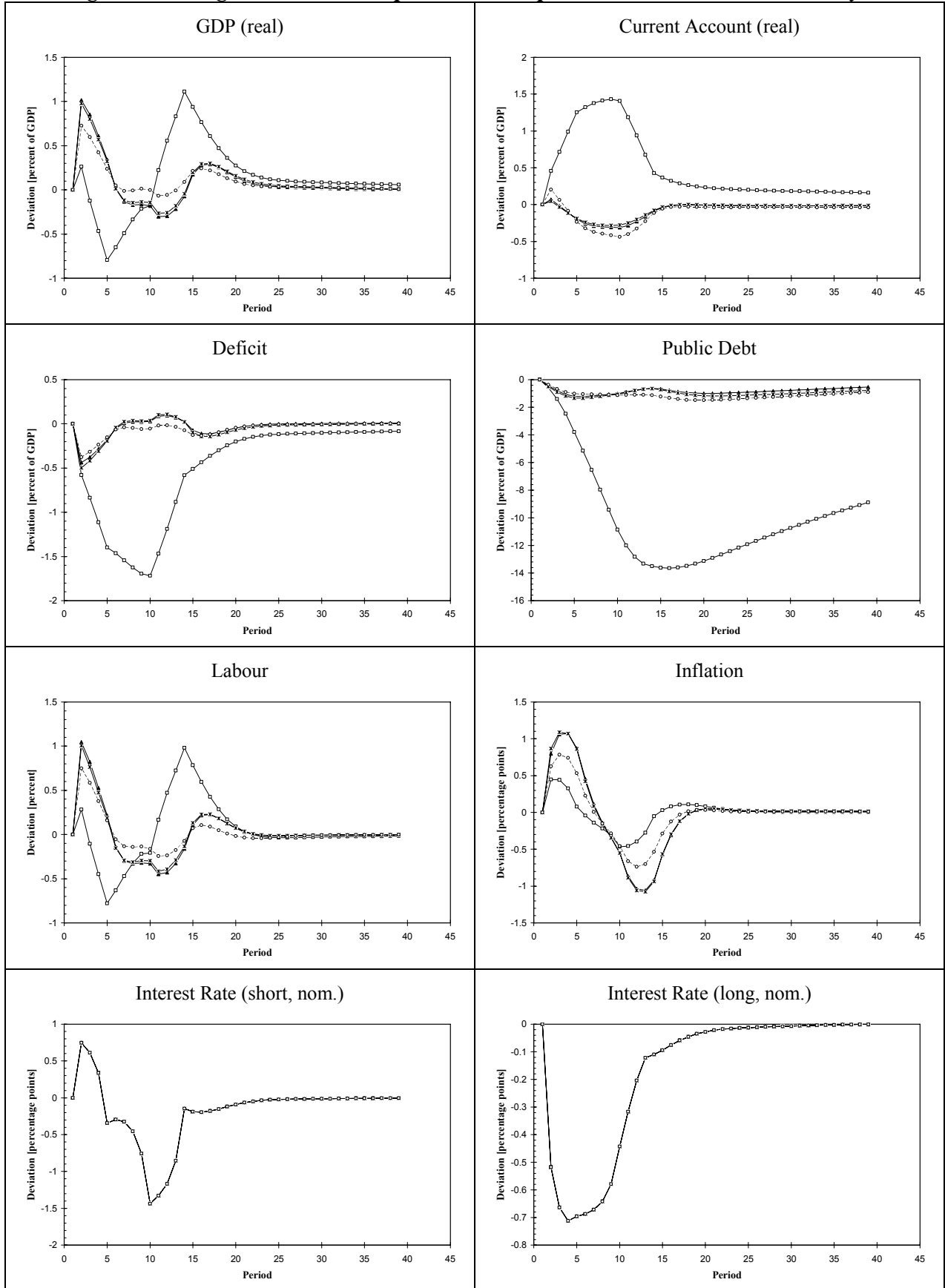
Figure 29: Budget consolidation, public consumption and tax decrease, Italy
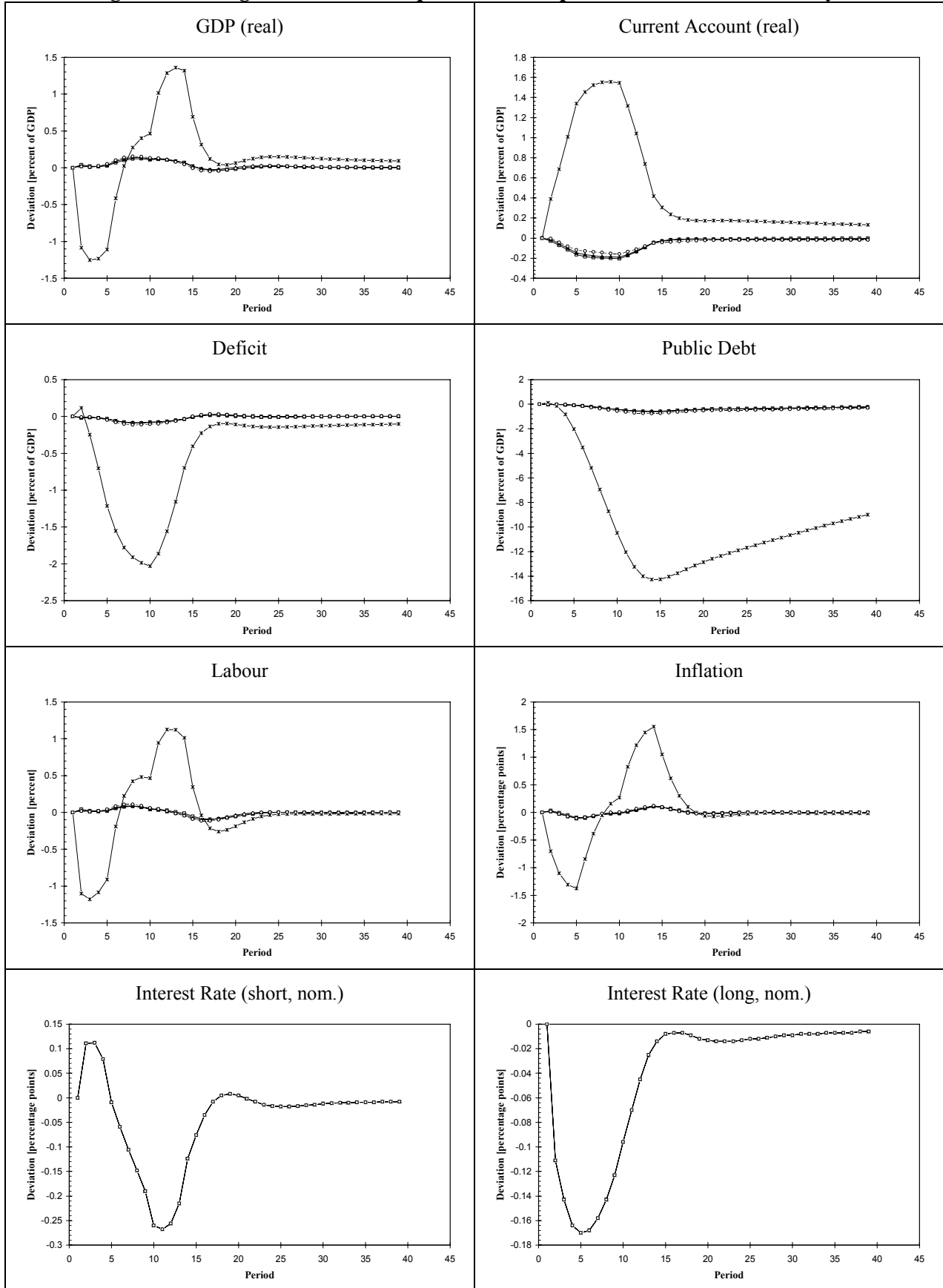
Figure 30: Budget consolidation, public consumption and tax decrease, euro area
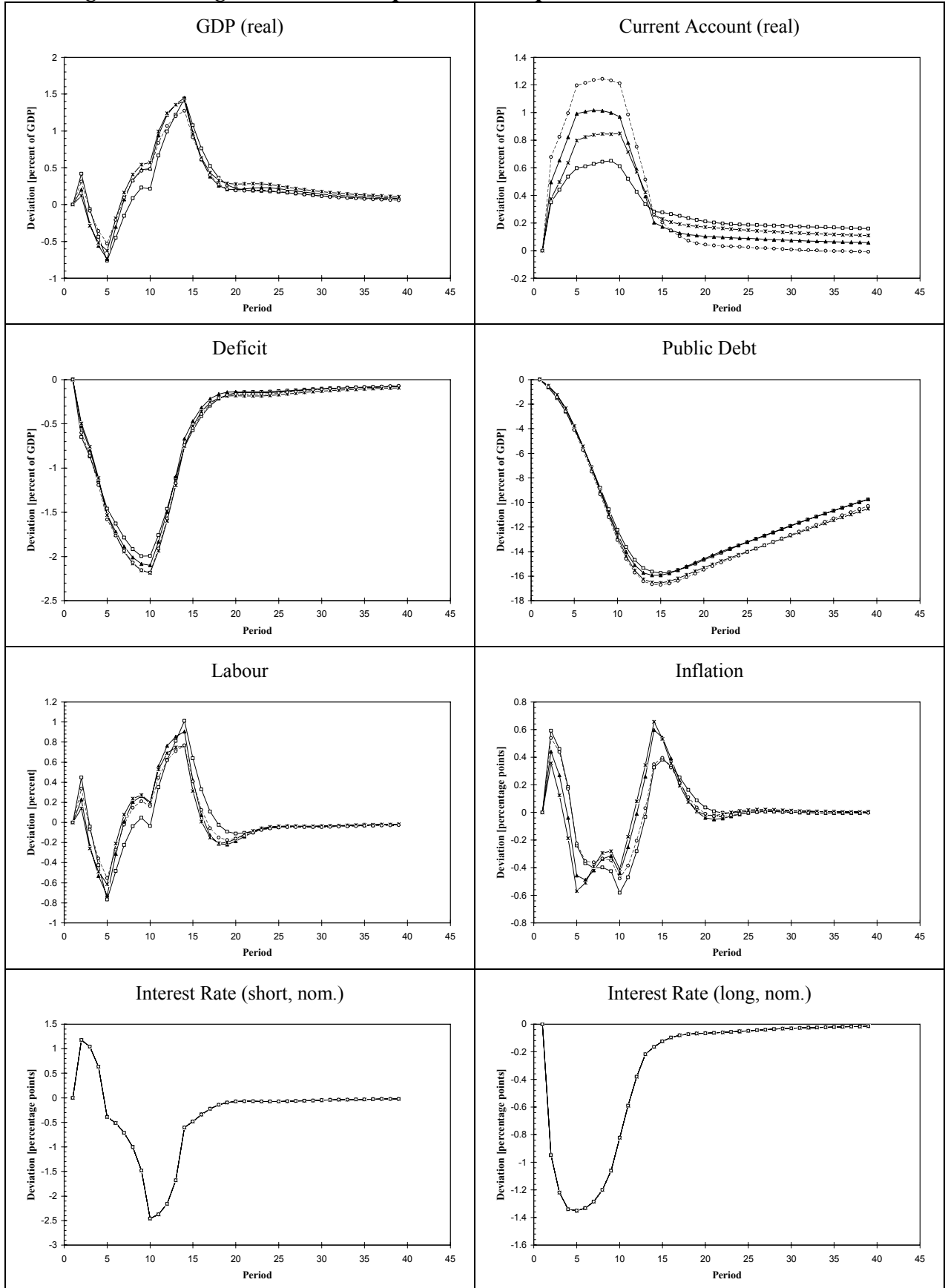
The results of these simulations can be briefly summarised as follows: In the country/region directly affected by the budgetary consolidation policies, all simulations are characterised by a Keynesian reaction of lower than baseline real GDP and employment in the short run and a non-Keynesian reaction of higher than baseline real GDP and employment in the medium run. The former effect is the familiar result of a reduction of (public or private) demand. It occurs in the MSG3 Model due to its short-run Keynesian features, which were introduced into the model mainly for reasons of better empirical fit: wages are sticky in the short run, and private consumption depends not only on wealth but also on current disposable income. The first feature can be justified by several theoretical arguments (incomplete information of workers, efficiency wages, insider-outsider theory, etc.), the latter by liquidity constraints of consumers (in the MSG3 Model, one half of private consumption depends on private wealth, the other one on current disposable income, which gave the best results when calibrating the model). Therefore non-Keynesian short-run effects, which have been analysed by some authors, cannot be observed here.

The medium-run non-Keynesian effect, which in most cases exceeds the short-run Keynesian effect, is mainly due to the reduction of the public deficit and hence public debt, resulting in lower rates of interest and higher private wealth; it is also partly due to the increase in competitiveness as shown by the improved current account. As the budgetary consolidation policy is modelled as temporary (although over a fairly long time horizon of 12 years), in the long run the economies return to the baseline path rather quickly after these 12 years. Only public debt remains permanently well below baseline values (by more than 10 percent of GDP after 40 years in the case where the budget consolidation policy is most effective; see Figure 30), inducing a (very modest) long-run increase of real GDP over its baseline values. By contrast, in Haber et al. (2006) we have shown that a permanent reduction of public consumption and hence the budget deficit can lead to substantial permanent gains in output.

Although the general behaviour of the variables of the countries directly affected by the policy shock is the same in all simulations considered here, there are some differences in detail. Comparing the three methods of reducing the budget deficit, we can see that lowering public consumption and taxes simultaneously gives the strongest effects, followed by decreasing public consumption only, while lump-sum (net) tax increases result in the weakest reactions. These differences are not dramatic, however. For example, in the case of budgetary consolidation for the entire euro area, the maximum reduction of the short-term and the long-

term rate of interest is 2.5 and 1.4 percentage points, respectively, when both public consumption and taxes are reduced; 2.4 and 1.2 percentage points, respectively, when only public consumption is reduced; and 1.6 and 0.88 percentage points, respectively, when lump-sum taxes are increased. Again, it has to be stressed that these simulations are biased against tax reductions due to the use of lump-sum instead of actual (distortionary) taxes; if the latter were reduced, consolidating the budget by reducing the size of the public sector through simultaneous expenditure and (smaller) tax reductions would appear even more favourable.

There are some differences between spillover effects when only one country undergoes the budgetary consolidation. When Germany is the only country to consolidate, the effects on its own GDP, employment, current account, public deficit and debt and rate of interest are weaker than in the case of Italy consolidating its budget. On the other hand, budgetary consolidation in Germany induces much stronger spillover effects on the other euro area economies and the common euro area interest rates than budgetary consolidation in Italy, where the spillover effects are negligible. Spillover effects to GDP, employment and current account of other euro area countries are anti-symmetric, i.e., they have the opposite signs than those of the respective own-country effects, reflecting shifts of demand due to both absorption and relative price effects. When Germany consolidates, the effects on its own inflation rate are weaker than those on the inflation rates of the other euro area economies, which is due to the strong first-period spillover effect from German to other euro area countries' GDP and employment.

A more interesting distinction can be made between the simulations where only one country implements the budgetary consolidation policy and those where the entire euro area consolidates. In the case of a coordinated budgetary consolidation for the entire euro area, there are gains from coordination: negative short-run Keynesian effects on GDP and employment are weaker, deficit and debt reduction are stronger and hence medium-run positive non-Keynesian effects on GDP and employment are also stronger than if one country only consolidates; this is true also for the respective country (both Germany and Italy in our simulations). Moreover, inflation oscillates less in the coordinated than in the non-coordinated scenarios. As for the simulations of structural policies and their effects on TFP, it turns out that coordinated policy-making brings about a "coordination dividend" for the participating countries. The reason is the same as for structural policies: If one country pursues an isolated policy, either of structural reforms or of budgetary consolidation (or both), this will affect this

particular country and, via trade and financial flows, to some extent other euro area countries. But if all euro area countries implement a coordinated policy of the same type, the spillover effects will reinforce the direct effects. The above-mentioned anti-symmetric effects are eliminated and even reversed, because now the entire euro area is affected in the same (desirable) way. Moreover, there may be some effect of increased credibility of such a coordinated policy, which is not really reflected in the simulations as all policies are assumed to be credible; hence our results may even underestimate the advantages of a coordinated policy of the type proposed here.

7.3   Combined structural and budgetary consolidation policies

Next, we investigate macroeconomic results of combining the structural policies analysed in section 7.1 and budget consolidation policies analysed in section 7.2 with the MSG3 Model. There are many possibilities of combining these two instruments within the euro area, depending on which country/region implements which policy. In Appendix 5, we document the results of all possible combinations of structural policy (the "TFP level shift" version from section 7.1) with each of the three versions of budgetary consolidation policies (reduction of public consumption, increase in (net) lump-sum taxes, and simultaneous decrease of public consumption and of lump-sum taxes) for the countries Germany and Italy and for the euro area as a whole. We concentrate on Germany and Italy for the same reason why we have omitted results for France, Austria and REA in the previous sections: The results for France are in between those for Germany and Italy, those for Austria lack virtually all international spillover effects (due to the small size of this country's economy), and those for the REA block would be completely artificial and not policy-relevant, as this block consists of several small- and medium-sized economies with fairly different economic and geographical characteristics (which result in close to euro area average reactions if shocked together, thereby neglecting the differences between such countries, as, for instance, Ireland, Spain, Finland and Greece). Again, we assume the policy rule of monetary targeting for euro area monetary policy. Still, we are left with 27 simulations whose main results are shown in the following diagrams and those in Appendix 5 for the values of the same endogenous variables as in sections 7.1 and 7.2. As before, countries are denoted by the following symbols: Germany − square, France − triangle, Italy − asterisk, Austria − circle. Here, we summarise only the most relevant results.

In the short-run, policy combinations result in nearly additive combinations of the effects of the single policies combined. For instance, with respect to GDP and employment, the negative short-run effect of budgetary consolidation combines with the positive effect of structural policy to give ambiguous results in the first periods, whereas for public deficit and debt, inflation and interest rates, the favourable effects of both policies reinforce each others. The long-run effects are probably more revealing, given the EU political objective of boosting economic growth during the next decade and beyond, hence we concentrate on them here.

We can distinguish between five main cases, each of which will be illustrated by the results of one simulation representative of a group containing several others.

1. One euro area country only implements both the structural policy and a budgetary consolidation policy. Take, for example, Germany. The results are shown in Figure 31. Here budgetary consolidation is achieved by reducing public consumption; if instead taxes are raised, long-run effects are slightly weaker; if both public consumption and taxes are reduced, long-run effects are slightly stronger. It can be seen that the combination of structural and budgetary consolidation policies, even when confined to one single euro area country without any policy change in other countries, suffices to make higher GDP, higher current account surplus, lower public budget deficit and lower public debt sustainable in the long run. Germany obtains real GDP permanently increased above baseline values by 0.8 percent, current account by 0.5 percentage points of GDP, deficit reduced by 0.5 percent of GDP and public debt by 15 percent of GDP. If instead of Germany, Italy is the country to conduct these combined policies, the own-country effects are even higher with 1 percent for GDP, –0.7 percent for the public deficit, and –19 percent for public debt. There are also some permanent international spillover effects to the other euro area economies: In the case of Germany, the other countries' current account deteriorates by about 0.1 percent of GDP, the public deficit is reduced by 0.1 percent of GDP, public debt is reduced by about 1 percent of GDP, and the common euro area interest rates are reduced by 0.1 percentage points. These international spillover effects are much smaller for Italy even though the primary effects of this country's policies are stronger than those for Germany (e.g., the rates of interest are only 0.03 percentage points below baseline values in the long run), showing that the size of long-run international spillover effects depends primarily upon the economic size of a country and its international trade and financial flows with the other euro area countries and less on the effectiveness of its policies on its own economy.

2. One euro area country only implements structural policy, another one a budgetary consolidation policy. Figure 32 shows such a scenario with Italy reducing its public consumption and Germany conducting the structural policy. In these cases, permanent effects on GDP are achieved only in the country implementing the structural reform. The output effects in the country enacting the budgetary consolidation are temporary only. Negative international spillover effects on the current account are permanent for the countries not affected by either policy. There is also a weak permanent effect on the rates of interest (about 0.05 percentage points if Germany implements the structural reform, even less if another country does so instead). This results in a small permanent decrease of the public deficit and

of public debt below baseline for both countries in which policy changes take place and still smaller ones in the other euro area countries.

3. One euro area country only implements structural policy, the entire euro area implements a budgetary consolidation policy. Figure 33 shows this scenario under the assumption that it is Germany that does the structural reform. This combination of policies is sufficient to generate long-run effects on GDP and the budgetary variables, although these are rather small. The country that carries out both kinds of policies is clearly better off than the others, both in the short and in the long run: it enjoys higher GDP, higher current account surplus, lower public budget deficit and public debt and less volatile inflation. The euro area interest rates remain below baseline by approximately 0.1 percentage points in the long run. If Italy instead of Germany is the country implementing structural policies, its own-country effects are stronger but the international spillover effects in the euro area are considerably smaller than those from German structural policy reforms.

4. One euro area country only implements a budgetary consolidation policy, the entire euro area implements structural policy. Figure 34 shows the resulting scenario with Germany being the budget consolidating country. Now there are permanent favourable effects on GDP in all countries, especially Germany and Italy. Interestingly, the stronger impulse from Italian structural reforms makes its long-run GDP rise more above its baseline GDP (in terms of its own GDP) than that of Germany in spite of the latter's combined policies. Public deficits remain below baseline by 0.5 percent of GDP in all countries, public debt is also lower than in the baseline path (most so, of course, in Germany), and the rates of interest are below by 0.15 percentage points. If Italy instead of Germany is the country consolidating its budget, its macroeconomic variables fluctuate more than those of Germany in the simulation where Germany consolidates, the long-run effects on Italy's GDP are still stronger, and the spillover effects to other countries are considerably weaker.

5. All euro area countries implement both the structural policy and a budgetary consolidation policy. This is the ultimate coordinated scenario for the euro area (although it must be noted that also scenarios assuming common euro area policies in one area only would require a considerable amount of cooperation to become true in reality). Figure 35 gives the results, again assuming that budgetary consolidation is done by reducing public consumption. As in the other four types of scenarios, increasing net lump-sum taxes give slightly weaker,

reducing public consumption and taxes slightly stronger effects, but the qualitative pattern of all macroeconomic variables remains the same, and there are only minor quantitative differences between the three kinds of budgetary consolidation policies. Figure 35 shows that in the euro area common policy scenario, real GDP remains above baseline by at least 1 percent for all countries in the long run; for Italy, the corresponding number is even 1.4 percent. Permanent improvements also apply to the current account, the public deficit and public debt in all euro area countries. The short-run interest rate is below baseline by 0.5 percent, the long-run by 0.2 percent.

The most important lessons from these simulations are the following: in the long run, the effects of structural policy reforms that increase TFP permanently (even if they raise only its level) dominate and can bring about a permanent improvement of key macroeconomic target variables such as output and public finances. In the medium run, budgetary policies are stronger, but as we have assumed that the budget consolidation will be done over a limited time period, it exerts nearly no permanent effects (except on public debt) unless supported by structural reforms. International spillover effects within the euro area are relatively small (except those from the biggest economy, Germany) and can be advantageous (mostly through the channel of the common interest rate) or disadvantageous (especially if they affect the competitiveness of some countries at the expense of other ones within the euro area). As many other studies on international macroeconomic policy-making have shown, we can confirm that cooperative policies brought about by policy coordination are superior to non-cooperative policies, and using two (or more) instruments is superior to relying on one instrument only. Our results show that the most effective way of achieving permanently higher output and lower public debt without undesirable side-effects is via a euro area wide coordinated design of both structural and budgetary consolidation policies. How such coordination can be achieved is a political question which goes beyond the scope of the present study.

Figure 31: Public consumption decrease and structural policy in Germany
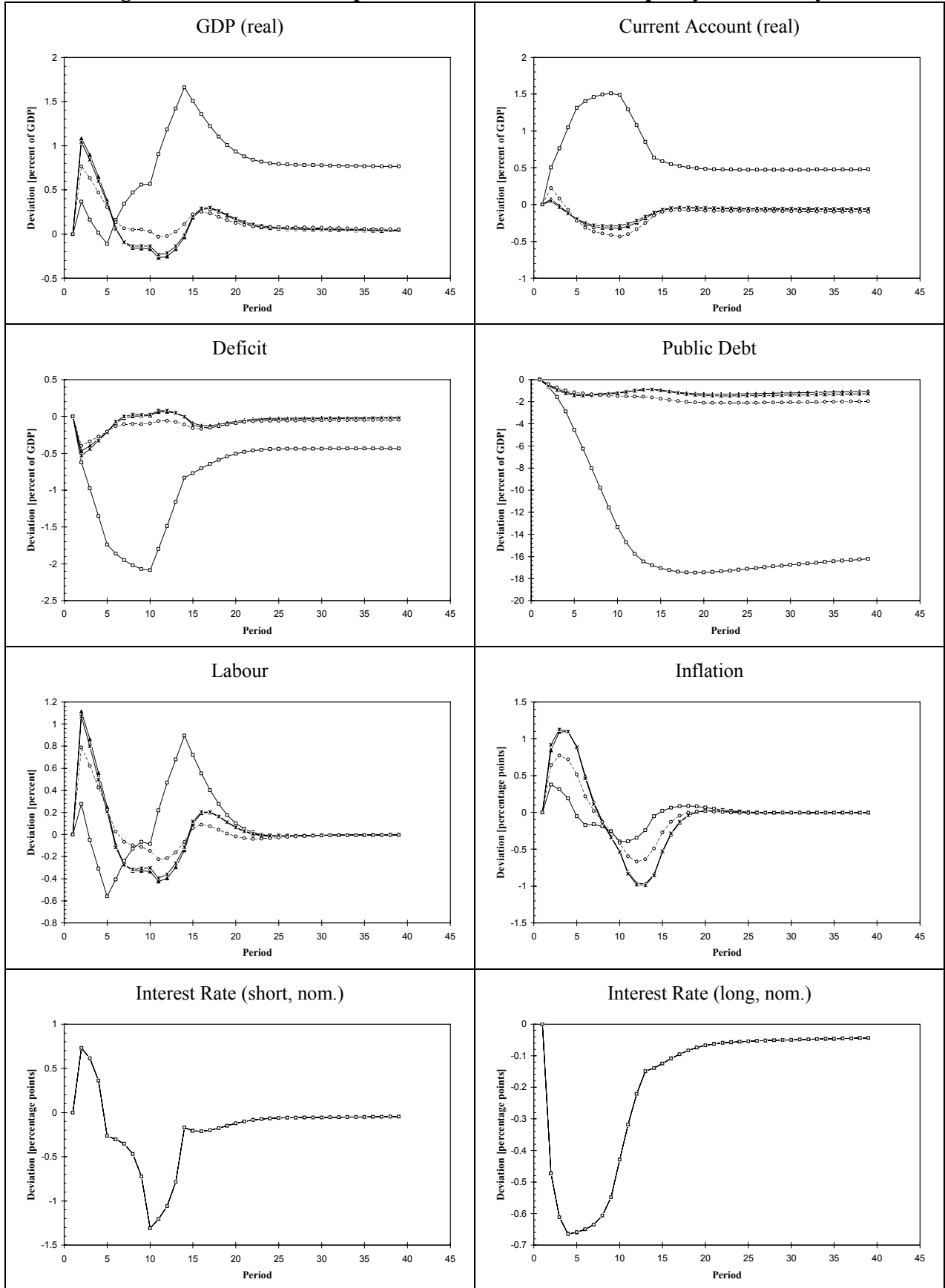
Figure 32: Public consumption decrease in Italy, structural policy in Germany
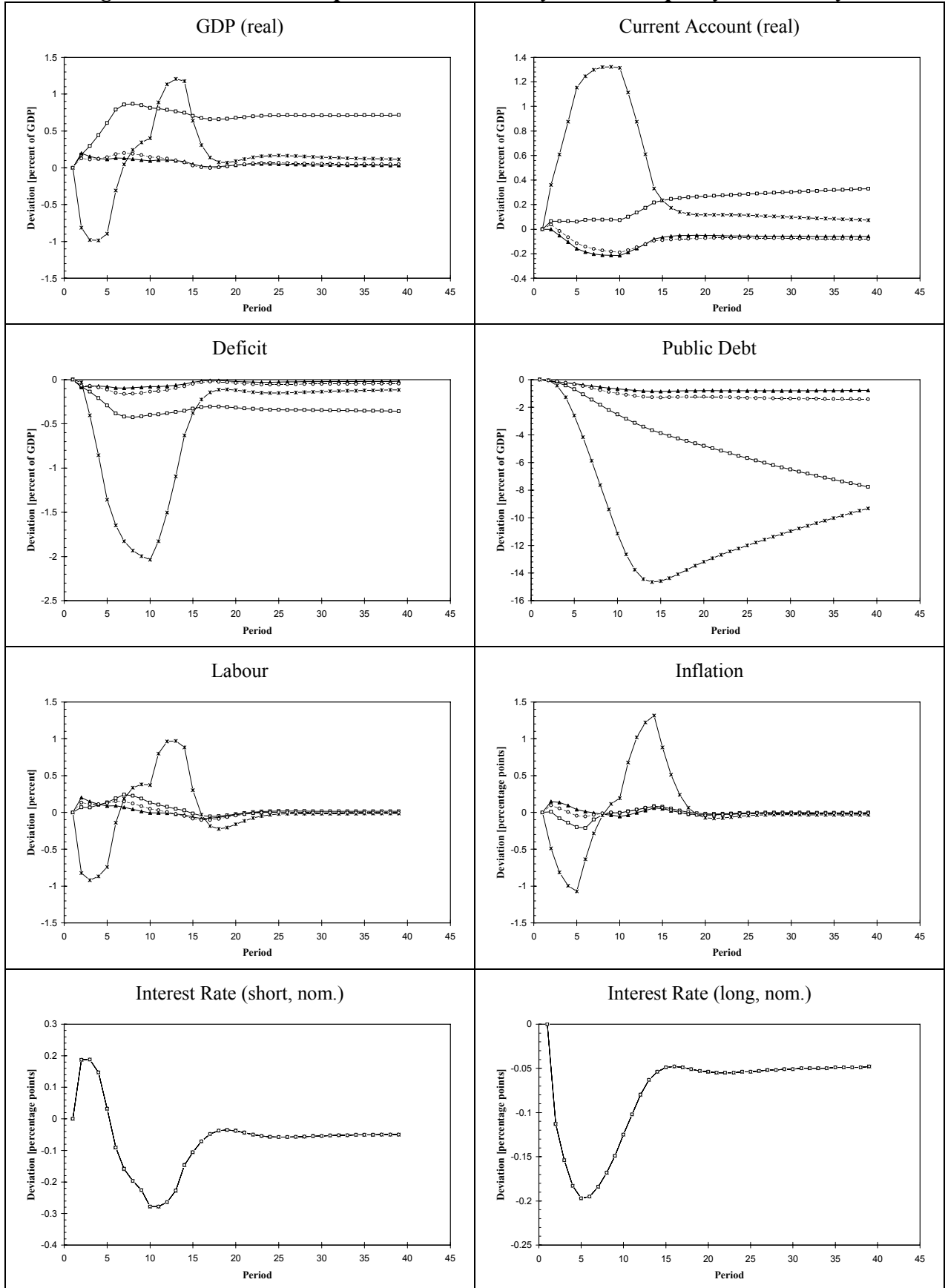
Figure 33: Public consumption decrease in euro area, structural policy in Germany
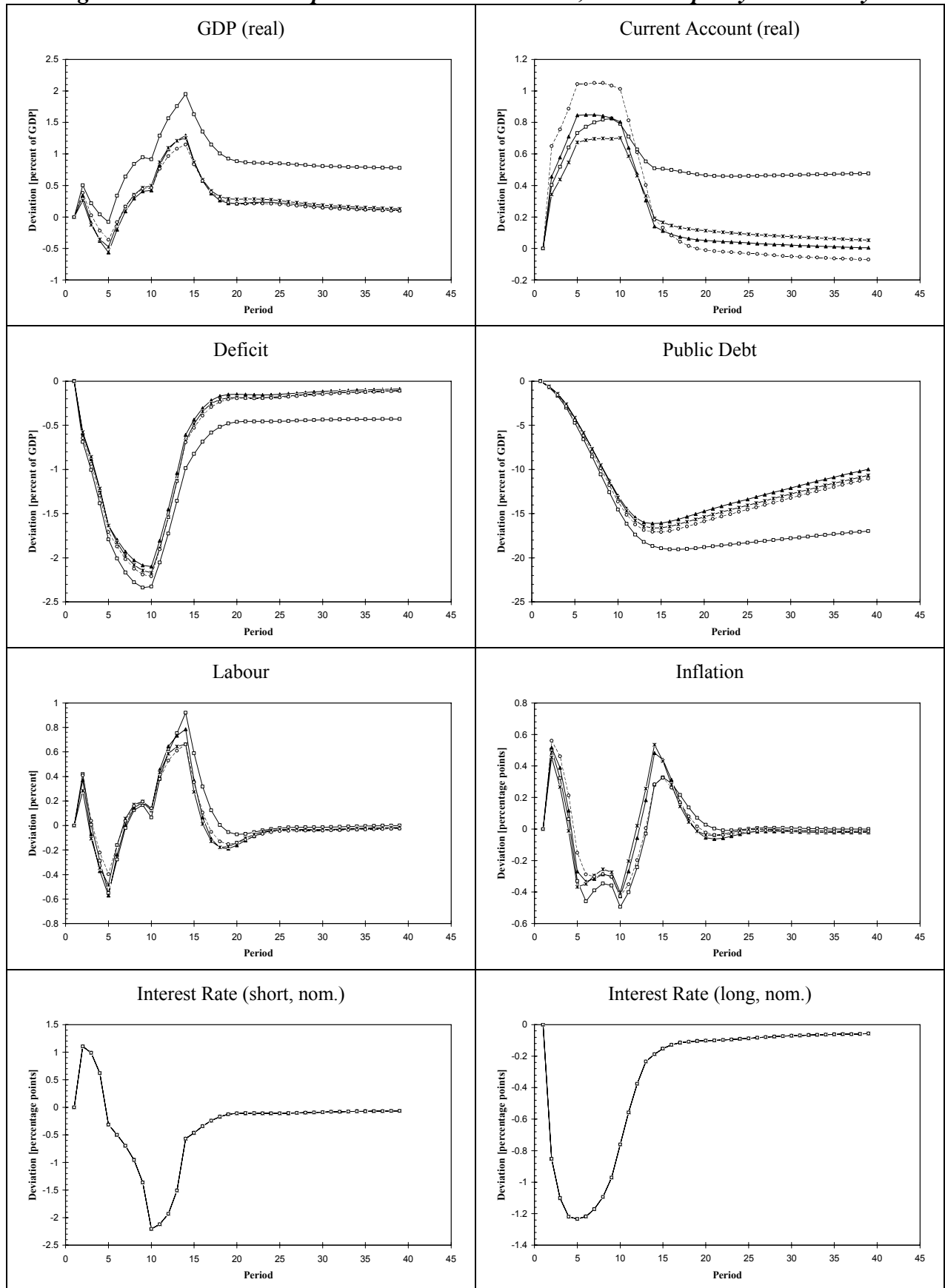
Figure 34: Public consumption decrease in Germany, structural policy in euro area
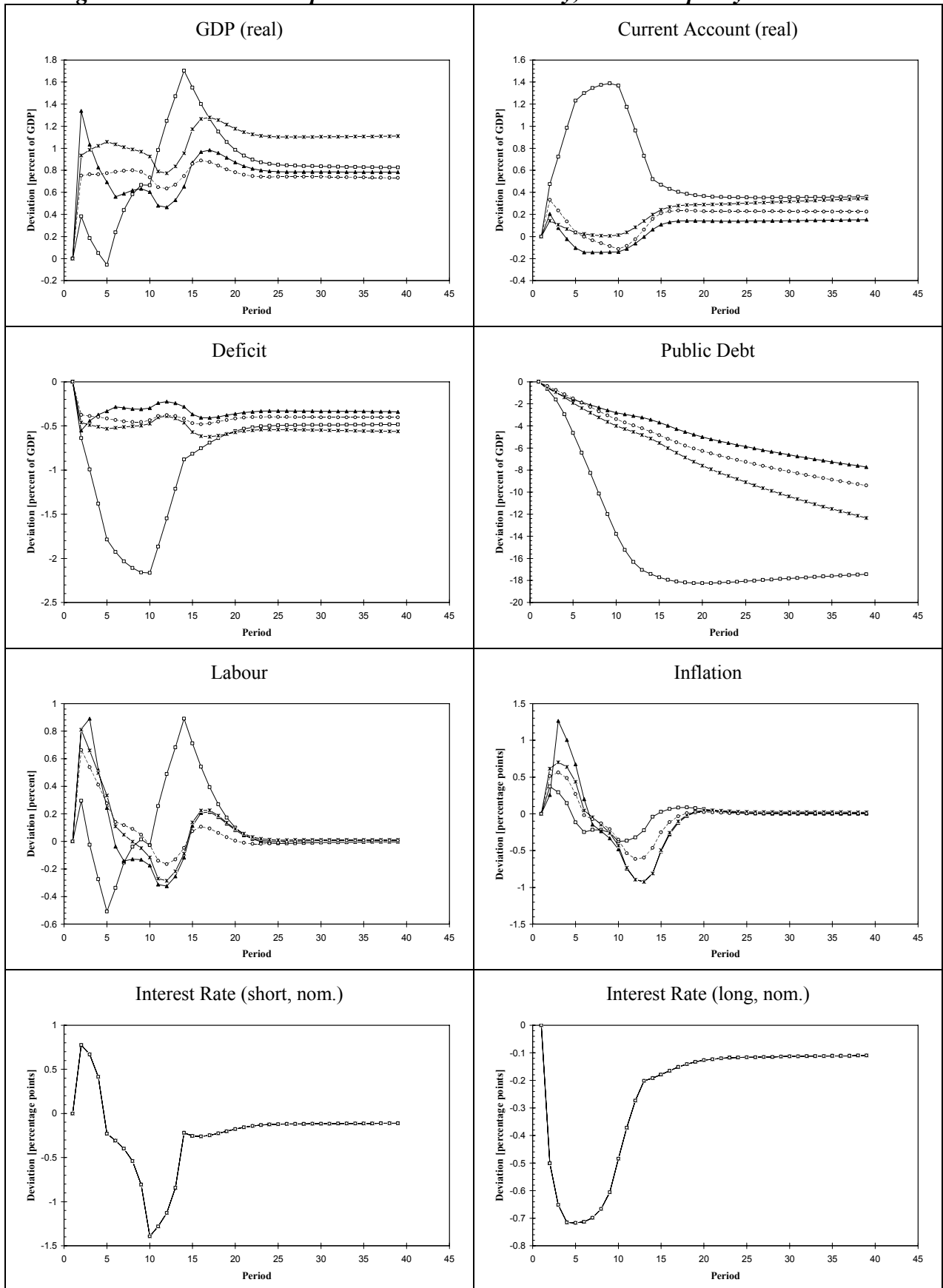
Figure 35: Public consumption decrease and structural policy in euro area
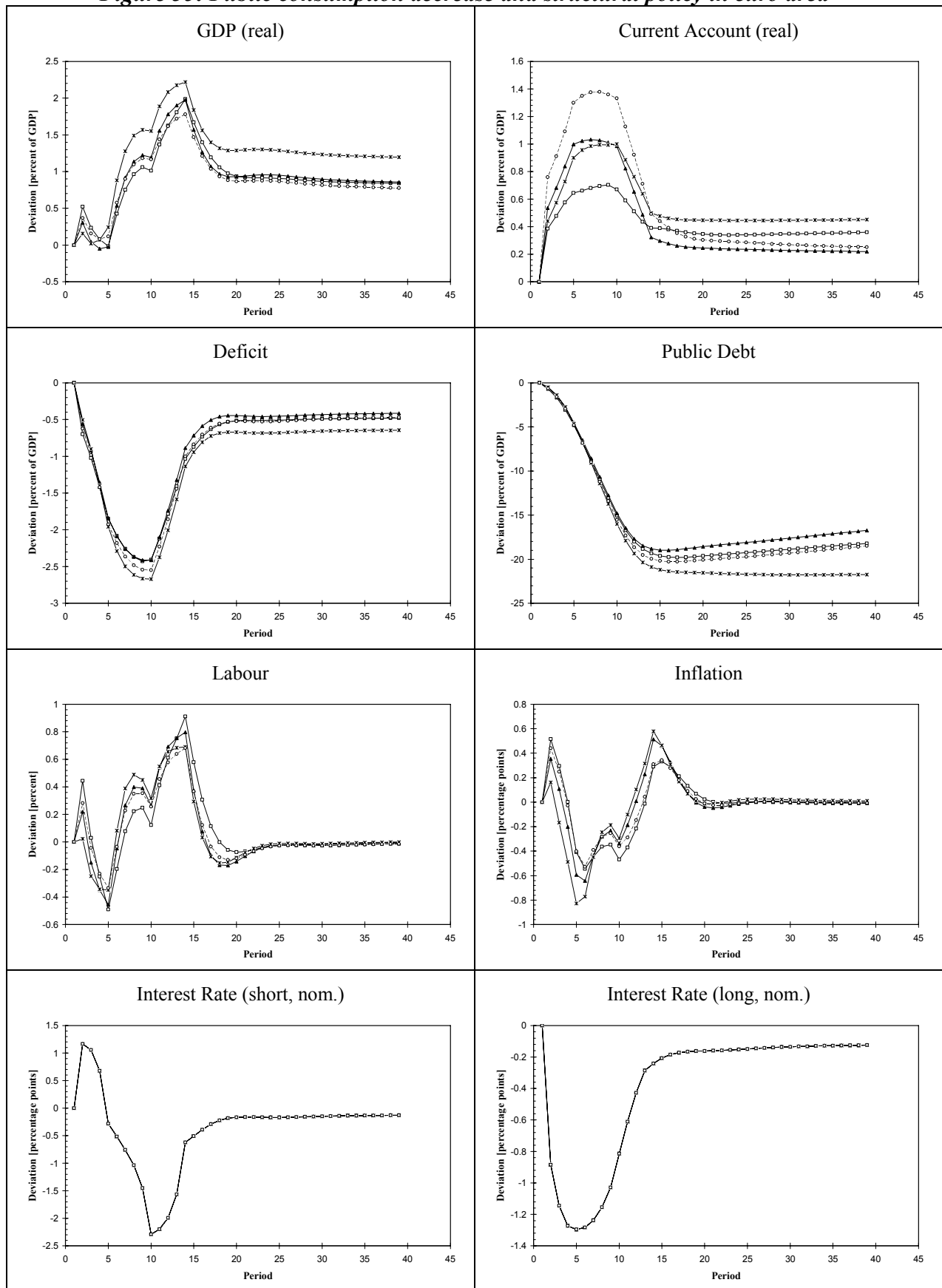
Note: Figure 34 and Figure 35 are identical to Figure 93 and Figure 95, respectively, in Appendix 5.

7.4 Sensitivity analysis: monetary versus inflation targeting

As can be seen from the diagrams in section 7.1, under the assumption of monetary targeting (i.e., the ECB sets its money supply for the euro area as in the baseline solution) in no case do inflation rates of any euro area country exceed 0.4 percentage points above the baseline solution. In fact, inflation and the price level are *lower* in all but a few periods for all countries of the euro area. The reason for this is the fact that the TFP shock is a positive supply shock that raises output and lowers price level variables. It would be highly counterproductive if the ECB would, by following a monetary policy rule of inflation targeting, annihilate these effects by a mostly restrictive policy activism to *raise* the price level and the rate of inflation, and we think such a policy of the ECB would be unrealistic either. Hence, we assume monetary targeting (or an "inactive" monetary policy) here. Moreover, we know from previous experiments with the MSG Model that under a (positive or negative) supply shock, "inactive" monetary policy (which is equivalent to monetary targeting in the framework of the MSG Model) gives results that are superior to those obtained under an "active" monetary policy (rules like inflation targeting, Taylor rules, nominal income targeting, exchange rate targeting, etc.); see, e. g., Neck et al. (2004).

The situation is less clear for demand shocks such as those emanating from the budgetary consolidation, where previous work with the MSG Model did not reveal one particular monetary policy rule as dominant. Therefore we re-ran several of the experiments of the previous subsections under the assumptions of monetary policy following a rule of inflation targeting (keeping euro area inflation at baseline values) and alternatively a rule comparable to a Taylor rule (a strict Taylor rule cannot be implemented in the MSG Model because money supply instead of an interest rate is the monetary policy instrument in that model). We report here only the results of three simulations with inflation targeting as monetary policy rule for the ECB. Monetary policy of the ECB following a modified Taylor rule (with a non-negligible weight on euro area real GDP) always resulted in an unstable model solution. The reason for this is simple: both structural and budgetary consolidation policies as assumed here result in *higher* GDP in the medium and long run without negative effects on price level and inflation rates. In this case, monetary authorities following a mechanical Taylor rule would implement restrictive policies to reduce real GDP to its baseline values. It is obvious that such policies were severely misguided and would not be attempted by any reasonable monetary policy-maker.

Hence we look only at simulations with inflation targeting instead of monetary targeting as policy rule for the ECB. Inflation targeting is introduced into the model by implementing dynamic optimisation for the ECB. The ECB is regarded as an active player, adjusting money supply in order to keep the average euro area inflation rates in each period at the baseline values (which are close to the 2 percent European inflation target). As inflation is assumed to be the only objective of the ECB under the monetary policy rule of inflation targeting and there is one instrument (money supply), the well-known Tinbergen results concerning the number of instruments and the number of objectives ensure that the inflation target will be strictly met in all periods. Note that this does not imply zero deviations of the national/regional inflation rates in all member countries and regions of the euro area, as the ECB cannot effectively account for differences in regional output and demand. At least for an asymmetric shock, there will be deviations from the baseline in both directions (positive and negative), but they will always be smaller than under a monetary targeting regime.

We show the results of structural policy (TFP shock) only and of budgetary consolidation by reducing public consumption only, both for the case of Germany implementing such a policy, and the results of combined structural and budgetary consolidation policies for the euro area in order to illustrate the varieties of isolated versus combined policies and of national versus coordinated policies. Figure 36 shows the results of structural policies for Germany and should be compared to Figure 19; Figure 37 shows the result of budgetary consolidation by reducing public consumption in Germany and should be compared to Figure 22; and Figure 38 shows the results of combined structural and (expenditure-side) budgetary consolidation policies for the entire euro area and should be compared to Figure 35 as the respective monetary targeting-counterpart to the inflation targeting rule considered here.

Figure 36: TFP shock Germany (inflation target)
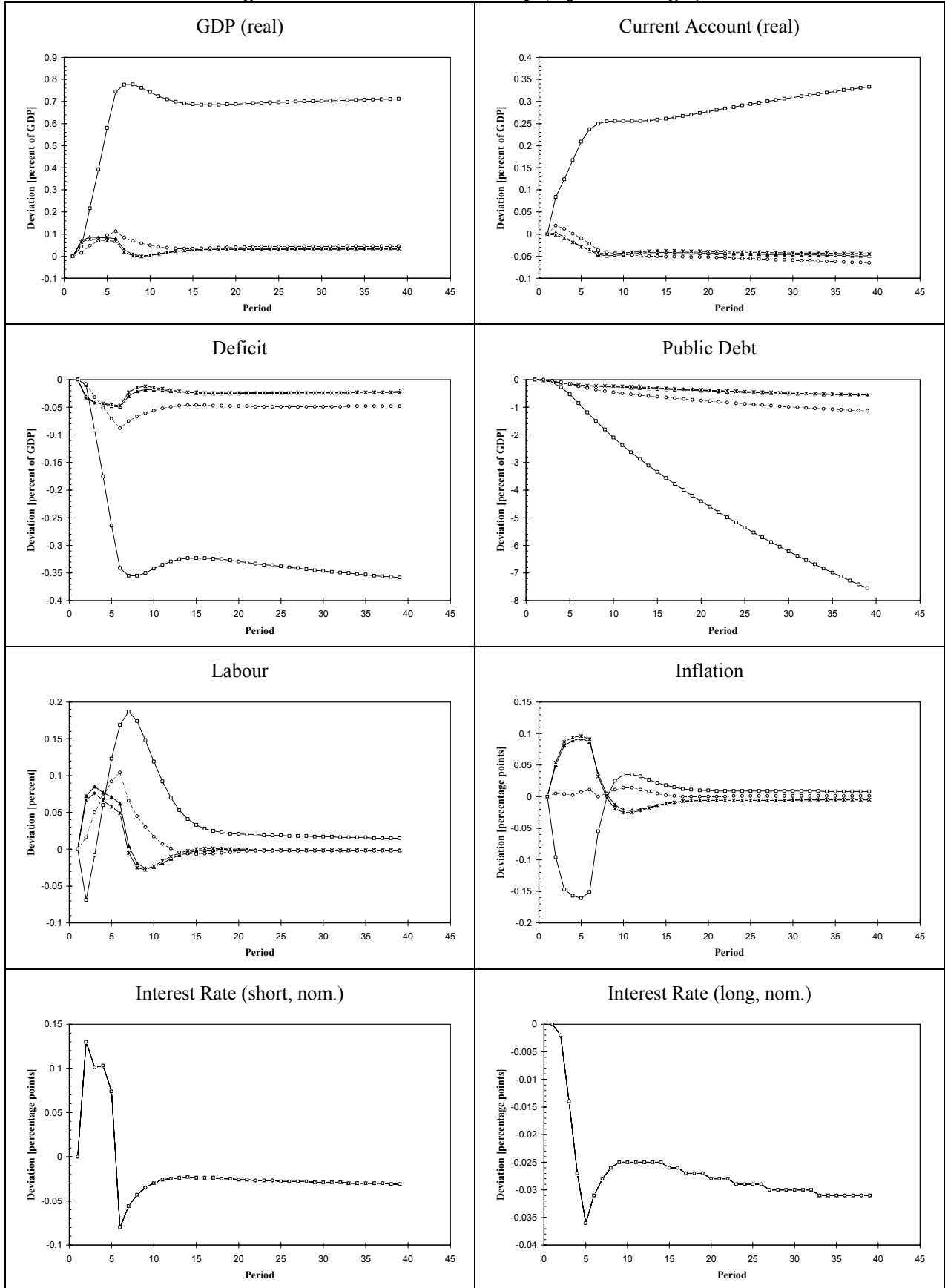
Figure 37: Budget consolidation, public consumption decrease, Germany (inflation target)
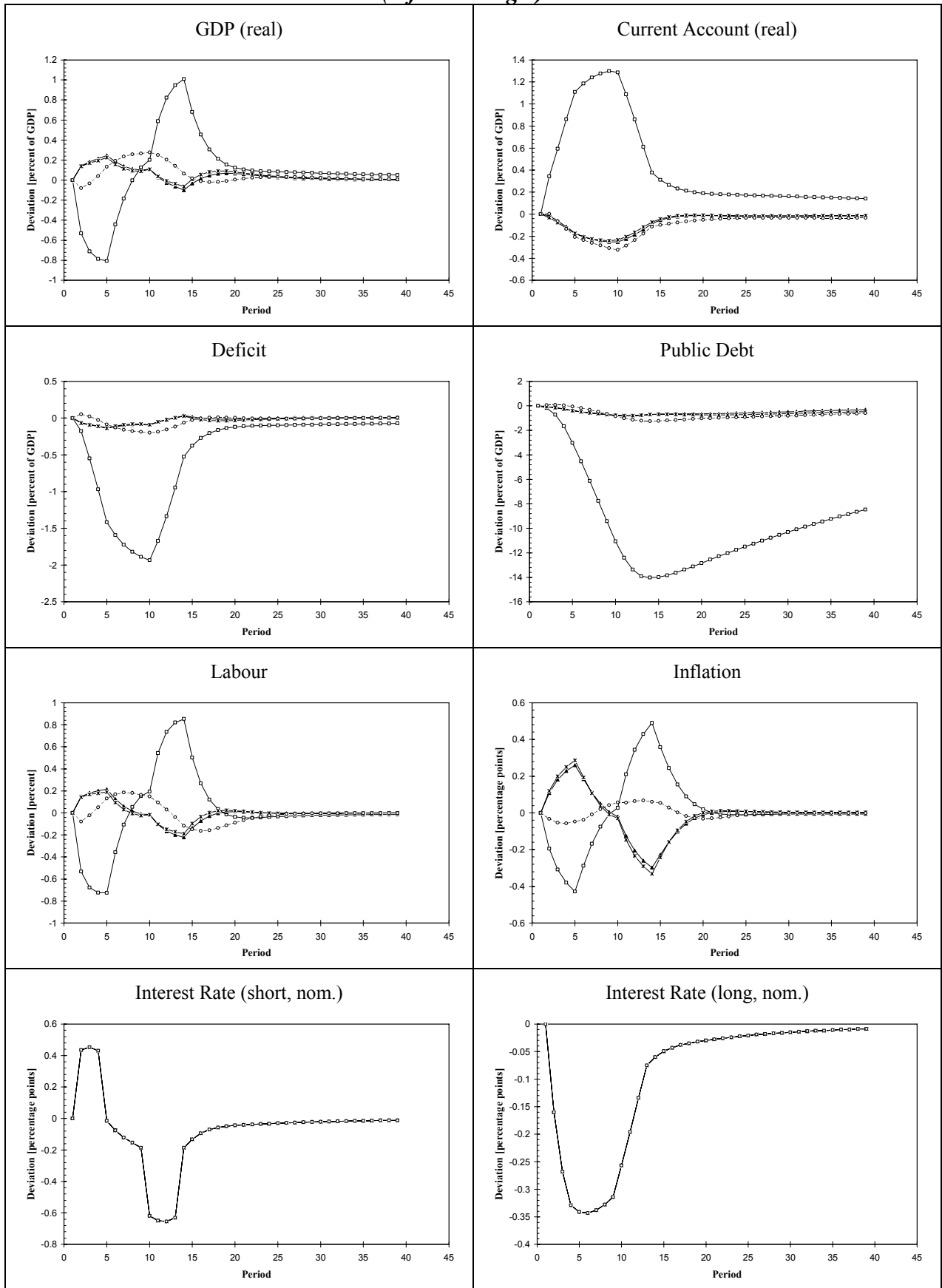
Figure 38: Public consumption decrease and structural policy, euro area
(inflation target)
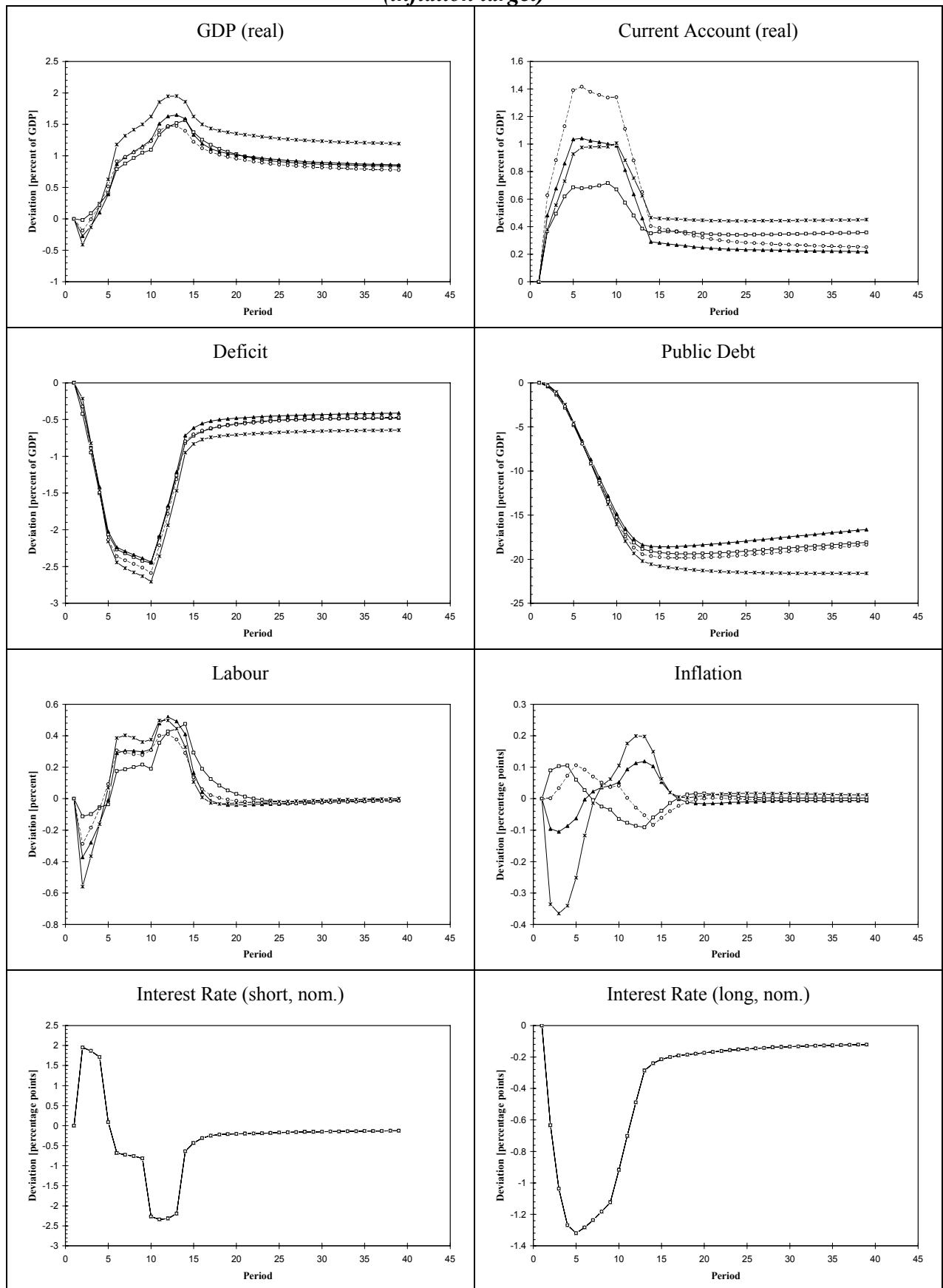
Comparing these results to those obtained with the monetary targeting policy rule, the most prominent features are the similarities of the results under the two monetary policy rules for the respective simulations. In the long run, monetary policy is neutral with respect to real variables, and this is reflected by the fact that time paths of virtually all variables are identical between simulations differing only by the monetary policy rule after the adjustment period, which in no case is longer than 15 years (and mostly much shorter). But even in the short run, differences are minor. Compare, for example, Figure 36 and Figure 19 (the structural policy TFP shift in Germany). During the first four years, the short-run and (less so) the long-run rate of interest are higher under inflation than under monetary targeting, resulting in slightly lower increases of GDP in Germany and smaller (positive) GDP spillover to the other euro area countries, lower positive (in the first period for Germany even negative) effects on employment, and a slower decrease of the public budget deficit. The rate of inflation differs less than under monetary targeting and euro area inflation effects are annihilated, reducing negative spillover effects from Germany from a maximum of 0.16 percentage points under monetary targeting to 0.1 percentage points under inflation targeting. In effect, monetary policy during the first few years puts on the brakes slightly to obtain a minimal reduction of euro area inflation at the cost of slightly less favourable effects for real GDP, employment and the budget deficit.

Similarly, in the case of budgetary consolidation by reducing public consumption in Germany (Figure 37 and Figure 22), inflation targeting implies a more restrictive monetary policy during the first periods than monetary targeting, which is reflected in a slightly higher short-run interest rate until year the 14th year after the start of the policy shock, slower fall of the long-run interest rate, lower GDP in Germany, especially in the first year, and nearly no spillover on other euro area regions' GDP. Employment, public deficit and current account are virtually the same under both monetary policy rules. The (modest) initial increase of inflation occurring under monetary targeting is prevented by the policy of inflation targeting, as are the amplitude of the inflation rate as well as the differences between inflation rates of different euro area countries. Altogether, the effects of the alternative monetary policy rule are minor and short-lived.

The same is true for the case where both structural and budgetary consolidation policies are applied, either in one country only or in several or all euro area countries. Look at Figure 38 and Figure 35 to compare the effects of the monetary policy rule on the (most favourable)

case of all euro area countries implementing both structural and budgetary consolidation policies. Under inflation targeting, short-run interest rates increase by about 2 percentage points under inflation targeting instead of 1 percentage point under monetary targeting in the short run due to a more restrictive monetary policy of the ECB under the former rule. Also long-run interest rates are slightly higher during the first few years. This leads to a small decrease of GDP in the first year, a decrease of employment during the first 5 periods, and virtually no change for public deficit, debt and the current account, all compared to the baseline solution. It is interesting to note that the variability of inflation is reduced from +0.6 to −0.8 percentage points under monetary targeting to +0.2 to −0.4 percentage points under inflation targeting only. Hence there are some short-run costs and some short-run benefits from applying a policy rule of inflation instead of monetary targeting, but both are minor, and we doubt whether the ECB will really react upon such small changes of the inflation rate as resulting from the structural and/or the budgetary consolidation policies.

7.5 Welfare effects of structural and budgetary consolidation policies

The results of the previous sections already provide some information about politically relevant effects of different kinds of economic policies in the euro area. To assess the welfare effects originating from structural economic reforms and from budgetary consolidation policies, however, we need some numerical measure of "welfare" or political desirability of the results of the policies under consideration (a "performance index").

In order to compare the macroeconomic outcomes of the different policies considered in this chapter, an assessment of the results in terms of welfare gains or losses for each of the simulations that we have performed with the MSG3 Model is required. For this purpose, we define an overall objective function as the sum of the respective welfare loss functions of the euro area countries/regions (assuming equal weights for each euro area country/region in the model and neglecting possible welfare losses of other countries/regions). The values of this function are calculated for each scenario, given a specific policy shock or combination of policy shocks. Since the objective function is specified as a welfare loss function, lower values would represent better results in terms of welfare, but to make results intuitively more appealing, we use the convention to denote welfare gains by positive and welfare losses by negative numbers.

As the results of the welfare analysis might depend on the specification of the welfare loss function, we provide a sensitivity analysis by showing the results of alternative specifications with different objective variables and different assumptions on the welfare impact of lower inflation rates as compared to the baseline (symmetric vs. asymmetric treatment of inflation deviations from the baseline values).

Generally, the objective function of each euro area country/region is specified as an asymmetric quadratic function that includes some or all of the following macroeconomic variables of the respective country/region: the inflation rate, employment, real GDP, and the fiscal surplus. Deviations of these target variables from their reference values are the arguments of the quadratic objective functions, but (with the exception of the inflation rate in some calculations) these deviations are evaluated in an asymmetric way: while overshooting of reference values is rewarded, undershooting is punished (vice versa for the rate of inflation). We assume that future periods are discounted by a discount rate of 4 percent in the objective function, which is in line with estimates of long-term market interest rates and the rate of depreciation of the capital stock.

The reference values in the objective functions are the respective baseline values of the model without any shocks. This makes sense, as the baseline represents a stable adjustment path towards the long-run equilibrium of the model. The inflation objective can be defined symmetrically, thus assigning penalties for deviations in both directions, because deflation could be regarded as no less of an evil than inflation (see the recent Japanese case of sustained deflation and the related economic problems). Alternatively, it can be argued that the objective function already includes output and employment, thus negative effects of sustained deflation would be captured by undesired deviations of those objective variables. Moreover, slightly lower inflation rates than in the baseline scenario might be recognised as desirable in case of a sustained positive supply shock, as long as no strong deflationary effects are observed. Thus welfare scenarios with both symmetric and asymmetric inflation assessment are calculated.

On the other hand, we depart from the traditional symmetric objective function of the theory of economic policy because we know from the previous sections that some policies result in attractive long-run effects, for example, in a permanently higher output or lower public deficit (and hence debt). It would not make sense to evaluate such an outcome in a negative instead

of a positive way. Moreover, increases in employment, even if only temporary, are generally regarded as politically desirable and should not be penalised by the (political) objective function. Needless to say, the objective function used is fairly ad-hoc (as is every macroeconomic objective function in the tradition of the theory of quantitative economic policy), but it summarises effects of policies in a convenient and easily computable way.

It should be noted that the numerical values of the alternative specifications of the objective function cannot be compared, as different magnitudes of the results must necessarily arise. While a comparison of the outcomes of different scenarios within each of the following tables is just the core of the welfare analysis, cross-table comparisons (across different specifications of the objective function) should be strictly avoided.

Although we have calculated the values of the objective function for all scenarios discussed in this chapter, and with different discount rates for each scenario, we confine ourselves to showing only a few results; again, more detailed results are available upon request. The following table gives an overview of the welfare effects of some of the previously described simulation exercises for all euro area countries/regions of the MSG3 Model, both separately and as a total.

Scenario [1] is the TFP level shock (structural reform policy) for the entire euro area (Figure 21 in section 7.1), scenario [2] is the decrease of public consumption in the euro area (Figure 24 in section 7.2), scenario [3] is the simultaneous TFP level shock on Germany and decrease of public consumption in Italy (with no policy change in the rest of the euro area; Figure 32 from section 7.3), scenario [4] is the simultaneous structural policy (TFP level) and public consumption decrease shock on Germany only (Figure 31 in section 7.3), and scenario [5] is the simultaneous structural and budgetary consolidation policy (decline of public consumption) shock on the entire euro area (Figure 35 in section 7.3).

As the end of economic policy is higher output (or consumption), a natural (and rather straightforward) approach to assess the welfare effects of different kinds of economic policy scenarios is to include only real GDP in the objective function. The results are shown in Table 8 (positive values are welfare gains).

Table 8: Welfare effects (GDP target)

	Scenario [1]	Scenario [2]	Scenario [3]	Scenario [4]	Scenario [5]
Germany	9.65	3.09	8.92	14.28	20.29
Austria	8.20	3.28	0.23	1.43	18.93
Italy	17.26	4.15	0.59	2.29	34.69
France	8.59	3.66	0.18	2.45	21.61
Rest of euro area	8.95	2.58	0.12	1.49	19.02
Total euro area	*52.66*	*16.76*	*10.03*	*21.95*	*114.54*

[Positive figures denote welfare gains, negative figures welfare losses]

As suggested by the simulations in the previous chapters and by economic theory, for the coordinated structural reforms within the euro area (scenario [1]), positive welfare effects can be observed in all of the euro area countries. The welfare gains are not perfectly equally distributed among the euro area Member States, but of similar magnitude for most regions. Italy exhibits higher GDP gains than the other regions due to the assumption of a stronger structural policy shock in this country.

Next, the coordinated reduction of public consumption also gives gains in terms of economic welfare, but the effects are lower for all regions than the effects originating from structural reform. Of course, the overall magnitude of the welfare effects depends on the magnitude of the "shocks", but the scenarios developed in the previous chapters were identified as being empirically realistic, so it can be argued that the long-run benefits of coordinated structural reforms will exceed the gains from coordinated budgetary consolidation efforts. Note that the consolidation might produce minor short-run welfare losses, but the overall results are determined by the positive long-run non-Keynesian effects of lower public debt.

The combined coordinated structural reforms and budgetary consolidation efforts within the euro area (scenario [5]) give the best results in terms of the GDP-only specification of the objective function (114.54 for the euro area as compared to 52.66 and 16.76, respectively). For all countries, the welfare gains are substantially higher than just the sum of the isolated consolidation and structural reforms scenarios. This is partly due to the economically sensible higher "rewards" of larger (positive) deviations from baseline GDP implied by the quadratic

specification of the objective function, but partly also due to positive effects originating from the policy mix.

If two countries enact different policies (structural reforms in Germany, fiscal consolidation in Italy – scenario [3]), the welfare effects on the country with the budgetary consolidation are weak, and the welfare effects for the country with structural reforms are lower than in the coordinated cases. Welfare spillover effects on other countries are negligible, as scenario [3] shows.

The Germany-only combined structural reforms and fiscal consolidation scenario [4] again gives welfare gains for Germany, which are higher than the sum of the isolated scenarios (14.28 > 9.65 + 3.09). But still the effects are significantly lower for Germany than in the euro area coordinated combined policy scenario [5] (20.29 > 14.28).

From the GDP-only specification of the objective function we conclude that structural policies are superior in the long-run and dominate fiscal reforms. Significant advantages of coordination can be confirmed. Fiscal consolidations without structural reforms have a lower overall impact, but can make sense as additional policy measures in combination with structural reforms.

One can argue that economic policy-makers usually have a larger number of targets and hence their preferences should be modelled by a more comprehensive welfare (loss) function. For this reason, and to get some hints on the sensitivity of the welfare results, we include real GDP, employment, and inflation as arguments in the objective function (Table 9). For this set of calculations, we chose an asymmetric specification of the inflation objective, meaning that lower inflation will be regarded as a benefit in terms of the objective function.

From the qualitative point of view, the results are very similar to the results in the previous specification, which only includes GDP. Still the coordinated euro area structural reforms (scenario [1]) dominate the coordinated euro area fiscal reforms (scenario [2]) significantly, both on the individual country levels and on the overall euro area level. Combined coordinated policy (scenario [5]) again proves to give better results than isolated policy measures scenarios (41.14 > 18.11 + 6.61, for the euro area).

For the Italian fiscal consolidation in combination with the German structural reforms efforts (scenario [3]), now even negative (but very small) effects can be observed (-0.06). Welfare gains for Germany are slightly lower compared to the euro area coordinated structural reforms scenario (3.07 < 3.33). Spillover effects to the other euro area countries and regions are very small (but positive). The combined German structural and fiscal reforms scenario (scenario [4]) leads to welfare gains in Germany and moderate positive spillover effects to the other euro area countries. Note that from the point of view of Italy, welfare effects are higher if Italy pursues no active fiscal consolidation in combination with the German structural reforms but Germany also reduces public consumption. These external effects (due to relatively strong spillover effects from Germany to Italy) might be again a case for international policy coordination.

Table 9: Welfare effects (GDP, inflation, and employment targets with asymmetric inflation target)

	Scenario [1]	Scenario [2]	Scenario [3]	Scenario [4]	Scenario [5]
Germany	3.33	1.29	3.07	5.18	7.40
Austria	2.83	1.28	0.10	0.65	6.79
Italy	5.96	1.59	-0.06	0.84	12.37
France	2.96	1.44	0.07	0.98	7.81
Rest of euro area	3.04	1.01	0.04	0.51	6.77
Total euro area	*18.11*	*6.61*	*3.22*	*8.17*	*41.14*

[Note: Positive figures denote welfare gains, negative figures welfare losses.]

As a next step, we modify the objective function by including the deficit of the public sector, still maintaining an asymmetric inflation target (Table 10). There is no consensus among economists whether the public deficit should be present in the objective function. On the one hand, deficits can be regarded as intermediate objectives for sustainable public budgets. As there is an intertemporal budget constraint for the public sector, sustained excessive deficits will eventually lead to higher taxes (or a reduction in public expenditure) in the long-run and might influence output by this mechanism. In this view, public deficits will be indirectly included in the output target. On the other hand, the deficit constraints imposed by the Stability and Growth Pact are binding for the euro area Member States and could therefore be seen as one of the important goals of economic policy makers. Irrespective of this discussion, we also look at some results including the deficit target to assess the sensitivity of the results

with respect to this variable. The calculations show that most of the main findings of the previous welfare calculations can be confirmed with the deficit present in the objective function. The most striking difference to the previous results is that now fiscal consolidation scenarios yield higher benefits than the structural reforms. This is of course due to the inclusion of the deficit as an explicit target in the objective function. This result is simply implied by the objective function and states that, if the deficit is regarded as an important separate target, fiscal consolidation efforts will be most beneficial.

Table 10: Welfare effects (GDP, inflation, employment, and public deficit targets with asymmetric inflation target)

	Scenario [1]	Scenario [2]	Scenario [3]	Scenario [4]	Scenario [5]
Germany	3.12	6.58	2.81	10.90	14.61
Austria	2.69	7.30	0.12	0.62	14.82
Italy	5.49	7.45	5.17	0.80	20.24
France	2.61	6.98	0.07	0.87	14.47
Rest of euro area	2.83	6.10	0.05	0.48	13.49
Total euro area	*16.74*	*34.41*	*8.21*	*13.67*	*77.62*

[Note: Positive figures denote welfare gains, negative figures welfare losses.]

To assess the implications of switching to a symmetric punishment of inflation deviations, Table 11 presents the results of such an exercise. The calculations show again that the main findings of the previous welfare calculations can be confirmed. Generally, positive welfare effects are lower now because deviations of the inflation rate in both directions are regarded as welfare losses. The most interesting differences can be found in scenario [4], the Germany-only structural reforms and fiscal consolidation shock. Spillover to the large euro area countries is now negative; the spillover to Austria (as a small country with a high level of interdependence with the German economy, mainly due to foreign trade flows) is close to zero. Obviously, this result provides an argument against non-coordinated policies.

Table 11: Welfare effects (GDP, inflation, employment, and public deficit targets with symmetric inflation target)

	Scenario [1]	Scenario [2]	Scenario [3]	Scenario [4]	Scenario [5]
Germany	3.07	6.21	2.76	10.68	14.10
Austria	2.64	7.02	0.11	0.04	14.44
Italy	5.31	7.11	3.60	-0.53	19.43
France	2.46	6.65	0.06	-0.42	13.95
Rest of euro area	2.79	5.71	0.04	-0.50	12.97
Total euro area	*16.27*	*32.69*	*6.57*	*9.27*	*74.88*

[Note: Positive figures denote welfare gains, negative figures welfare losses.]

The results of the welfare assessment of different scenarios show that coordinated euro area wide structural reforms are likely to be very successful in terms of improving economic welfare. If deficits also matter as final objectives (which is denied by many economists), fiscal reforms also produce good welfare results. If deficits are only intermediate objectives, structural reforms outperform fiscal reforms significantly, but overall economic performance can still be improved by implementing both structural and fiscal reforms.

It can be concluded that coordinated euro area wide structural reforms will always give good results and should be implemented in any case. Coordinated fiscal consolidation efforts will be suitable supportive policy measures (or even useful stand-alone strategies, if the fiscal deficit itself is regard as an objective). In any case, coordination pays off for the participating economies and avoids negative external effects or free rider problems, which can be identified in some asymmetric scenarios with different policies in different countries.

PART 3: CONCLUSIONS

8   Summary, recommendations and future research

The European Economic and Monetary Union (EMU) is characterised by an asymmetric division of competences on the field of economic policy-making: While monetary policy is conducted centrally by the European System of Central Banks and the European Central Bank (ECB) in particular, structural and fiscal policies remain under the responsibility of the individual Member States, but they are subject to intensive consultation and multilateral surveillance. Article 99 of the EC Treaty calls on Member States to regard their economic policies as a matter of common concern and to coordinate them in the Council. Common principles are laid down in the Broad Economic Policy Guidelines, which encourage structural reforms in product and factor markets, and (together with the Stability and Growth Pact) promote fiscal discipline.

Given this institutional structure, the question arises whether the macroeconomic performance and ultimately welfare in the EMU can be improved by the coordination of economic policy-measures among the Member States. Policy coordination may in particular be justified in the presence of significant economic spillover. Evidence on the size, timing and macroeconomic effects of spillover supports the ongoing debate on the need for greater flexibility in the euro area's budgetary rules and on strategies for structural reforms on capital, labour and product markets

The main aim of this study is to provide plausible estimates of the magnitude of economic spillover and the welfare effects of economic policy coordination in the euro area. To this end, the study

1. estimates spillover from fiscal policy to short-term interest rates;
2. estimates spillover from fiscal policies to long-term interest rates;
3. estimates effects of and spillover from structural policies;
4. estimates macroeconomic and welfare effects of structural and budgetary policies.

In a highly integrated economic space such as the euro area, the spillover from fiscal policies is likely to be important and complex. Several transmission channels are at work. Fiscal policy actions taken in individual countries affect output and inflation in the other Member States not only directly through international trade; the transmission via the common interest rate and the real exchange rate is also important. The empirical analysis of the spillover from

fiscal policy on the short-term interest rate in the euro area was carried out with a VAR model of the aggregate euro area economy and VAR models of individual Member States. In the aggregate model we find weak evidence of direct spillover between monetary and fiscal policies in the euro area. In particular, a positive interest rate shock reduces the fiscal balance. A positive shock to the fiscal balance tends to reduce the interest rate in the short run, but this effect is rather small. Furthermore, an improvement of the fiscal balance in the aggregate euro area has a small but positive effect on output, suggesting the existence of non-Keynesian effects from fiscal consolidation. The disaggregated analysis shows that behind the aggregate behaviour of the euro area economy, there is a whole multitude of country-specific adjustments at work. Therefore, the spillover from a fiscal policy shock in the rest of the euro area varies considerably across Member States.

Evidence on significant spillover from fiscal policies to long-term interest rates would support the view that fiscal discipline is supportive for the growth potential of the euro area. Budgetary consolidation would contribute to increased growth in the long run by promoting private investment. Fears of fiscal profligacy underlie the fiscal rules of EMU. The mitigating effect of financial integration on domestic interest rates is enhanced by the expectations of fiscal or monetary bail-outs under a common currency. Such spillover effects on long-term interest rates would exacerbate crowding-out effects at the EMU level. Therefore, crowding-out and spillover effects of deficit and debt accumulation for both the euro area as a whole and the major Member States have been investigated by applying structural VAR models.

The main result is that spillover dilutes the effects of fiscal policy on long-term interest rates in the euro area. With the exception of some highly indebted countries, there are hardly any significant responses to changes in domestic fiscal policies. Aggregate euro area responses, on the other hand, are stronger than for the individual Member States. Moreover, the crowding-out effect at the level of individual Member States is enhanced when aggregate euro area conditions are taken into account. It is mainly through the accumulation of debt that long-term interest rates crowd out private demand. The consolidation of public finances would thus be supportive to private investment and capital accumulation.

The benefits of fiscal discipline would come from an enhanced growth potential of the economy in the longer run. The way to achieve this reduction in public debt is less obvious and depends on the sources of the interest rate spillover. The evidence in this report leads us

to believe that spillover comes mainly from financial integration. Further liberalisation and ongoing integration of financial markets would improve efficiency in the allocation of savings both between countries and between the private and public sectors.

While this report has found evidence of the crowding-out and spillover effects of fiscal policies on long-term interest rates, some issues deserve further research. Among those aspects that could be examined more closely, one important topic is the source of the spillover in the EMU. If spillover is mainly related to capital market integration, fiscal policies probably have global rather than regional effects. An extension of the results to incorporate the fiscal stance in other OECD countries, especially the United States and Japan, could shed light on this question. Monetary union is a complete overhaul of both the monetary and the fiscal policy regime. The foundations for governments' financing decisions have changed completely, and they are regulated by a combination of deficit rules and the no-bail-out clause. The estimates presented in this report are probably a conservative lower limit on the importance of spillover. In order to explicitly take EMU conditions into account, an empirical benchmark would need to be constructed that mimics the effect of monetary union. Uniform monetary policy settings can be simulated as in Beetsma and Giuliodori (2004).

Another issue to be studied further concerns the possible instability of the results regarding the effects of fiscal policies, as diverging effects might arise from strong fiscal consolidations, changes in the composition of the budget, political turmoil, etc. Testing explicitly for the significance of structural breaks could help to locate the origins of such shifts. In particular, it would be useful to ascertain whether stronger spillover effects in the EU started with the Single Market Programme in 1992 or have changed their character only since 1999. A sequential sup Quandt-Andrews likelihood ratio test could be applied to search endogenously for break dates in the empirical model.

Finally, the total costs of the large short-run impact of net lending shocks have to be compared against those of the long-run rise in interest rates. As a related issue, the eventual crowding-in of private investment needs some quantification to provide a view of the benefits of fiscal discipline. Fiscal policy is not the main driver of long-term interest rates. In addition, not all fiscal expansions consist of unproductive expenditures, and government bond finance competes with private issuances for funding. The role of productive government expenditures should be considered.

The empirical investigations of the spillover from fiscal policies to short- and long-term interest rates have rested on the assumption of linear relationships between the variables. Robustness checks suggest that this assumption seems warranted.

Structural reforms on the product and factor markets should strengthen competition in the euro area. In a more competitive environment, the scope for exploiting economic rents would be reduced. As a result, mark-ups would decline, i.e. prices would come closer to marginal cost. According to our estimates, even though the fostering of competition with the Single Market Programme has reduced mark-up ratios in the euro area, they are still substantially higher than in the US; mark-ups in the euro area are also larger than in the UK. In future research on mark-ups in the euro area, the results presented in this report could be complemented by analyses at the sectoral level, as in Przybyla and Roma (2005).

Significant deviations of prices from production costs distort the efficient allocation of resources. Prices are higher and output is lower than under more intensive competition. These inefficiencies negatively affect technical progress and the growth potential of the economy. Endogenous growth models conclude that fostering competition may reduce rents to be accrued without engaging in innovation by more than post-innovation rents. Thus, reforms that reduce mark-up would induce firms to engage in innovation activities. As a result, total factor productivity (TFP) would be supported. Panel estimations show that a reduction of the mark-up in the euro area by 10 percent (which is around the difference to the US level) would raise average TFP growth by around 0.57 percentage points. Besides total factor productivity, employment and the growth rate of labour productivity would be supported by reducing the mark-up ratios in the euro area. Lack of competition, in particular on the labour market, may induce trade unions to claim parts of the economic rent. Structural reforms reduce the mark-up of prices over marginal cost by increasing potential and actual competition. As the example of the telecommunication sector has shown, the liberalisation of formerly regulated markets tends to reduce prices and to increase productivity. Since entry barriers are reduced, the number of firms increases, entailing a positive impact on job creation. Employment is also supported by the fact that lower profit margins are accompanied by lower real wage claims and thus by reduced structural unemployment.

The institutional framework is an important determinant of the degree of competition. The latter in turn determines the scope for setting prices significantly above marginal cost. A highly regulated labour market allows employers' and employees' associations to share economic rents. Labour market regulations protecting workers or providing generous benefits to the unemployed tend to increase the reservation wage, thus leading to higher wage demands. Companies will react by decreasing their workforce. Both longer unemployment benefit durations and a higher benefit replacement rate would positively influence the mark-up. In contrast, a higher degree of wage bargaining coordination would allow account to be taken of economy-wide developments in the wage negotiations. Thus, a higher degree of coordination would reduce the wage pressure and thus the mark-up. Besides the labour market, product market institutions are crucial. As an important example, a high degree of actual or potential international competition reduces the scope for companies to set prices above marginal cost.

The main aim of the investigation of structural reforms in the present report was to provide the basis for model simulations so as to derive welfare implications of spillover from structural policies and from the interactions between structural and fiscal policies. But as some of the panel estimations in this report exhibit unsatisfactory statistical properties, further research on the effects and institutional determinants of the mark-up ratios is encouraged.

The macroeconomic and welfare effects of both structural reforms and budgetary consolidations have been determined by means of simulations with the MSG3 Model, a dynamic, intertemporal, general-equilibrium model of a multi-region world economy.

Structural policies have been implemented by assuming that total factor productivity will gradually increase over a period of five years to a level 0.57 percent higher for the euro area as a whole. For individual countries, the TFP shift varied between 0.54 and 0.75 percent. If TFP increases in one country only, real GDP of the country directly affected rises over six years and then stays at the higher level forever. The effects are stronger for Italy than for Germany. The current account improves permanently, the public-sector deficit remains below baseline values, causing public debt to fall indefinitely. Employment rises slightly (with a minimal permanent effect), inflation falls temporarily. Euro area countries not directly affected exhibit only temporary positive spillover effects to GDP, small permanent negative ones to the current account and positive ones to public deficit and debt. Interest rates rise in

the short run and fall below baseline in the long run. Spillover effects are stronger for Germany than for Italy due to the different sizes of the economies. A productivity shock to the entire euro area brings about positive effects for all Member States. Interestingly, also the effects on Germany and Italy are stronger than in the case where only one of these countries is affected. Hence, there are positive spillover effects from a coordinated structural policy in the euro area.

Besides implementing structural reforms, different strategies of consolidating the general government budget have been analysed by means of model simulations. The results of these simulations can be briefly summarised as follows: After a decrease of public investment, long-term interest rates overshoot and stay above baseline values, with negative effects on capital and wealth. This leads to public debt overshooting in later periods of the simulation; hence the original improvement of the public sector's debtor position is reversed in the long run for the countries/regions that reduce public investment. From this, we can conclude that both the short-run and the long-run effects clearly speak against using public investment as a means of consolidating the budget of the public sector. Thus, in the following, decreases of public consumption and increases of lump-sum taxes (or, equivalently, decreases of lump-sum transfers) are considered. In addition to implementing only one of these measures at a time, as a third option a combination of reducing public consumption and (to a lower extent) net taxes has been analysed.

In the country/region directly affected by the budgetary consolidation policies, all simulations are characterised by a Keynesian reaction of lower than baseline real GDP and employment in the short run and a non-Keynesian reaction of higher than baseline real GDP and employment in the medium term. The former effect is the familiar result of a reduction of (public or private) demand. The non-Keynesian effect, which in most cases exceeds the short-run Keynesian effect, is mainly due to the reduction of the public deficit and hence public debt, resulting in lower rates of interest and higher private wealth; it is also partly due to the increase in competitiveness as shown by the improved current account. As the budgetary consolidation policy is modelled as temporary (although over a fairly long time horizon of 12 years), in the long run the economies return to the baseline path rather quickly after these 12 years. Only public debt remains well below baseline values for many years, inducing a (very modest) long-run increase of real GDP over its baseline values. By contrast, a permanent

reduction of public consumption and hence the budget deficit can lead to substantial permanent gains in output.

Although the general behaviour of the variables of the countries directly affected by the policy shock is the same in all simulations considered, there are some differences in detail. Comparing the three methods of reducing the budget deficit, we can see that lowering public consumption and taxes simultaneously gives the strongest effects, followed by decreasing public consumption only, while lump-sum (net) tax increases result in the weakest reactions.

There are some differences between spillover effects when only one country undergoes budgetary consolidation. When Germany is the only country to consolidate, the macroeconomic effects within the country are weaker than in the case of Italy consolidating its budget. On the other hand, budgetary consolidation in Germany induces much stronger spillover effects on the other euro area economies and the common interest rate than budgetary consolidation in Italy, where the spillover effects are negligible. Spillover to GDP, employment and the current account of other Member States are anti-symmetric, reflecting shifts of demand due to both absorption and relative price effects.

A more interesting distinction can be made between the simulations where only one country implements the budgetary consolidation policy and those where the entire euro area consolidates. In the case of a coordinated budgetary consolidation for the entire euro area, there are gains from coordination: Negative short-run Keynesian effects on GDP and employment are weaker, deficit and debt reductions are stronger and hence medium-run positive non-Keynesian effects on GDP and employment are also stronger than if one country only consolidates; this is true also for the country in question. Moreover, inflation oscillates less in the coordination than in the non-coordination scenarios. As for the simulations of structural policies and their effects on TFP, it turns out that coordinated policy-making brings about a "coordination dividend" for the countries participating.

In addition to implementing either only structural reforms or budget consolidation policies separately, combinations of both policies may be pursued. In the short run, such policy combinations result in almost additive combinations of the effects of the single policies combined. For instance, with respect to GDP and employment, the negative short-run effect of budgetary consolidation combines with the positive effect of structural reforms to give

ambiguous results in the first periods, whereas for public deficit and debt, inflation and interest rates, the favourable effects of both policies reinforce each others. The long-run effects are probably more revealing, given the EU political objective of achieving higher growth and more jobs during the remainder of the decade and beyond. The combination of structural and budgetary consolidation policies, even when confined to one single Member State without any policy change in other countries, suffices to make higher GDP, current account improvements, lower public budget deficit and lower public debt sustainable in the long run. There is also some permanent international spillover to the other euro area economies; the size of these long-run spillover effects depends primarily upon the economic size of a country and its international trade and financial flows with the other euro area countries and less on the effectiveness of its policies on its own economy. The ultimate coordination scenario for the euro area is for all euro area countries to implement both the structural reforms and a budgetary consolidation policy . In this area-wide common policy scenario, real GDP remains above baseline for all countries in the long run. Permanent improvements also apply to the current account, the public deficit and public debt in all Member States. The short-run interest rate is below baseline in the long run.

The most important lessons from these simulations are the following: In the long run, the effects of structural policy reforms that increase the TFP level permanently dominate and can bring about a permanent improvement of key macroeconomic target variables such as output and public finances. In the medium run, budgetary policies are stronger, but as we have assumed that the budget consolidation will be done over a limited time period, it exerts almost no permanent effects (except on public debt) unless supported by structural reforms. International spillover effects within the euro area are relatively small (except those from the biggest economy, Germany) and can be advantageous (mostly through the channel of the common interest rate) or disadvantageous (especially if they affect the competitiveness of some countries at the expense of other Member States within the euro area). As many other studies on international macroeconomic policy-making have shown, we can confirm that coordinated policies are superior to non-coordinated policies, and using two (or more) instruments is superior to relying on one instrument only. Our results show that the most effective way of achieving permanently higher output and lower public debt without undesirable side-effects is via a euro area-wide coordinated design of both structural and budgetary consolidation policies. How such coordination can be achieved is a political question which goes beyond the scope of the present study.

The calculation of welfare effects confirms the impression obtained from inspecting the time paths of the main policy variables in the different simulations. Structural policy effects were assessed rather cautiously. Although their effects are permanent in the long-run, their overall welfare effects are moderate in our objective function. Budgetary consolidation in the entire euro area, although of a temporary nature, leads to strong favourable effects on public finances and – in spite of short-run losses of output and employment – on output in the medium term, hence the overall welfare effects are stronger than those of structural reforms. If two countries enact different policies, the welfare effects on each of them are weak and the welfare spillover on other countries is negligible. Welfare spillover effects on other countries can even be negative if one country changes its policies in isolation, although by combining the two types of policies, the resulting welfare effects for this country are higher than the sum of the welfare effects from implementing these policies separately. This becomes most evident from the coordinated euro area reform scenario. Here all countries/regions enjoy high welfare gains. This demonstrates very clearly that there are strong positive spillover effects not only between different countries' policies but also between different kinds of policies, in this case between structural policies and budgetary consolidation policies. As this result is fairly robust against variations in several parameters of the objective function, we think that it provides a strong argument in favour of policy coordination within the euro area.

In future research, the model simulations could be extended by dynamic games, implying different assumptions on policy reactions. The following scenarios could be investigated:

I.   No policy reaction at all: Such a scenario corresponds to strict rule-based behaviour of economic policy authorities. In particular, a set of scenarios might assume a temporary demand-side or supply-side shock and calculate the time paths of the policy target variables in the euro area countries resulting from that shock. Exogenous increases in government expenditures or decreases of tax revenues due to, for instance, environmental catastrophes, floods, etc. could be related directly to supply-side shocks; if such budgetary changes (and the resulting deficits) are due to deficient demand outside the euro area, they could be related to demand-side shocks. "No-policy" simulations should show the differences of macroeconomic consequences for the euro area between these different shocks.

II.   Alternatively (and more realistically), active macroeconomic policy reactions could be taken into account in the simulations of the MSG3 Model, which would correspond to flexible policy rules (or "limited discretion": policies designed according to some rule taking into account the current economic situation). Two different groups of scenarios could be considered:

a.   non-cooperative reactions (a dynamic Nash game between fiscal policy-makers in the euro area), where each government takes into account only the target variables of its own country, where possible differences of policy preferences with respect to, e.g., price stability vs. employment can also be taken into account;

b.   a cooperative (coordinated) reaction, with a common (aggregated) objective function for the entire euro area to be optimised jointly (a dynamic Pareto game of euro area policy-makers). This may be supplemented by an analysis of partial cooperation, for instance of a coalition of countries preferring price stability or a balanced budget more strongly than another coalition giving higher priority to short-run employment goals (see Di Bartolomeo et al., 2005 for a first analysis of policy-makers' coalitions in a dynamic macroeconomic game).

Comparisons between outcomes of scenarios (I) and (IIa) would provide information about spillover without and with policy intervention, whereas comparisons between outcomes of scenarios (IIa) and (IIb) would provide information about spillover without and with policy coordination. As these simulations would deliver not only quantitative values of macroeconomic target (and other) variables but also of the (assumed) objective functions, conclusions about the desirability of policy coordination in terms of "welfare" (if identified with the assumed objective functions) could be drawn from such an analysis.

APPENDIX

Appendix 1a: Variables used for chapter 3

The definitions of the variables used in the analysis in chapter 3 and the data sources that have been used are given in the following table.

Table 12: Data definitions and sources for chapter 3

Variable	Definition	Unit	Source
GDP	Gross Domestic Product	Mio EUR	OECD MEI and QNA
PGDP	GDP deflator	Index (1995=100)	OECD MEI and QNA
SIN	Short Term Interest Rate	%	OECD MEI and QNA
OIL	Oil price	US dollar per barrel	IMF IFS
CUA	Current account	Mio EUR	OECD MEI and QNA
NLG	Net Lending Government	Mio EUR	IMF IFS
YGAP	Output gap	%	OECD MEI and QNA
INF	Inflation Rate	%	OECD MEI and QNA
DEPREUR	Depreciation euro exch .rate	% p.a. EUR/USD	OECD MEI and QNA
DUM_EUR	EMU dummy	= 1 after 99:I	
WTR	World Trade	Billion USD	IMF IFS

The following sample period was used when estimating the SVAR for the various countries:

Table 13: Sample period VAR model estimations, chapter 3

Country	Sample / number of observations
euro area	1981:III - 2003:IV, 90 observations
Austria	1981:II - 2003:IV, 91 observations
Belgium	1981:II - 2003:IV, 91 observations
Finland	1981:II - 2003:IV, 91 observations
France	1981:II - 2003:IV, 91 observations
Germany	1981:II - 2003:IV, 91 observations
Greece	1981:IV - 2003:IV, 89 observations
Ireland	1981:II - 2003:IV, 90 observations
Italy	1981:II - 2003:IV, 90 observations
The Netherlands	1981:II - 2003:IV, 91 observations
Portugal	1981:III - 2003:IV, 90 observations
Spain	1981:II - 2003:IV, 91 observations

Table 14: Cross-country correlations of output, inflation and fiscal deficits in the euro area

	YGAP_AUS	YGAP_BEL	YGAP_EA	YGAP_FIN	YGAP_FRA	YGAP_GER	YGAP_GRE	YGAP_IRE	YGAP_ITA	YGAP_NET	YGAP_POR	YGAP_SPA
YGAP_AUS	1.00	0.24	0.37	-0.08	0.24	0.34	0.28	0.14	0.36	0.22	0.10	0.07
YGAP_BEL	0.24	1.00	0.68	0.31	0.70	0.57	0.36	0.60	0.58	0.41	0.53	0.52
YGAP_EA	**0.37**	**0.68**	**1.00**	**0.35**	**0.90**	**0.95**	**0.37**	**0.71**	**0.81**	**0.69**	**0.63**	**0.68**
YGAP_REA	**0.33**	**0.67**	**-**	**0.30**	**0.84**	**0.82**	**0.36**	**0.70**	**0.75**	**0.62**	**0.62**	**0.65**
YGAP_FIN	-0.08	0.31	0.35	1.00	0.23	0.28	0.07	0.52	0.46	-0.05	0.31	0.47
YGAP_FRA	0.24	0.70	0.90	0.23	1.00	0.79	0.31	0.65	0.74	0.54	0.76	0.67
YGAP_GER	0.34	0.57	0.95	0.28	0.79	1.00	0.33	0.56	0.65	0.64	0.49	0.57
YGAP_GRE	0.28	0.36	0.37	0.07	0.31	0.33	1.00	0.22	0.30	0.23	0.19	0.16
YGAP_IRE	0.14	0.60	0.71	0.52	0.65	0.56	0.22	1.00	0.79	0.46	0.58	0.56
YGAP_ITA	0.36	0.58	0.81	0.46	0.74	0.65	0.30	0.79	1.00	0.44	0.66	0.54
YGAP_NET	0.22	0.41	0.69	-0.05	0.54	0.64	0.23	0.46	0.44	1.00	0.25	0.42
YGAP_POR	0.10	0.53	0.63	0.31	0.76	0.49	0.19	0.58	0.66	0.25	1.00	0.62
YGAP_SPA	0.07	0.52	0.68	0.47	0.67	0.57	0.16	0.56	0.54	0.42	0.62	1.00

(a) correlations of output gaps

	INF_AUS	INF_BEL	INF_EA	INF_FIN	INF_FRA	INF_GER	INF_GRE	INF_IRE	INF_ITA	INF_NET	INF_POR	INF_SPA
INF_AUS	1.00	0.74	0.83	0.59	0.76	0.70	0.74	0.59	0.79	0.39	0.66	0.78
INF_BEL	0.74	1.00	0.88	0.67	0.86	0.68	0.77	0.68	0.81	0.27	0.81	0.85
INF_EA	**0.83**	**0.88**	**1.00**	**0.78**	**0.97**	**0.78**	**0.86**	**0.75**	**0.97**	**0.34**	**0.84**	**0.95**
INF_REA	**0.83**	**0.87**	**-**	**0.77**	**0.92**	**0.66**	**0.85**	**0.74**	**0.93**	**0.30**	**0.84**	**0.94**
INF_FIN	0.59	0.67	0.78	1.00	0.79	0.45	0.74	0.63	0.81	0.20	0.73	0.76
INF_FRA	0.76	0.86	0.97	0.79	1.00	0.62	0.78	0.82	0.96	0.35	0.83	0.93
INF_GER	0.70	0.68	0.78	0.45	0.62	1.00	0.71	0.45	0.63	0.19	0.60	0.69
INF_GRE	0.74	0.77	0.86	0.74	0.78	0.71	1.00	0.43	0.84	0.04	0.87	0.86
INF_IRE	0.59	0.68	0.75	0.63	0.82	0.45	0.43	1.00	0.74	0.49	0.52	0.67
INF_ITA	0.79	0.81	0.97	0.81	0.96	0.63	0.84	0.74	1.00	0.30	0.82	0.92
INF_NET	0.39	0.27	0.34	0.20	0.35	0.19	0.04	0.49	0.30	1.00	0.00	0.21
INF_POR	0.66	0.81	0.84	0.73	0.83	0.60	0.87	0.52	0.82	0.00	1.00	0.91
INF_SPA	0.78	0.85	0.95	0.76	0.93	0.69	0.86	0.67	0.92	0.21	0.91	1.00

(b) correlations of inflation rates

	NLGY_AUS	NLGY_BEL	NLGY_EA	NLGY_FIN	NLGY_FRA	NLGY_GER	NLGY_GRE	NLGY_IRE	NLGY_ITA	NLGY_NET	NLGY_POR	NLGY_SPA
NLGY_AUS	1.00	0.36	0.65	0.33	0.36	0.10	0.29	0.31	0.60	0.46	0.10	0.34
NLGY_BEL	0.36	1.00	0.71	0.09	-0.06	0.22	0.57	0.82	0.72	0.69	0.72	0.49
NLGY_EA	**0.65**	**0.71**	**1.00**	**0.45**	**0.44**	**0.45**	**0.53**	**0.67**	**0.87**	**0.80**	**0.45**	**0.63**
NLGY_REA	**0.62**	**0.62**	**-**	**0.40**	**0.25**	**0.22**	**0.48**	**0.66**	**0.68**	**0.76**	**0.44**	**0.52**
NLGY_FIN	0.33	0.09	0.45	1.00	0.67	0.09	-0.16	0.00	0.24	0.15	-0.13	0.29
NLGY_FRA	0.36	-0.06	0.44	0.67	1.00	0.13	-0.14	-0.14	0.13	0.14	-0.29	0.28
NLGY_GER	0.10	0.22	0.45	0.09	0.13	1.00	0.18	0.27	0.16	0.27	0.26	0.16
NLGY_GRE	0.29	0.57	0.53	-0.16	-0.14	0.18	1.00	0.61	0.58	0.53	0.60	0.28
NLGY_IRE	0.31	0.82	0.67	0.00	-0.14	0.27	0.61	1.00	0.71	0.78	0.91	0.49
NLGY_ITA	0.60	0.72	0.87	0.24	0.13	0.16	0.58	0.71	1.00	0.82	0.48	0.44
NLGY_NET	0.46	0.69	0.80	0.15	0.14	0.27	0.53	0.78	0.82	1.00	0.54	0.44
NLGY_POR	0.10	0.72	0.45	-0.13	-0.29	0.26	0.60	0.91	0.48	0.54	1.00	0.39
NLGY_SPA	0.34	0.49	0.63	0.29	0.28	0.16	0.28	0.49	0.44	0.44	0.39	1.00

(c) correlations of fiscal balances

Appendix 1b: Spillover effects in VAR models (from chapter 3)

Figure 39: Spillover from the (rest of the) euro area on individual countries (Austria,

Response to Generalized One S.D. Innovations ± 2 S.E.
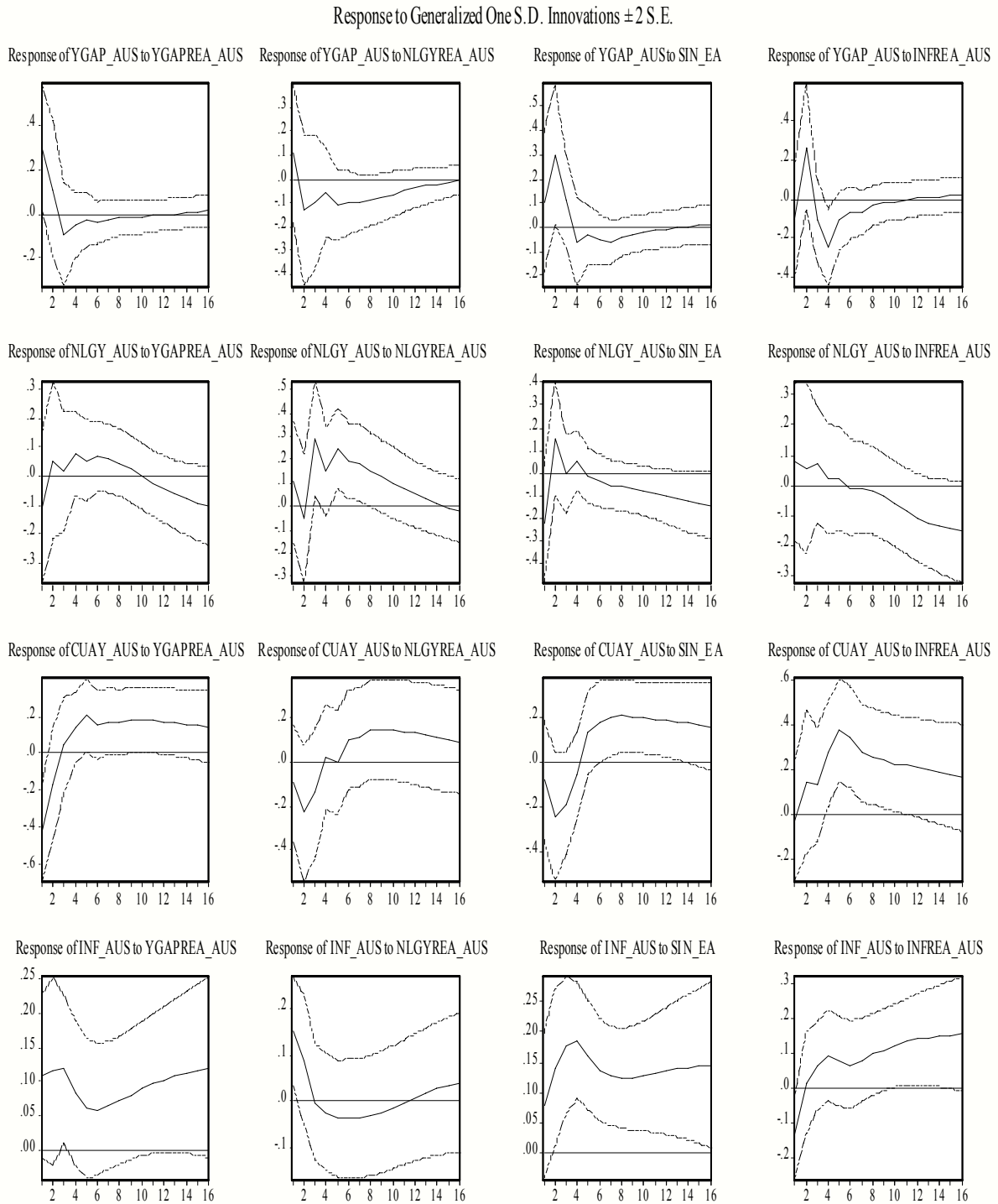
(a) Austria

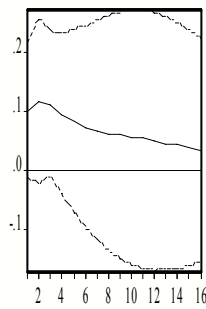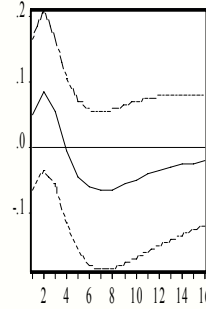Response of YGAPREA_AUS to YGAPREA_AUS Response of YGAPREA_AUS to NLGYREA_AUS Response of YGAPREA_AUS to SIN_EA Response of YGAPREA_AUS to INFREA_AUS
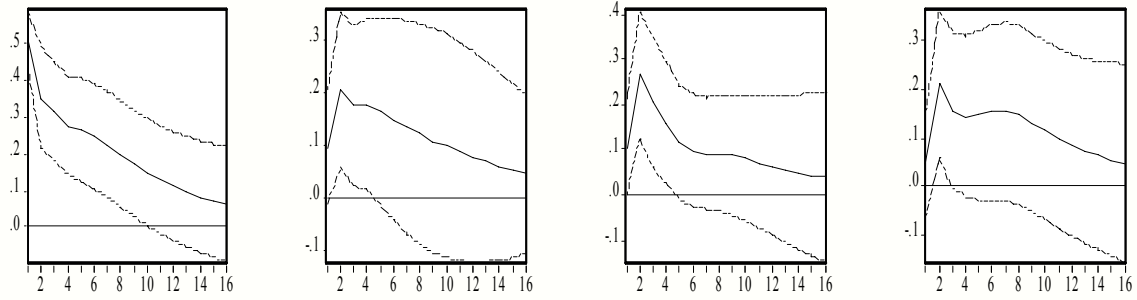
Response of NLGYREA_AUS to YGAPREA_AUS Response of NLGYREA_AUS to NLGYREA_AUS Response of NLGYREA_AUS to SIN_EA Response of NLGYREA_AUS to INFREA_AUS
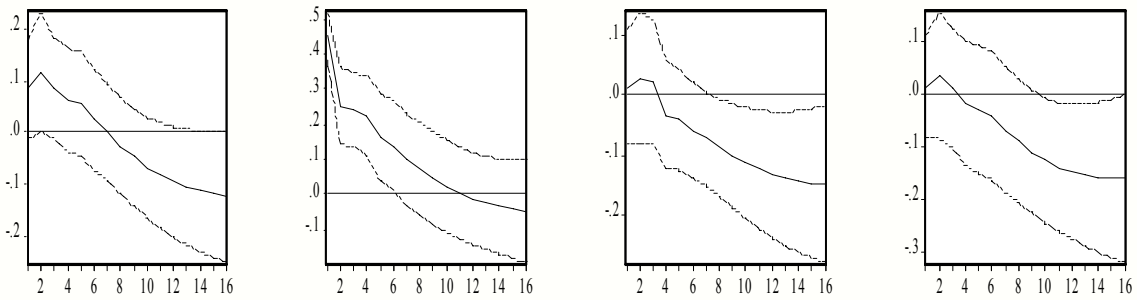
Response of SIN_EA to YGAPREA_AUS Response of SIN_EA to NLGYREA_AUS Response of SIN_EA to SIN_EA Response of SIN_EA to INFREA_AUS
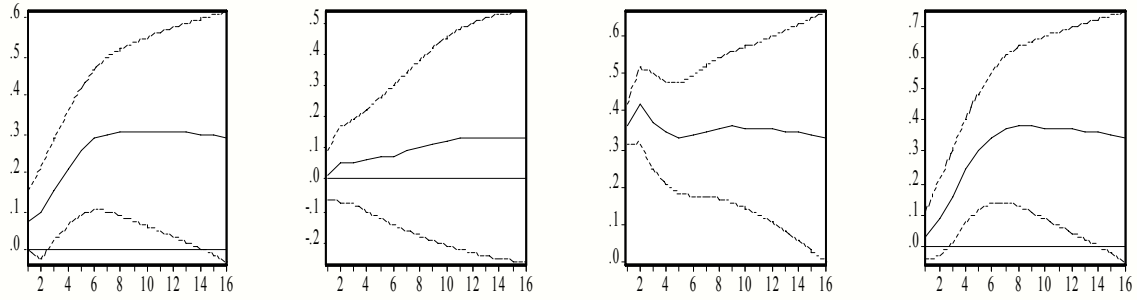
Response of INFREA_AUS to YGAPREA_AUS Response of INFREA_AUS to NLGYREA_AUS Response of INFREA_AUS to SIN_EA Response of INFREA_AUS to INFREA_AUS
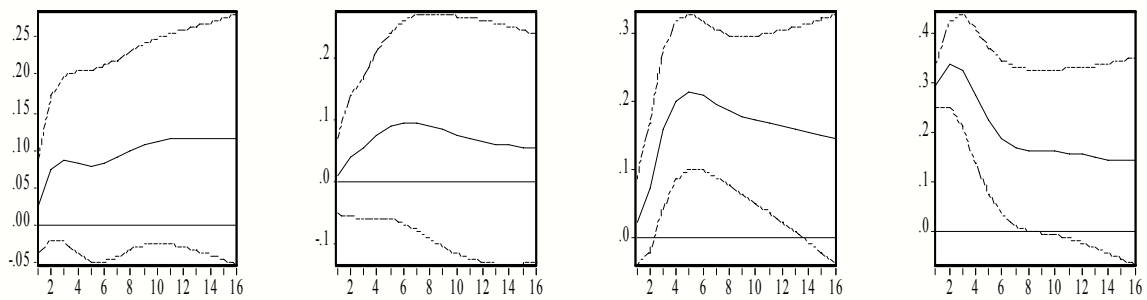
(a) Austria (cont'd)

Response to Generalized One S. D. Innovations ± 2 S.E.
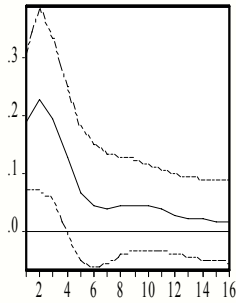
(b) Belgium

Response of YGAPREA_BEL to YGAPREA_BEL Response of YGAPREA_BEL to NLGYREA_BEL Response of YGAPREA_BEL to SIN_EA Response of YGAPREA_BEL to INFREA_BEL
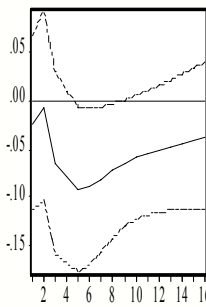
Response of NLGYREA_BEL to YGAPREA_BEL Response of NLGYREA_BEL to NLGYREA_BEL Response of NLGYREA_BEL to SIN_EA Response of NLGYREA_BEL to INFREA_BEL
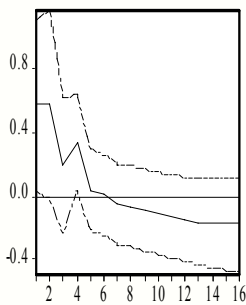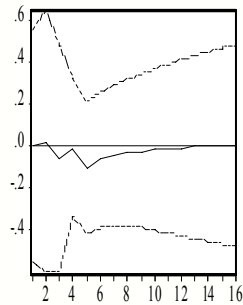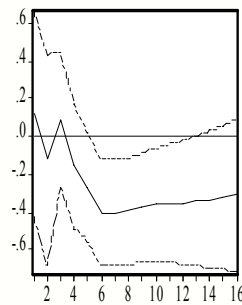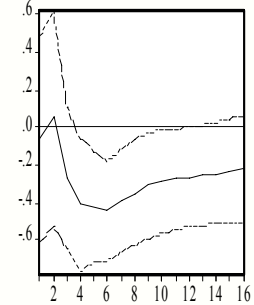
Response of SIN_EA to YGAPREA_BEL Response of SIN_EA to NLGYREA_BEL Response of SIN_EA to SIN_EA Response of SIN_EA to INFREA_BEL
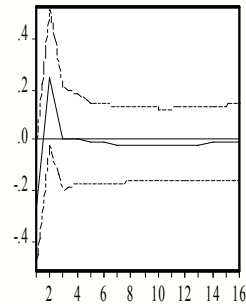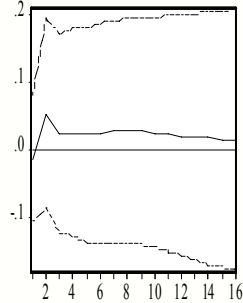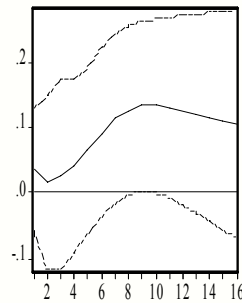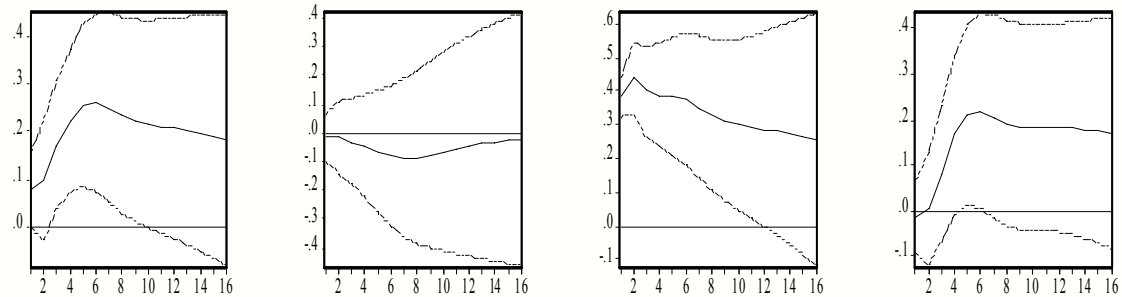
Response of INFREA_BEL to YGAPREA_BEL Response of INFREA_BEL to NLGYREA_BEL Response of INFREA_BEL to SIN_EA Response of INFREA_BEL to INFREA_BEL
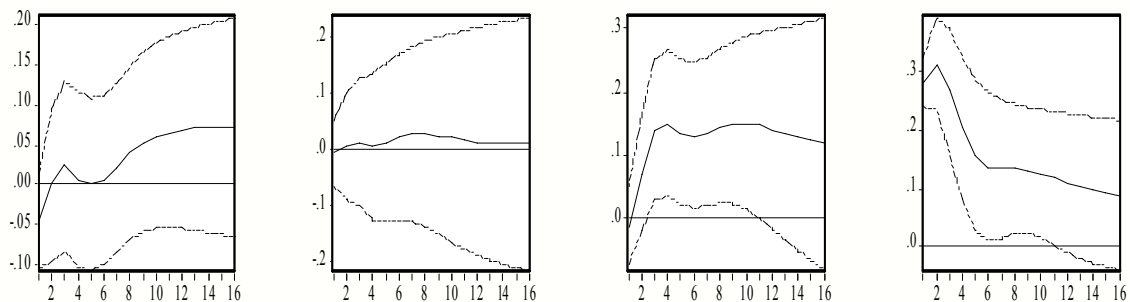
(b) Belgium (cont'd)

Response to Generalized One S. D. Innovations ±2 S.E.
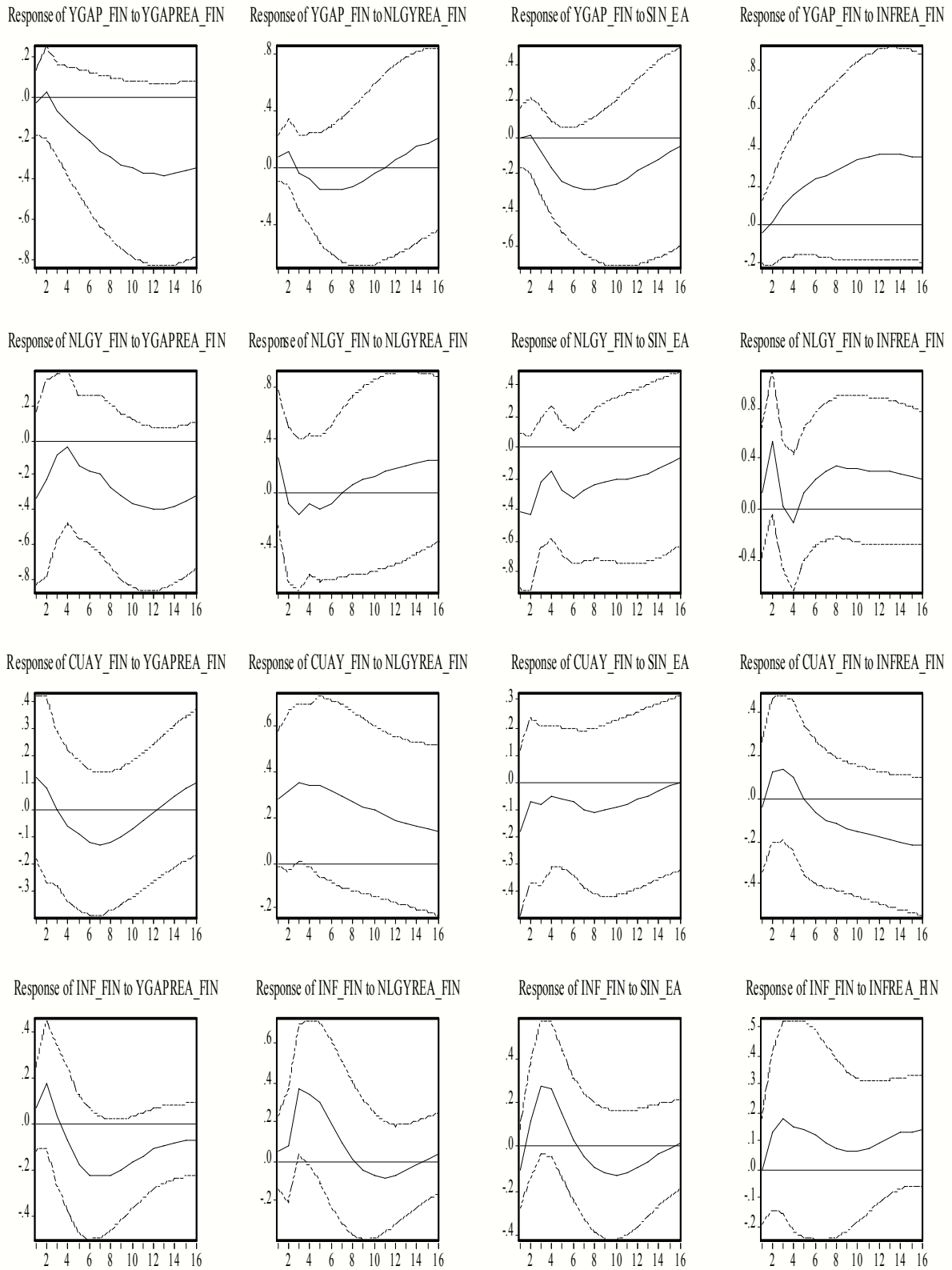
(c) Finland

Response of YGAPREA_FIN to YGAPREA_FIN

Response of YGAPREA_FIN to NLGYREA_FIN

Response of YGAPREA_FIN to SIN_EA

Response of YGAPREA_FIN to INFREA_FIN
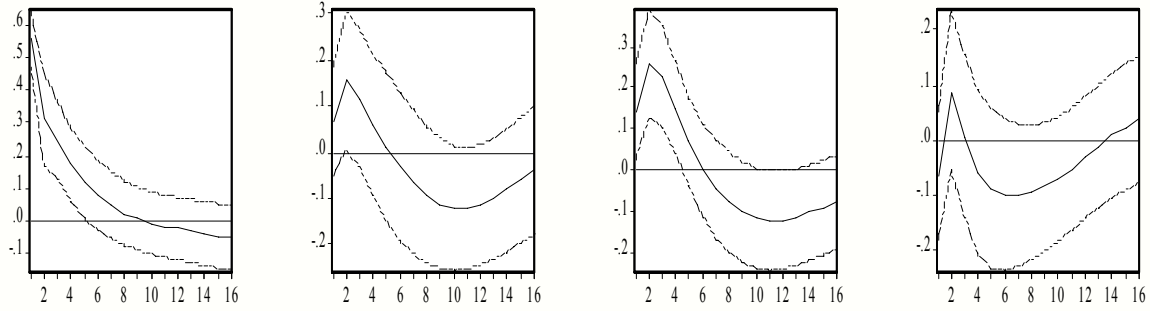
Response of NLGYREA_FIN to YGAPREA_FIN

Response of NLGYREA_FIN to NLGYREA_FIN

Response of NLGYREA_FIN to SIN_EA

Response of NLGYREA_FIN to INFREA_FIN
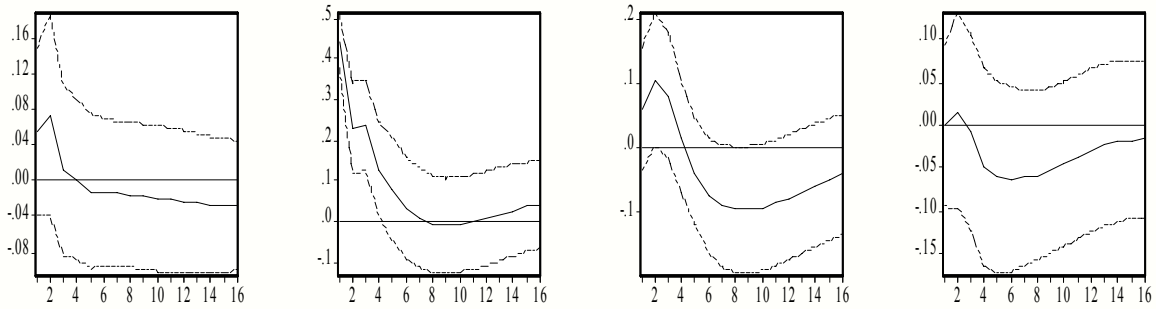
Response of SIN_EA to YGAPREA_FIN

Response of SIN_EA to NLGYREA_FIN

Response of SIN_EA to SIN_EA

Response of SIN_EA to INFREA_FIN
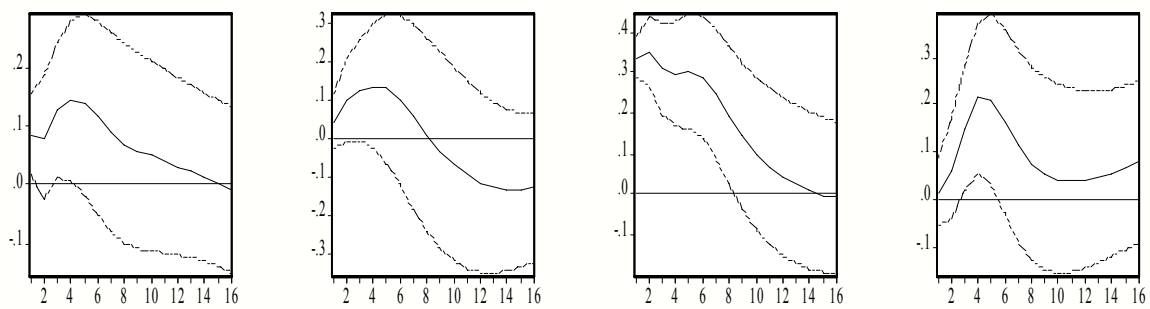
Response of INFREA_FIN to YGAPREA_FIN

Response of INFREA_FIN to NLGYREA_FIN

Response of INFREA_FIN to SIN_EA

Response of INFREA_FIN to INFREA_FIN

(c) Finland (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

(d) Greece

Response of YGAPREA_GRE to YGAPREA_GRE

Response of YGAPREA_GRE to NLGYREA_GRE

Response of YGAPREA_GRE to SIN_EA

Response of YGAPREA_GRE to INFREA_GRE
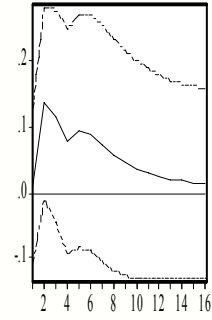
Response of NLGYREA_GRE to YGAPREA_GRE
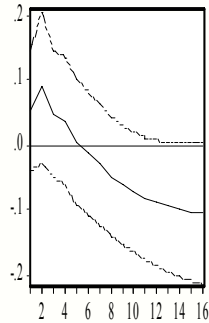
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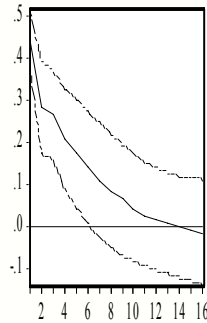
Response of NLGYREA_GRE to SIN_EA
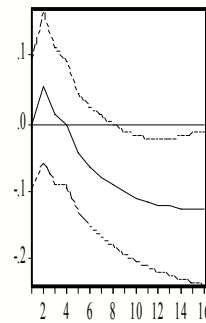
Response of NLGYREA_GRE to INFREA_GRE
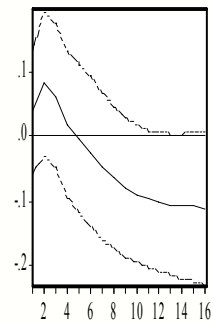
Response of SIN_EA to YGAPREA_GRE
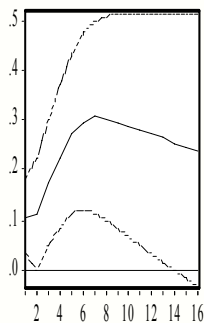
Response of SIN_EA to NLGYREA_GRE
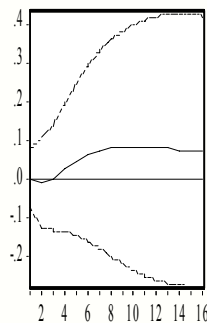
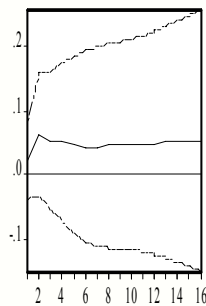Response of SIN_EA to SIN_EA
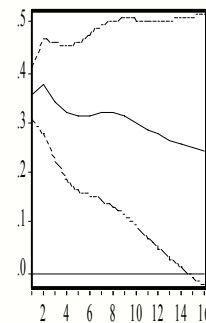
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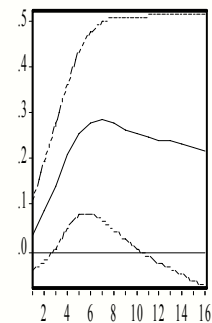
Response of INFREA_GRE to YGAPREA_GRE
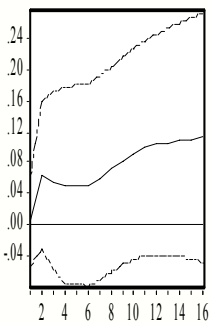
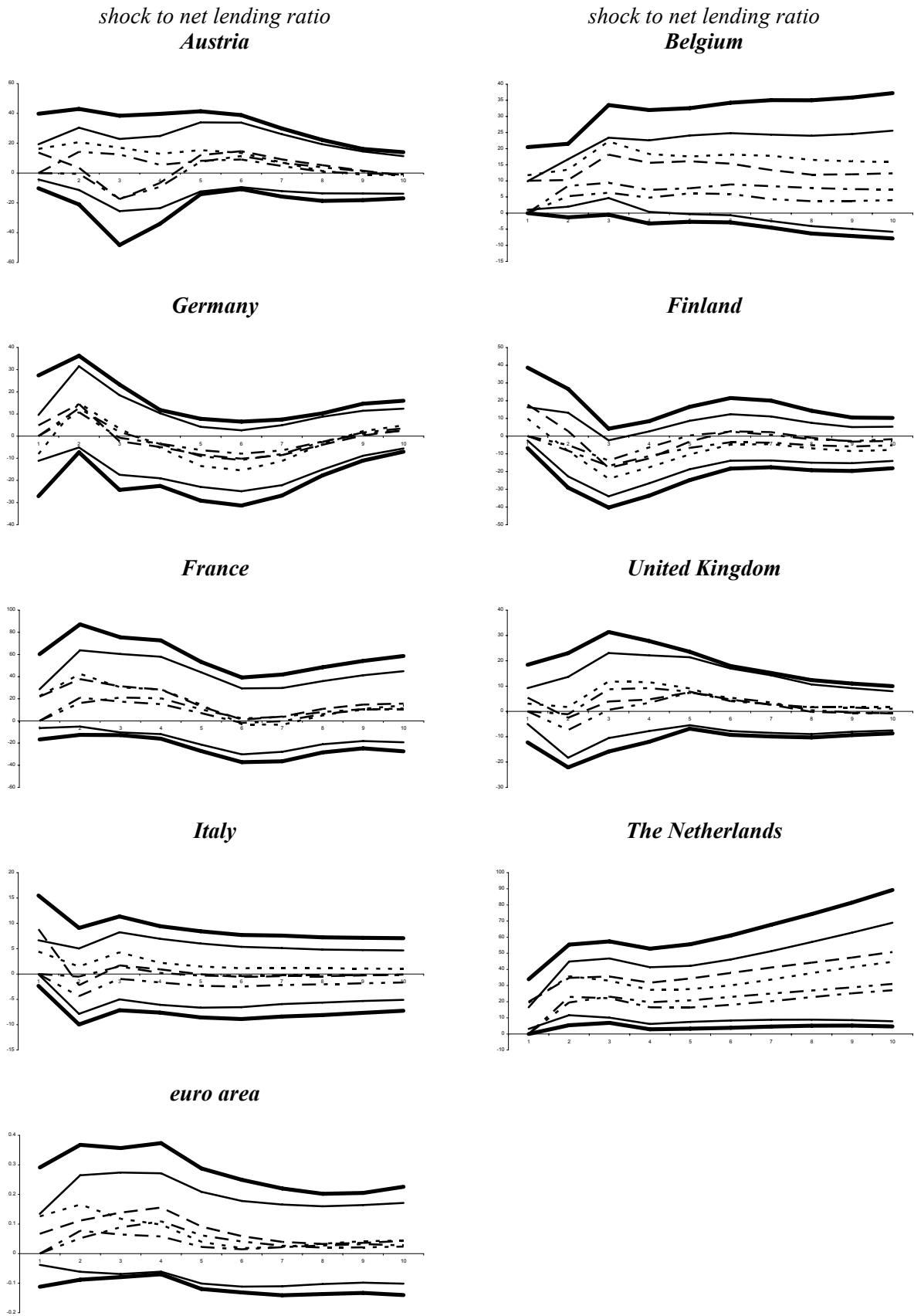Response of INFREA_GRE to NLGYREA_GRE
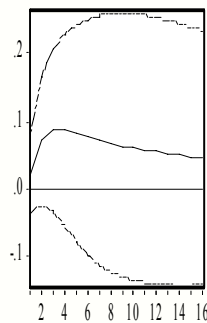
Response of INFREA_GRE to SIN_EA
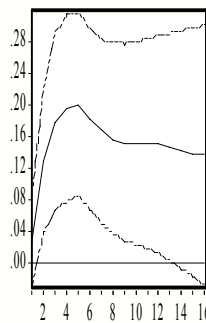
Response of INFREA_GRE to INFREA_GRE

(d) Greece (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

(e) Ireland

Response of YGAPREA_IRE to YGAPREA_IRE

Response of YGAPREA_IRE to NLGYREA_IRE

Response of YGAPREA_IRE to SIN_EA

Response of YGAPREA_IRE to INFREA_IRE

Response of NLGYREA_IRE to YGAPREA_IRE
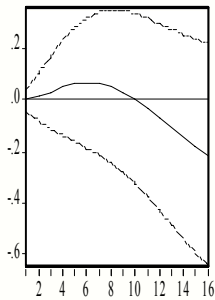
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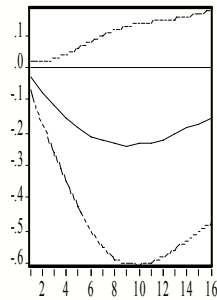
Response of NLGYREA_IRE to SIN_EA
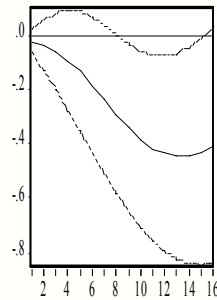
Response of NLGYREA_IRE to INFREA_IRE
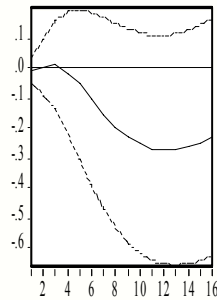
Response of SIN_EA to YGAPREA_IRE
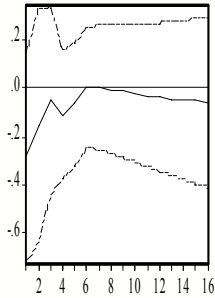
Response of SIN_EA to NLGYREA_IRE

Response of SIN_EA to SIN_EA

Response of SIN_EA to INFREA_IRE

Response of INFREA_IRE to YGAPREA_IRE

Response of INFREA_IRE to NLGYREA_IRE
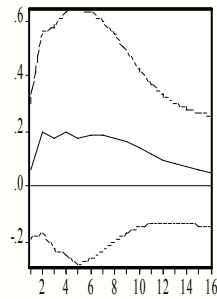
Response of INFREA_IRE to SIN_EA
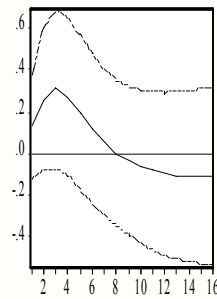
Response of INFREA_IRE to INFREA_IRE

(e) Ireland (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.
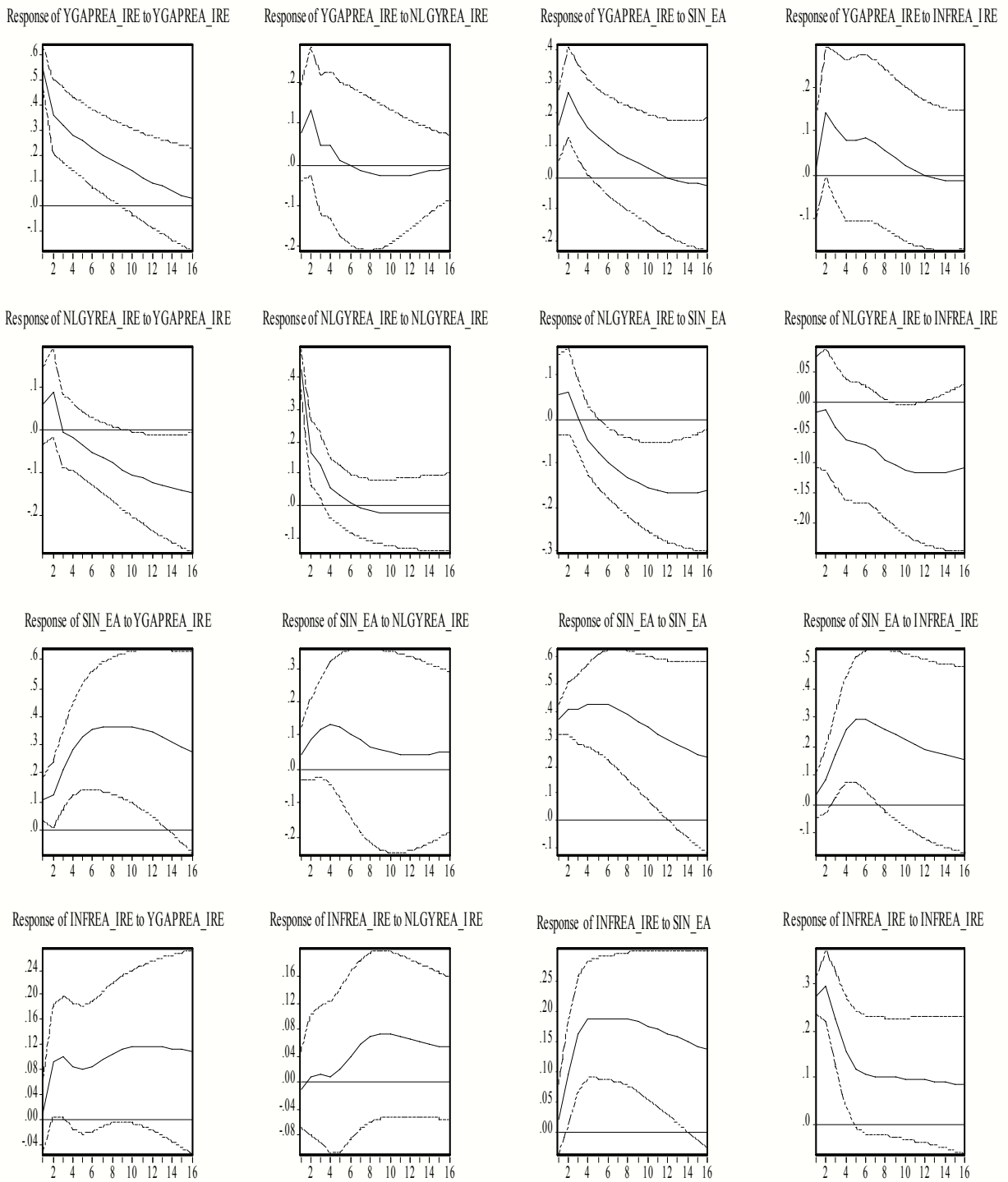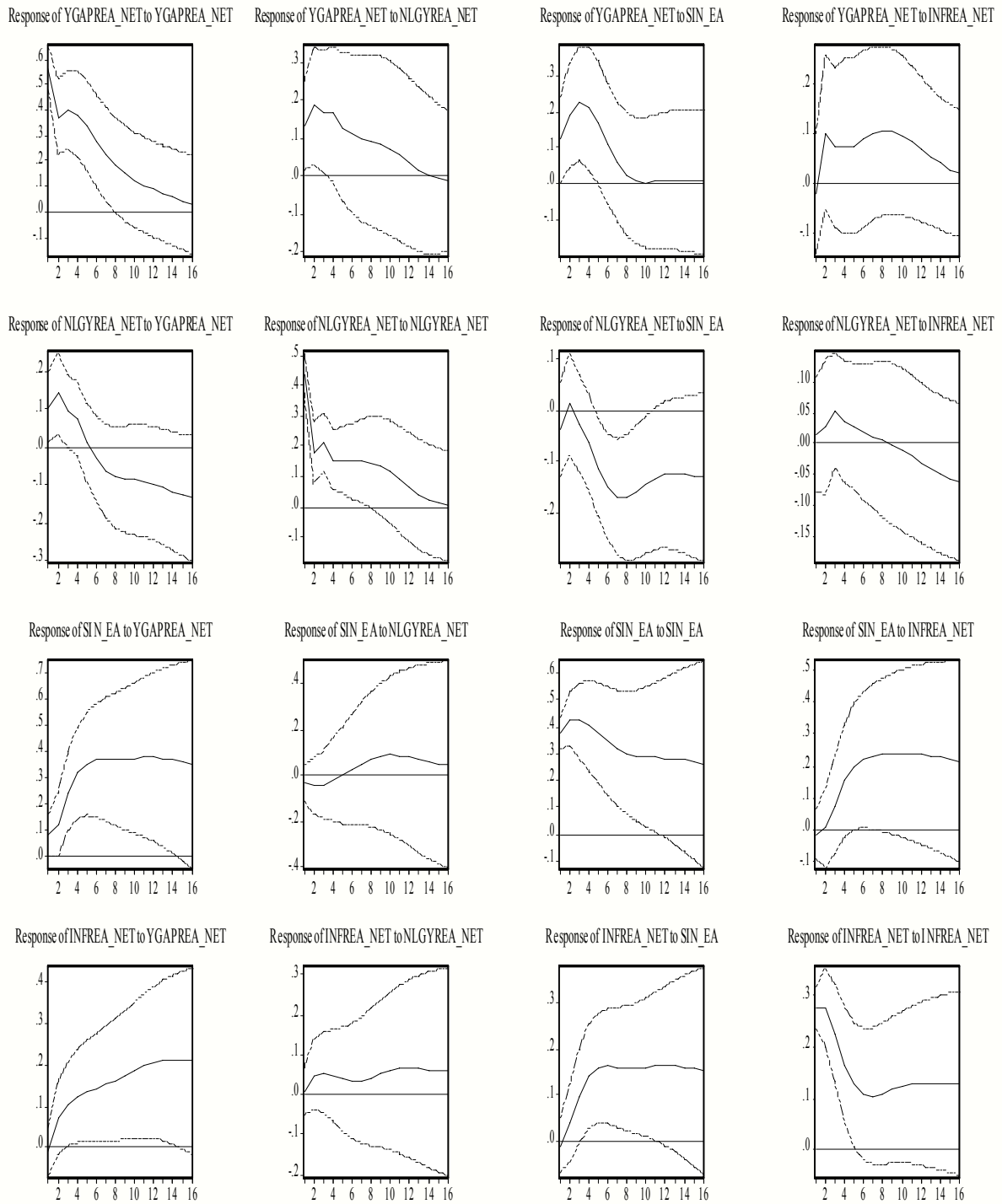
(f) Netherlands

(f) Netherlands (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.

Response of YGAP_POR to YGAPREA_POR

Response of YGAP_POR to NLGYREA_POR

Response of YGAP_POR to SIN_EA

Response of YGAP_POR to INFREA_POR

Response of NLGY_POR to YGAPREA_POR

Response of NLGY_POR to NLGYREA_POR

Response of NLGY_POR to SIN_EA

Response of NLGY_POR to INFREA_POR

Response of CUAY_POR to YGAPREA_POR

Response of CUAY_POR to NLGYREA_POR

Response of CUAY_POR to SIN_EA

Response of CUAY_POR to INFREA_POR

Response of INF_POR to YGAPREA_POR

Response of INF_POR to NLGYREA_POR

Response of INF_POR to SIN_EA

Response of INF_POR to INFREA_POR

(g) Portugal

(g) Portugal (cont'd)

Response to Generalized One S.D. Innovations ± 2 S.E.
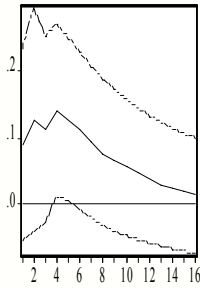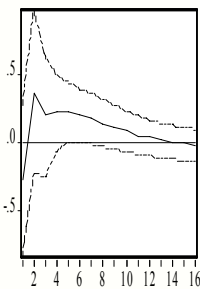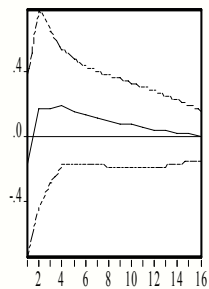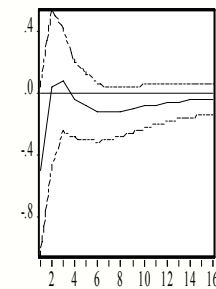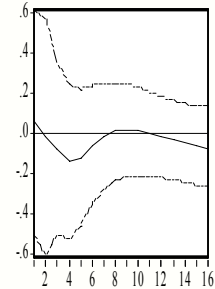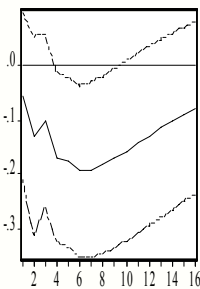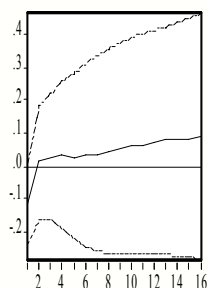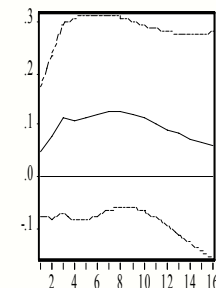
(h) Spain

Response of YGAPREA_SPA to YGAPREA_SPA
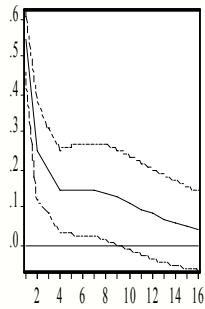
Response of YGAPREA_SPA to NLGYREA_SPA

Response of YGAPREA_SPA to SIN_EA

Response of YGAPREA_SPA to INFREA_SPA
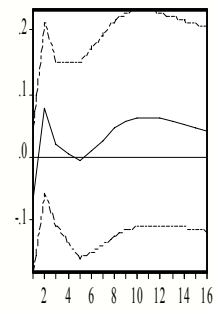
Response of NLGYREA_SPA to YGAPREA_SPA
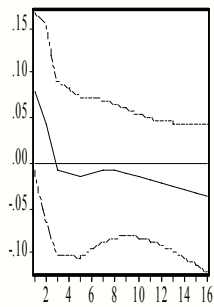
Response of NLGYREA_SPA to NLGYREA_SPA
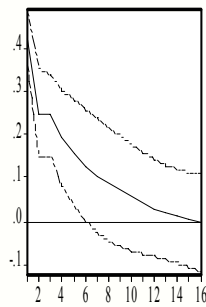
Response of NLGYREA_SPA to SIN_EA

Response of NLGYREA_SPA to INFREA_SPA
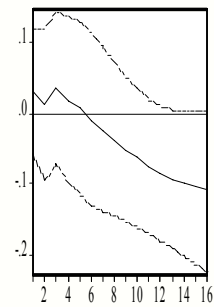
Response of SIN_EA to YGAPREA_SPA
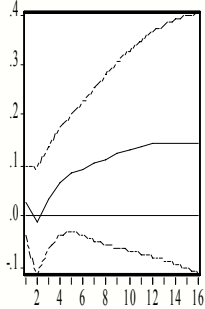
Response of SIN_EA to NLGYREA_SPA
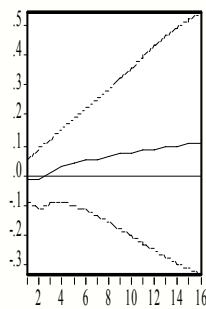
Response of SIN_EA to SIN_EA
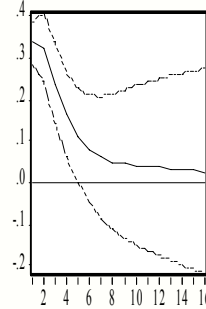
Response of SIN_EA to INFREA_SPA
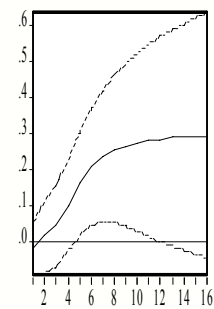
Response of INFREA_SPA to YGAPREA_SPA
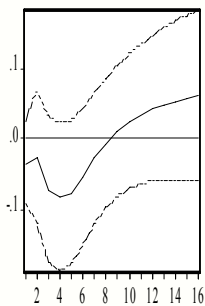
Response of INFREA_SPA to NLGYREA_SPA

Response of INFREA_SPA to SIN_EA
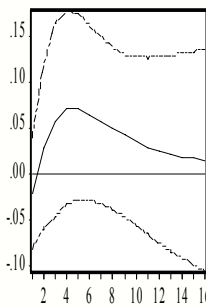
Response of INFREA_SPA to INFREA_SPA
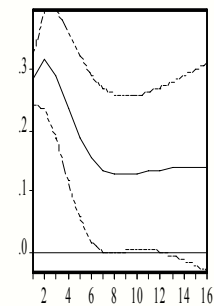
(h) Spain (cont'd)

Appendix 2a: Domestic economy: SVAR models with exogenous debt ratio.

Figure 40: Domestic economy, SVAR-model (4.1a-b): impulse responses of real long-term interest rates to shocks of 1% of GDP in net lending ratio.

shock to net lending ratio
Austria

shock to net lending ratio
Belgium

Germany

Finland

France

United Kingdom

Italy

The Netherlands

euro area

Appendix 2b: SVAR models with yield.

Figure 41: Domestic economy, SVAR-model (4.1a-b): impulse responses of yield to shocks of 1% of GDP in net lending and debt ratio

shock to net lending ratio   *shock to debt ratio*

Austria

Belgium

Germany

Finland
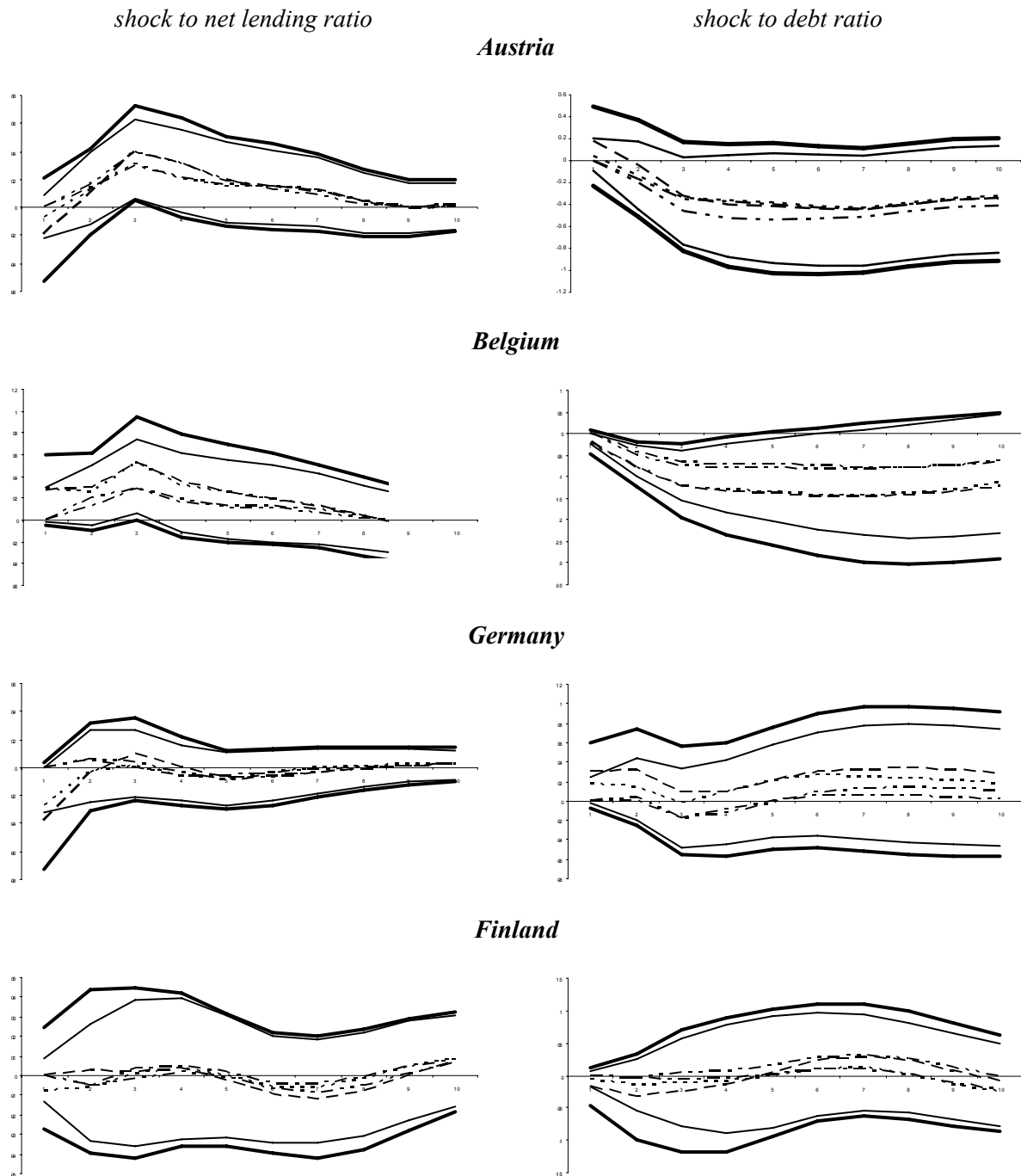
shock to net lending ratio   *shock to debt ratio*

France
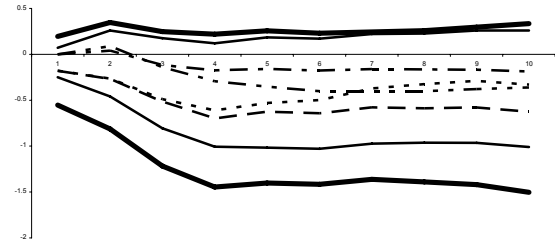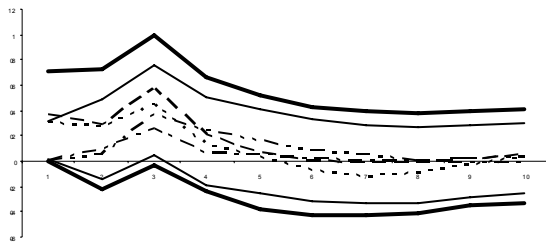
United Kingdom
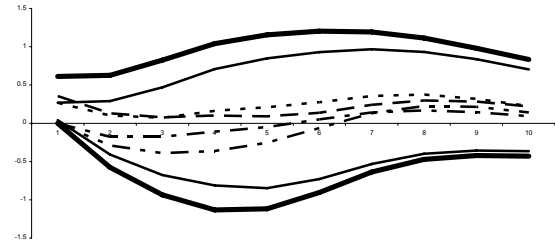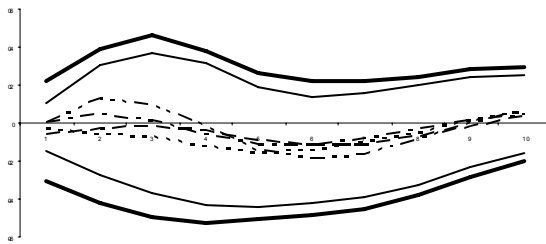
Italy
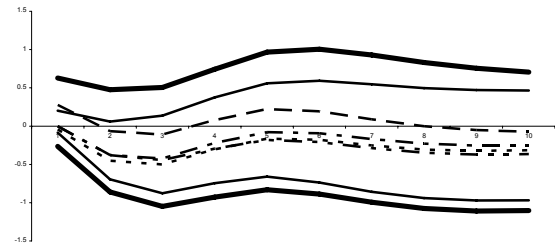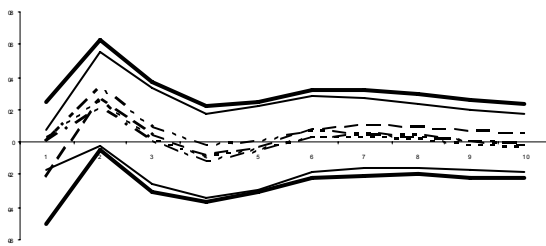
The Netherlands
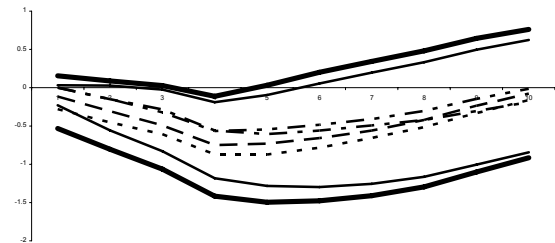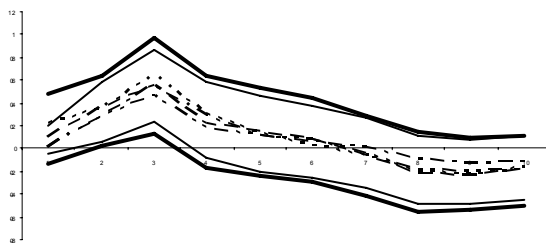
Notes: (a) graphs display percentage point impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

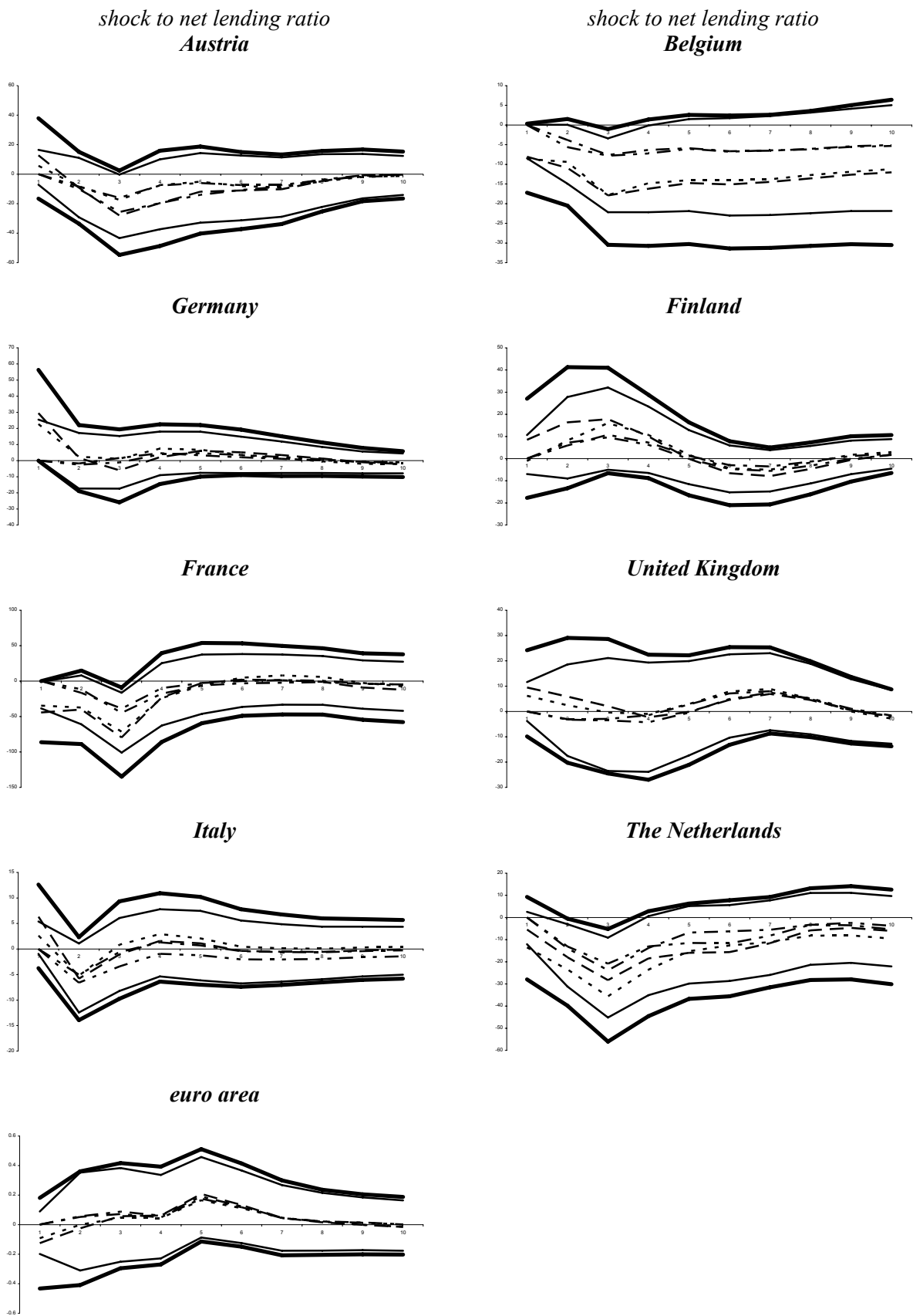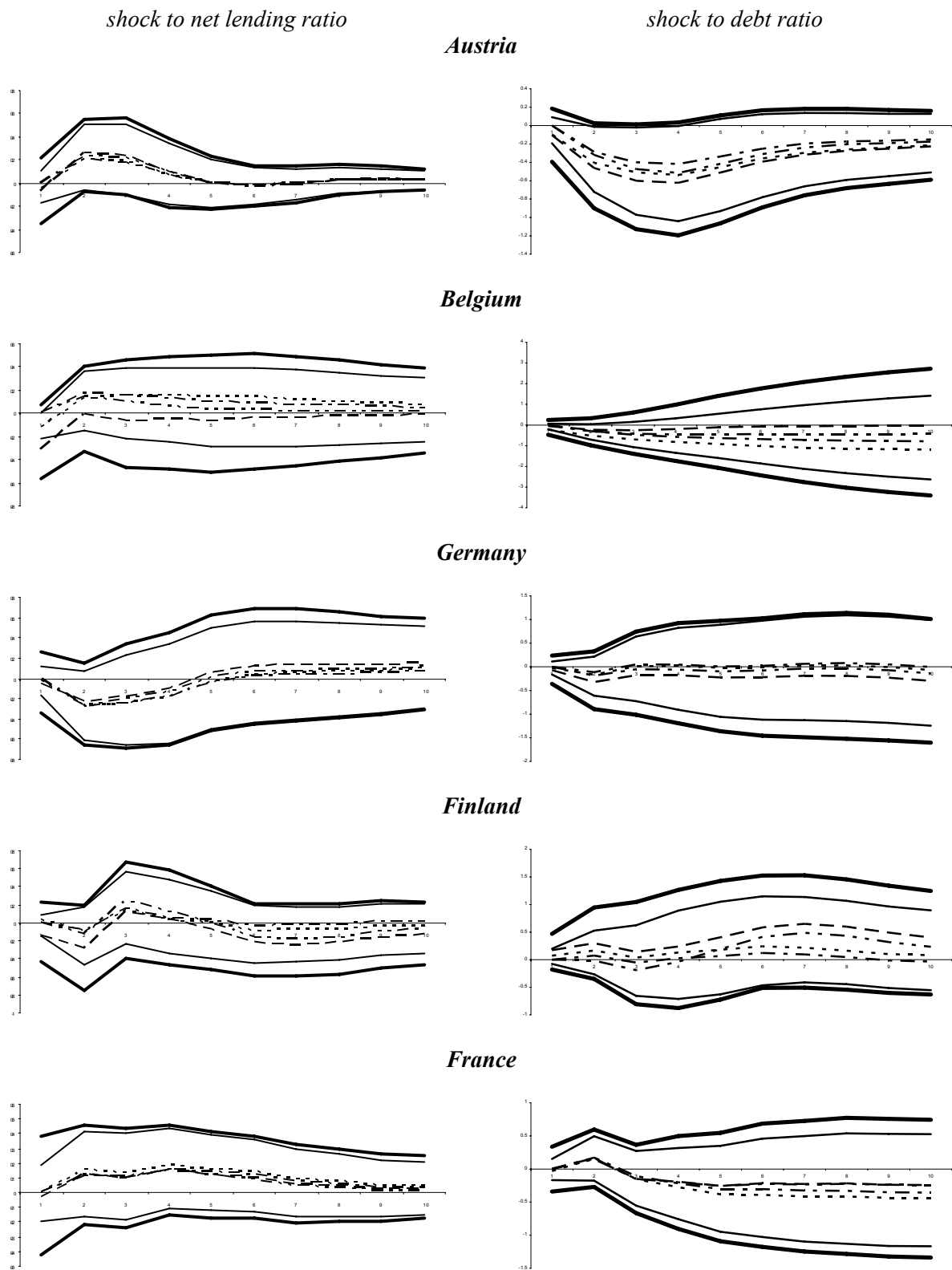**Figure 42: Euro area economy, SVAR-model (4.1a-b): impulse responses of yield to shocks of 1% of GDP in net lending and debt ratio**

shock to net lending ratio   *shock to debt ratio*
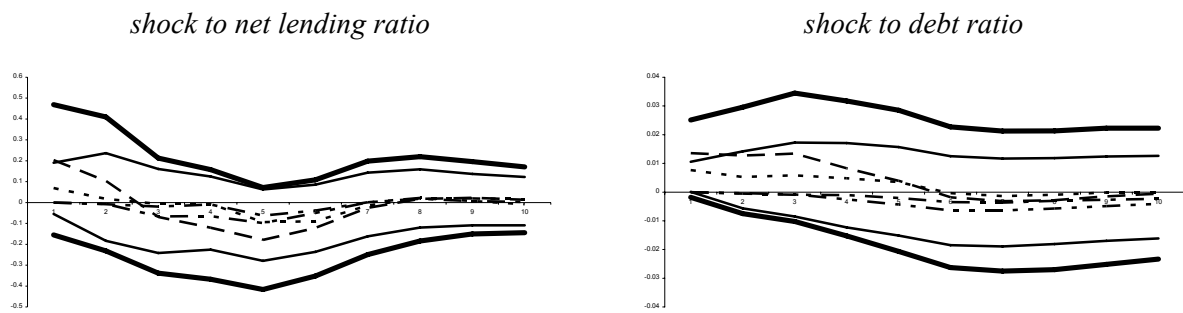
Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Figure 43: Domestic economy, SVAR-model (4.1a-b): impulse responses of yield to shocks of 1% of GDP in net lending ratio

shock to net lending ratio
Austria

shock to net lending ratio
Belgium

Germany

Finland

France

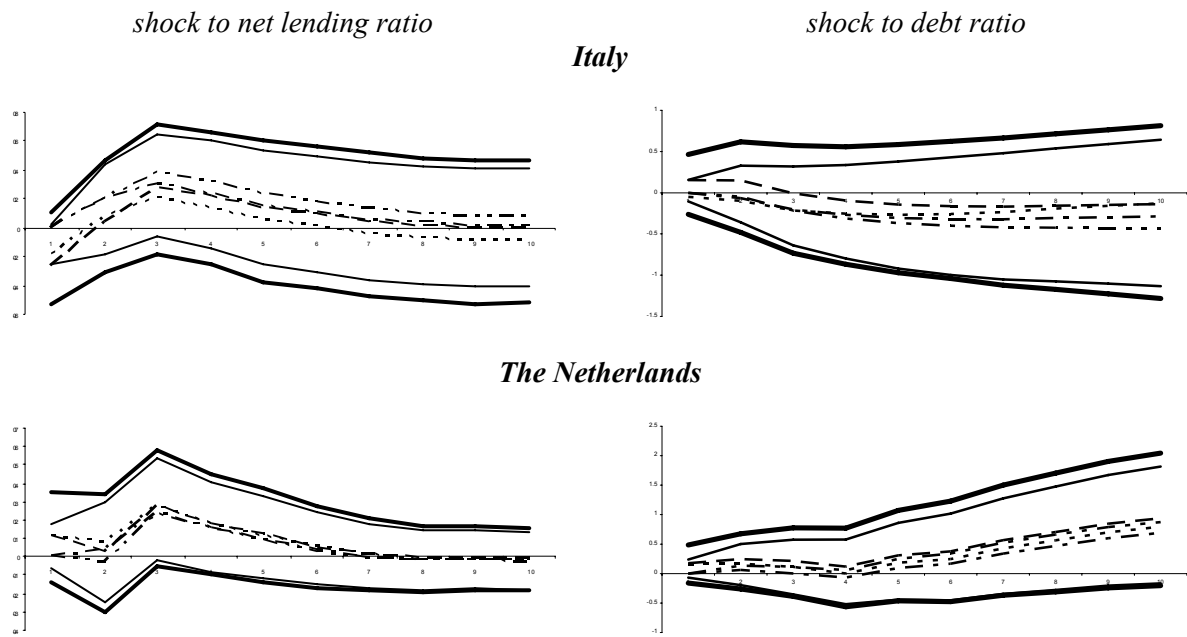**United Kingdom**

Italy

The Netherlands

euro area

Figure 44: Open economy, SVAR-model (4.2a): on difference of country i to euro area; impulse responses of yield to 1 standard deviation shocks in net lending and debt ratio

shock to net lending ratio

shock to debt ratio

Austria

Belgium

Germany

Finland

France

shock to net lending ratio   *shock to debt ratio*

Italy

The Netherlands

Notes: (a) graphs display percentage impulse responses of the interest rate measure, in response to a shock; (b) 90% confidence intervals from bootstrapped model – with 1000 draws – are the average (normal continuous line) and maximum (bold continuous line) of all four Choleski orders.

Table 15: Domestic economy: forecast error variance decomposition of yield

country	horizon year	debt endogenous debt	deficit	debt exogenous net lending
euro area	1	18.18	6.25	0.50
	5	21.73	11.44	1.77
	10	21.79	13.34	5.31
Germany	1	2.27	4.42	2.61
	5	1.68	7.87	8.59
	10	1.85	7.42	8.75
France	1	8.71	0.15	0.01
	5	8.09	19.64	3.13
	10	7.19	20.25	4.12
Italy	1	10.65	7.82	2.99
	5	10.39	8.12	5.52
	10	10.68	8.19	8.33
United Kingdom	1	39.28	1.98	1.98
	5	35.38	6.34	9.25
	10	32.53	6.30	9.87
Austria	1	7.35	4.36	1.06
	5	19.58	23.36	12.50
	10	18.99	23.43	14.83
Belgium	1	3.73	20.01	17.76
	5	5.08	18.11	18.90
	10	5.05	17.88	21.15
Finland	1	0.71	10.98	21.68
	5	20.01	7.76	27.44
	10	23.48	7.78	25.54
Netherlands	1	1.24	0.24	0.09
	5	0.98	7.07	8.47
	10	0.94	6.31	8.12

Table 16: Open economy: forecast error variance decomposition of yield

country	horizon year	difference of country i to euro area	
		debt	net lending
Germany	1	0.31	0.84
	5	1.36	2.45
	10	1.48	2.36
France	1	0.00	9.51
	5	0.08	8.43
	10	0.09	9.12
Italy	1	2.91	0.77
	5	2.65	0.73
	10	2.64	0.98
United Kingdom	1	0.70	24.51
	5	2.18	28.06
	10	1.99	31.94
Austria	1	0.05	0.08
	5	11.18	0.37
	10	14.00	1.15
Belgium	1	0.00	1.25
	5	3.99	3.29
	10	4.73	3.63
Finland	1	0.28	0.94
	5	0.84	1.32
	10	0.95	4.62
Netherlands	1	3.31	0.03
	5	2.98	1.05
	10	2.91	1.27

Appendix 2c: Data definitions and sources for chapter 4

Table 17: Data used in chapter 4

Series	*code*	*description*	*frequency*	*source*
EU countries				
total net lending	GLN	ratio to GDP		AMECO; OECD
public debt	UDGGL	ratio to GDP		
long-term interest	ILNN	%	annual	
short-term interest	ISN	%		AMECO
CPI inflation	ZCPIN	growth rate		
output gap	GAP	% of potential GDP		
euro area				
total net lending	GLN	ratio to GDP	annual	AMECO
public debt	UDGGL	ratio to GDP	annual	AMECO
		Note: total debt is sum of all EU-countries debt, except Denmark, France, Luxemburg, Portugal, Sweden and Spain.		
long-term interest	LTN	%		
short-term interest	STN	%	quarterly data are annualised by taking 4th quarter value	ECB-EAS
CPI inflation	HICP	growth rate		
output gap	-	% of potential GDP		
potential GDP	-	HP-filtered real GDP		
real GDP	YER	level		

Table 18. Data sample, chapter 4

Country	*Sample*	*Sources*
Germany	1970-2004	AMECO
France	1977-2004	AMECO
Italy	1964-2004	AMECO
euro area	1970-2004	AMECO (for net lending, public debt); ECB-EAS (for interest rates, inflation and output gap)
United Kingdom	1970-2004	AMECO
Austria	1970-2004	AMECO OECD (for net lending)
Belgium	1970-2004	AMECO
Finland	1970-2004	AMECO OECD (for net lending)
Netherlands	1969-2004	AMECO

Notes: the ECB-EAS database constructs synthetic euro area aggregate statistics since 1970 on a quarterly basis. See Fagan et al. (2001).

Appendix 3: The McKibbin-Sachs Global Model

The macroeconomic model simulations in this report use the MSG3 model, the most recent version of the McKibbin-Sachs Global Model. This is a dynamic, intertemporal, general-equilibrium model of a multi-region world economy. Based on microeconomic foundations by assuming that economic agents maximise intertemporal objective functions, the model exhibits a mixture of classical and Keynesian properties: partly rational expectations in combination with various rigidities allow for deviations from fully optimising behaviour. In particular, nominal wages are assumed to adjust slowly in the major industrial economies. Nevertheless, the model solves for a full intertemporal equilibrium. McKibbin and Sachs (1991) describe the original version of the model in full detail.

The MSG3 model is a two-sector version of the twelve-sector G-Cubed multi-country of McKibbin and Wilcoxen (1998). In many ways the aggregation gives a model similar to the McKibbin and Sachs (1991) MSG2 model except that there is substantial estimation of key parameters in the MSG3 model. The two sectors of production are energy and non-energy. There is also a third capital goods producing sector. MSG3 is therefore very similar in sectoral and country coverage to the MSG2 model but includes many of the features of the newer G-Cubed model. Overall, the model is designed to provide a bridge between computable general equilibrium models and macroeconomic models by integrating the more desirable features of both approaches. Details on this integration and how the G-cubed model bridges the gap between CGE and traditional macroeconometric models can be found in McKibbin and Wilcoxen (1998). Additional resources are available on the web (http://www.msgpl.com.au/).

The main features of the new MSG3 model relative to the previous MSG2 model are:

- A better mapping of the energy flows in the economy based on country specific input-output data from the G-Cubed database.

- Estimated production technologies based on the G-Cubed twelve-sector aggregation are aggregated to the two-sector level, which gives a better depiction of the aggregate production substitution possibilities than in the MSG2 model which assumed a Cobb-Douglas specification.

- Explicit treatment of capital goods in the household and firm sectors. Because the MSG3 model is based on G-Cubed, we also have two additional sectors which create

capital goods for investment by firms and capital goods for investment by households. This structural depiction of economies enables a closer examination of the impact of computers and other capital goods investment on overall economic activity globally.

- There are no residual country blocks in the MSG3 model but detailed structural models for all regions captured by the model.

The MSG3 model has been constructed to contribute to the current policy debate on macroeconomic policy design in different economies. It is a world model with substantial regional disaggregation and some sectoral detail. In addition, countries and regions are linked both temporally and intertemporally through trade and financial markets. Like the MSG2 and G-Cubed models, the MSG3 model contains a strong foundation for analysis of both short run macroeconomic policy analysis as well as long run growth consideration of alternative macroeconomic policies. Intertemporal budget constraints on households, governments and nations (the latter through accumulations of foreign debt) are imposed. To accommodate these constraints, forward looking behaviour is incorporated in consumption and investment decisions.

The long run of the world economy is driven by a neoclassical growth model, with exogenous technical progress and population growth. Keynesian rigidities in the goods and labour markets in the short run and optimal decisions, conditional on expected future paths of the world economy, drive the short run of the model. Thus, the model captures long-run effects of shocks and short-run dynamics towards these long-run outcomes based on historical experience, with expectations formation providing a link between the long-run outcome and the short-run adjustment.

As the MSG3 Model is a fully specified dynamic general-equilibrium model, it incorporates both the demand and the supply sides of the major industrial economies. Stock-flow relations are carefully observed, and intertemporal budget constraints are imposed. Asset prices are determined by intertemporal arbitrage conditions and rational expectations. For the long-run behaviour of the model, stock equilibrium rather than flow equilibrium is important. Asset prices stabilize in real terms once the desired ratios of asset stocks to GDP are reached. The short run of the model behaves similarly as the basic Mundell-Fleming model under flexible exchange rates and high capital mobility; however, the future paths of the world economy are important in the short run because of the forward-looking behaviour in asset and goods

markets. The assumptions of rational expectations in financial markets and of partially Forward-looking behaviour in real spending decisions allow for the incorporation of the effects of anticipated policy changes.

The supply side of the model is specified in an internally consistent manner. Factor input decisions are based in part on intertemporal profit maximization by firms. Labour and intermediate inputs are determined to maximise short-run profits, given a stock of capital that is fixed within each period and adjusted according to a Tobin's q-model of investment, where Tobin's q evolves according to a rational-expectations forecast of future after-tax profitability.

The version of the MSG3 Model used in this paper, called MSG3v54o, consists of models of the following countries and regions: the United States, Japan, Canada, Australia, the United Kingdom, Germany, France, Italy, Austria, the rest of the euro area (REA), the rest of the OECD (ROECD), China, Central and Eastern European economies (CEEC), non-oil developing countries, oil-exporting countries, and Russia. Although the basic theoretical structure for all industrial regions is the same, institutional differences are taken into account, especially in modelling labour markets.

For the simulations and optimisations regarding euro area policy problems described in this report, the MSG3 Model was modified to implement the European System of Central Banks (ESCB) for the euro area. Money supply in all current euro area countries (twelve in reality, five in the model) is no longer available as an instrument; instead, monetary policy is conducted by the ECB, which acts independently of the instruments and goals of national fiscal policies. Therefore we assume a single monetary authority in the euro area (the ECB) and several national fiscal policy-makers in the euro area.

The MSG3 Model was fitted to empirical data by a mix of calibration techniques for CGE models and econometric time-series estimates. Behavioural parameters taken from econometric studies and data for macro aggregates were combined with steady-state relations in the model to generate other data. The reference year, for which actual data is replicated, is regarded as representing a point on the stable adjustment path towards the steady state of the model; hence not all steady-state relations are assumed to hold for that year. The model is solved in linearised form around the base year of 2002.

Appendix 4: Impulse responses to a shock reducing the budget deficit in the MSG3 model

In this Appendix, we present in some detail the impulse responses to one-time positive shocks of approximately 1 percentage points of GDP to the budgetary surplus (reduction of the budget deficit) of the public sector in some or all of the euro area countries/regions in the MSG3 Model. The results may be compared with those presented in chapters 3 and 4 of the report. They differ for the following reasons:

- The results in chapters 3 and 4 were obtained from SVAR and SVEC Models estimated directly from data on the euro area countries. The results given here rest on the parameters of the MSG3 Model, which are only partially results of econometric estimations, but reflect also the calibration process of the model.

- The results of the VAR estimations in chapters 3 and 4 use only data on those variables contained in the VAR models. By contrast, the results given here involve all feedbacks through the entire MSG3 Model, including repercussions from other countries and regions.

- As the MSG3 Model is an annual model, no quarterly adjustments are available here.

- In a global macroeconomic model like the MSG3 Model, different assumptions can be made concerning the institutional environment and the actions and reactions of other policy-makers than those whose behaviour is primarily studied. For example, the effects of different policy rules for monetary policy (the ECB) on the impulse response can be studied. It would also be possible (but is not done here due to lack of space and time) to vary assumptions about policies in other countries than the euro area, to study the effects of strategic reactions within and outside the euro area, etc. In particular, counter-factual environments can be simulated, whereas the results of a VAR model rest on data generated only by actual (economic and political decision-makers') behaviour in the past.

- Due to restrictions on the dimension of VAR models, in chapters 3 and 4 only one type of budgetary consolidation shock could be considered, namely a direct shock to (a reduction of) the budget deficit by 1 percentage point of GDP. In contrast, the MSG3 Model allows for a greater variety of changes in exogenous variables. Therefore, we can consider several alternative ways of bringing about the budget

deficit shock: reductions of (different kinds of) government expenditures and increases in taxes.

Obtaining information about many variants of shocks reducing the budget deficit by approximately one percentage point serves both for learning about the effects on key macroeconomic variables including international spillover effects and for policy purposes, especially for preparing the analysis in chapter 7. Therefore, we show a great variety of impulse responses in this Appendix to display differences with respect to the instruments used for deficit reduction, to the country or region applying the respective instrument (performing the deficit reduction), and to the institutional framework assumed (policy rule of the ECB). We confine ourselves to one-period shocks here; results of (politically more interesting) multi-period budget consolidations are shown and discussed in more detail in chapter 7. Responses are shown for the four explicitly modelled countries of the euro area: the three large euro area economies of Germany, France and Italy, and Austria as a representative of a small open euro area economy. The values for the other variables as well as results for the REA block and for other countries and regions of the model are available on request. In the following, we show the time paths of a few key variables originating from each shock. All numbers are deviations from the baseline values of the MSG3 Model. In each case, we present (row-wise) the variables real GDP, current account, budget deficit (general government), public debt (general government), labour (employment), rate of inflation, short-term and long-term nominal rates of interest. Countries are denoted by the following symbols: Germany – square, France – triangle, Italy – asterisk, Austria – circle.

The following variants of budgetary consolidation shocks are considered:

- The reduction of the budget deficit by one percentage point of GDP is brought about by
    1. increasing lump-sum taxes (equivalently: decreasing lump-sum transfers) by one percentage point of GDP,
    2. decreasing public consumption by one percentage point of GDP, or
    3. decreasing public investment by one percentage point of GDP.

    Distinguishing according to the instruments used for reducing the budget deficit is important for policy purposes. There is an extensive literature on the relative advantages of different instruments for consolidating public finances (see, among many others,

papers in Rowley et al. 2002; Neck and Schneider, 2001). It shows that there may be significant differences between these instruments with respect to their ability of consolidating the budget as well as to their effects on other macroeconomic variables. This applies also to international spillover effects. Here we consider only three possibilities, which involve changes in purely exogenous variables of the MSG3 Model in order to show the endogenous reactions of other variables that may, in reality, also be influenced by political actions (e. g., particular taxes and/or public expenditures).

- The budget deficit is reduced in
    1. the entire euro area (all five countries/regions of the euro area modelled),
    2. Germany only (the largest economy of the euro area),
    3. Austria only (representing a small euro area economy),
    4. France only,
    5. Italy only.

This serves to study differences with respect to spillover effects. The results for the entire euro area can also be interpreted as coming from a coordinated policy shock across the entire euro area.

- For the conduct of monetary policy, we consider two variants:
    1. monetary targeting (the ECB does not change its money supply as compared to the baseline solution),
    2. inflation targeting (the ECB keeps euro area average inflation at its baseline values).

Both possibilities can be argued to be contained in the two-pillar strategy of the ECB, and the differences between them are studied mainly in order to make a decision for the (politically more relevant) simulations of structural and budgetary policies of chapter 7.

Figure 45: Impulse response, tax increase, euro area, monetary targeting
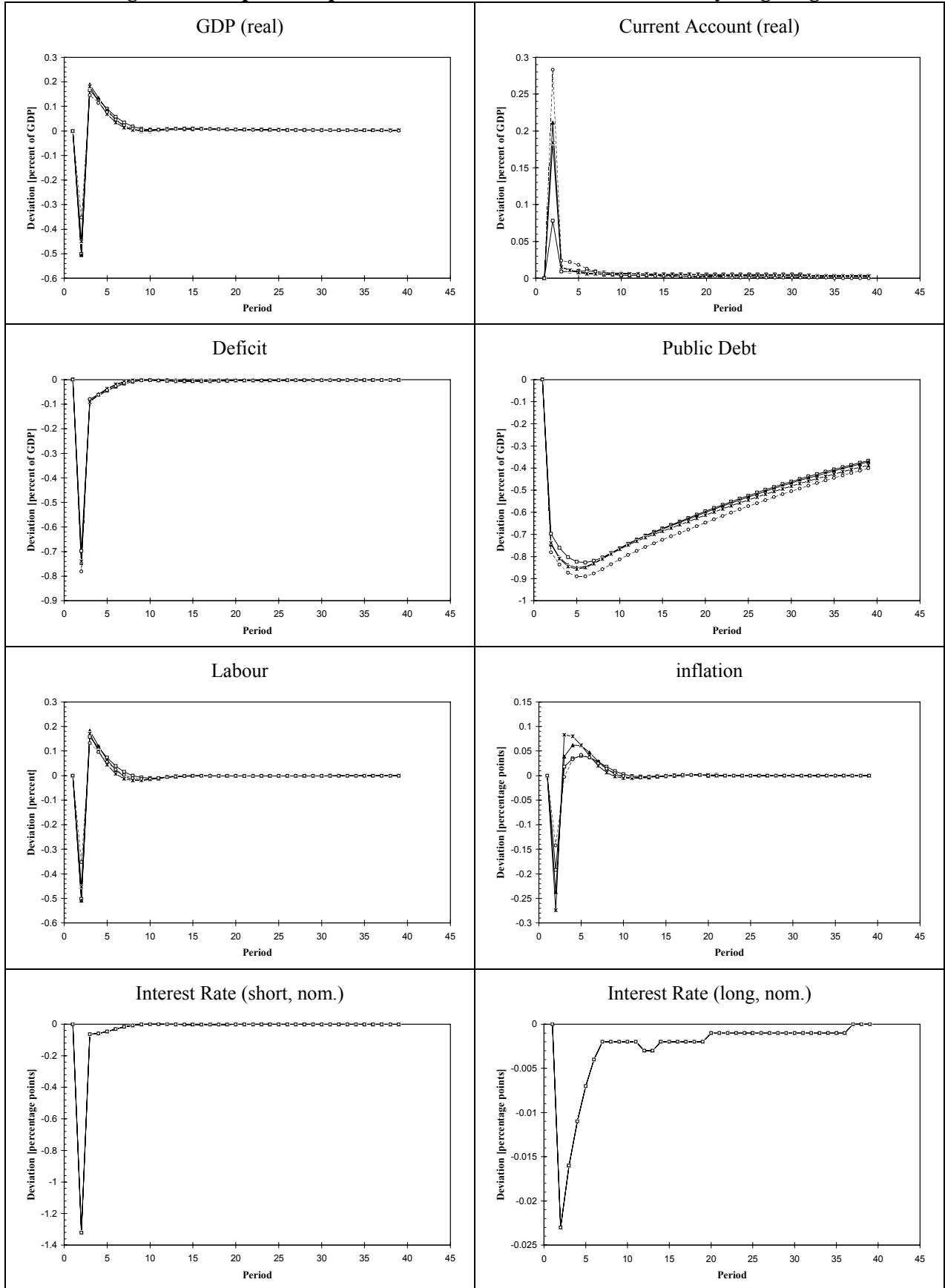
Figure 46: Impulse response, tax increase, Germany, monetary targeting
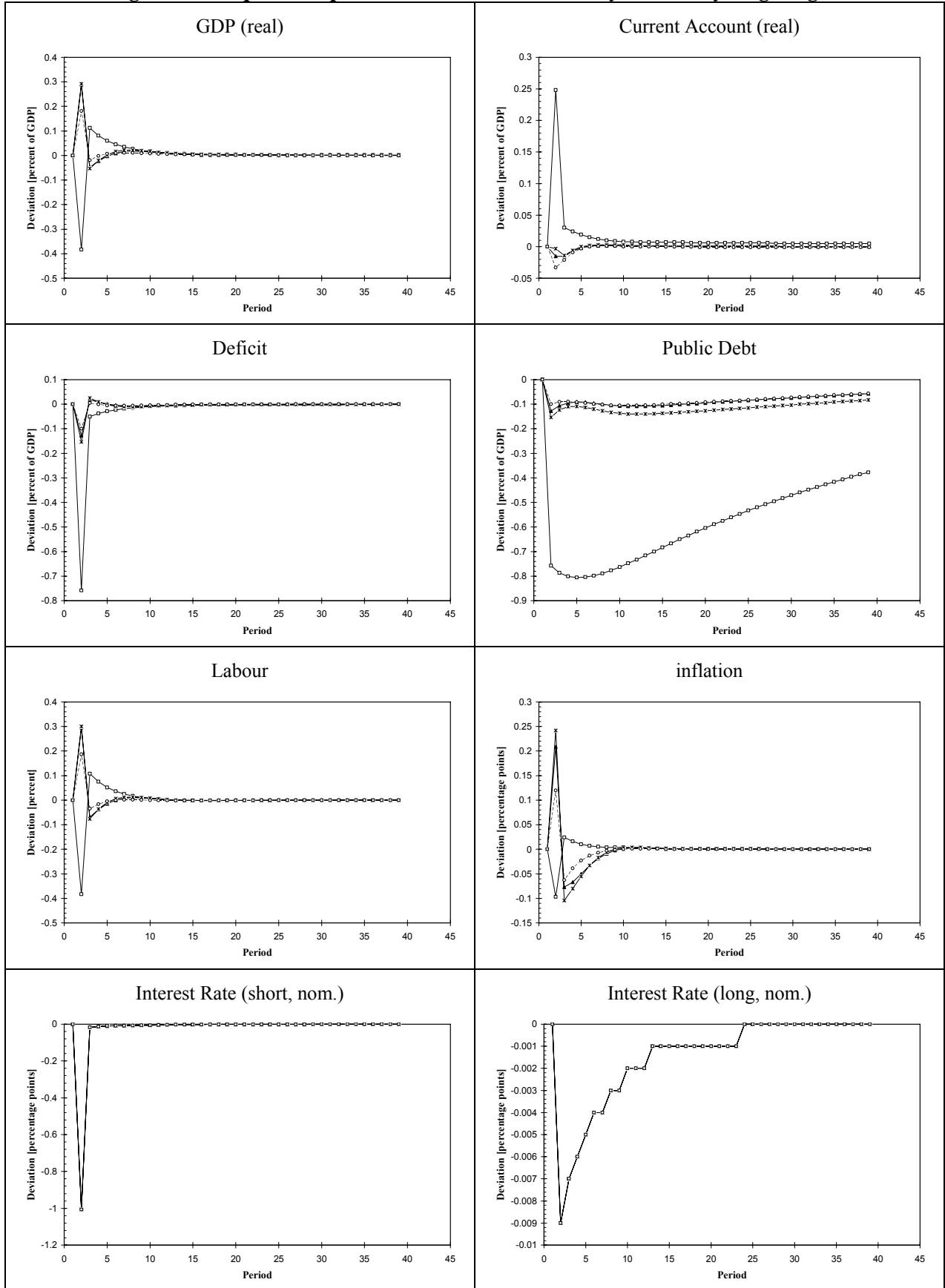
Figure 47: Impulse response, tax increase, Austria, monetary targeting
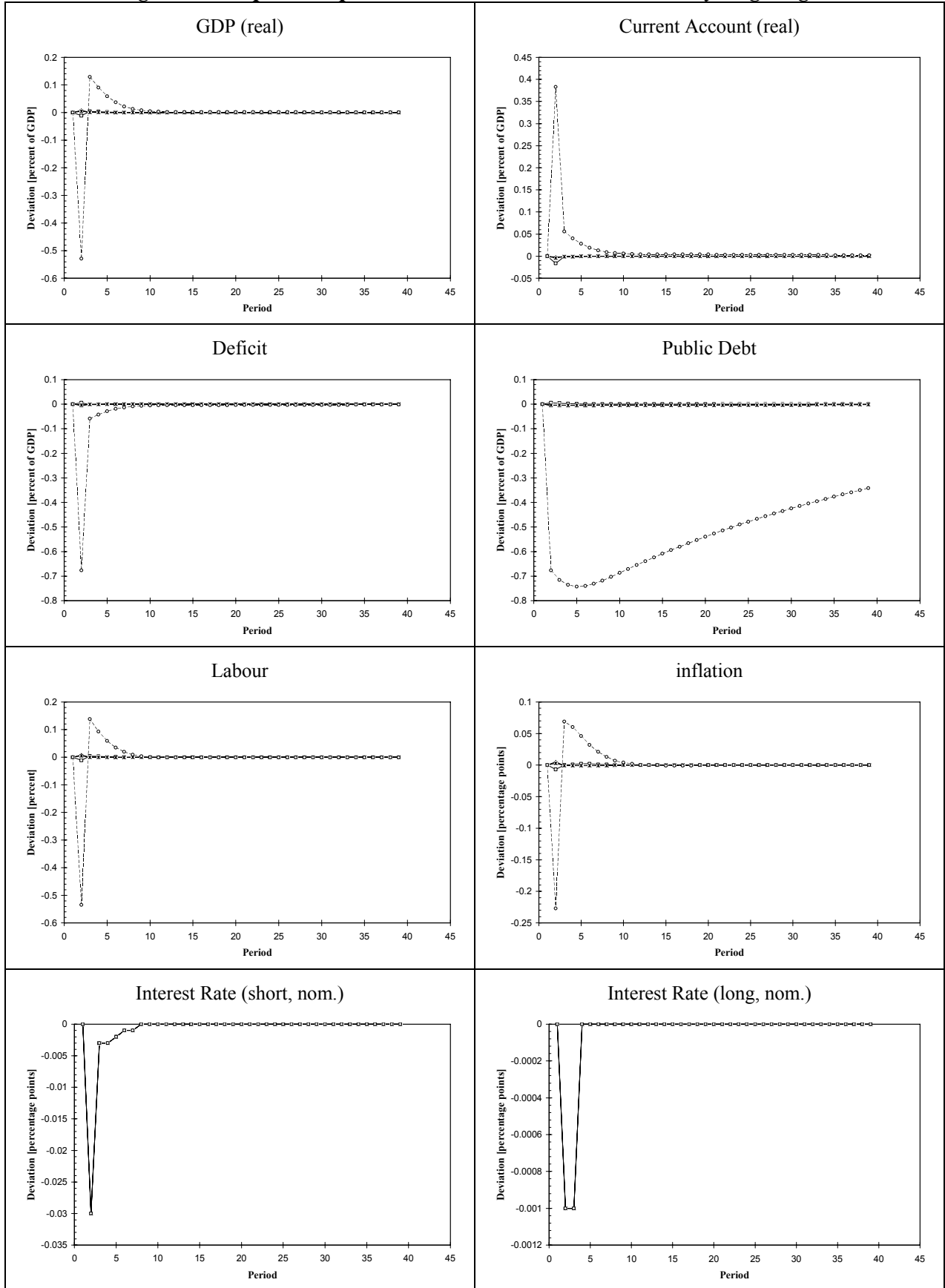
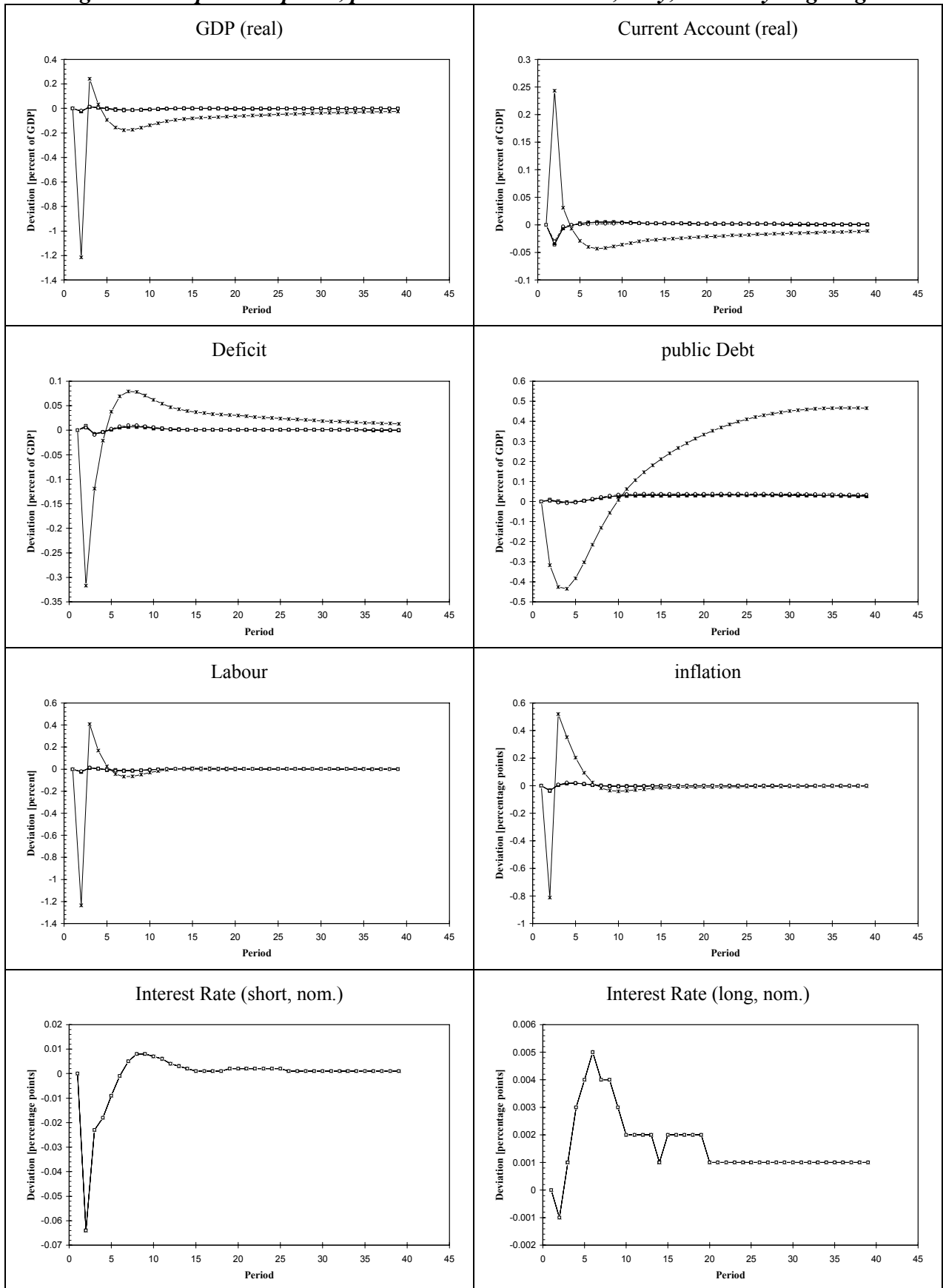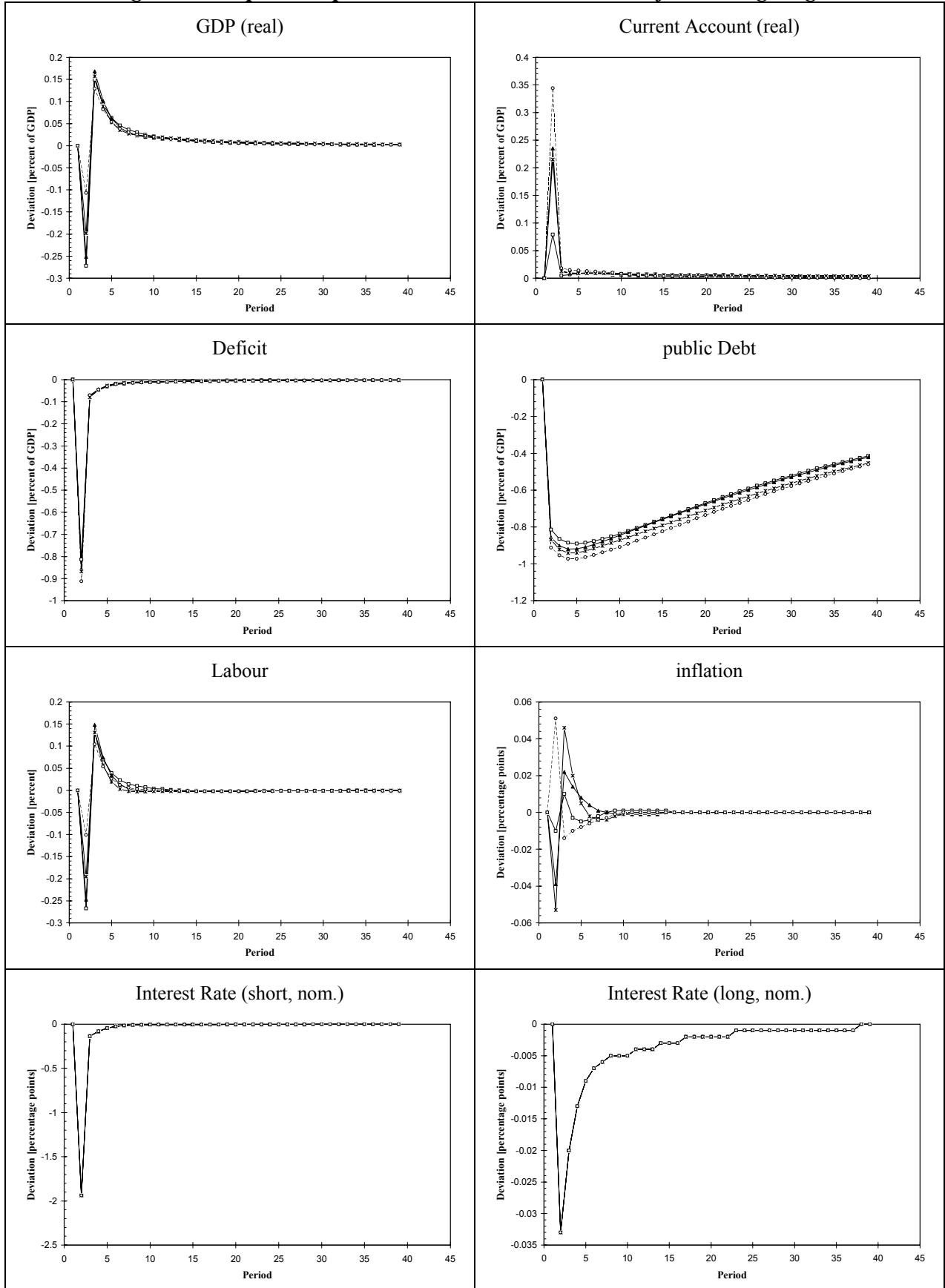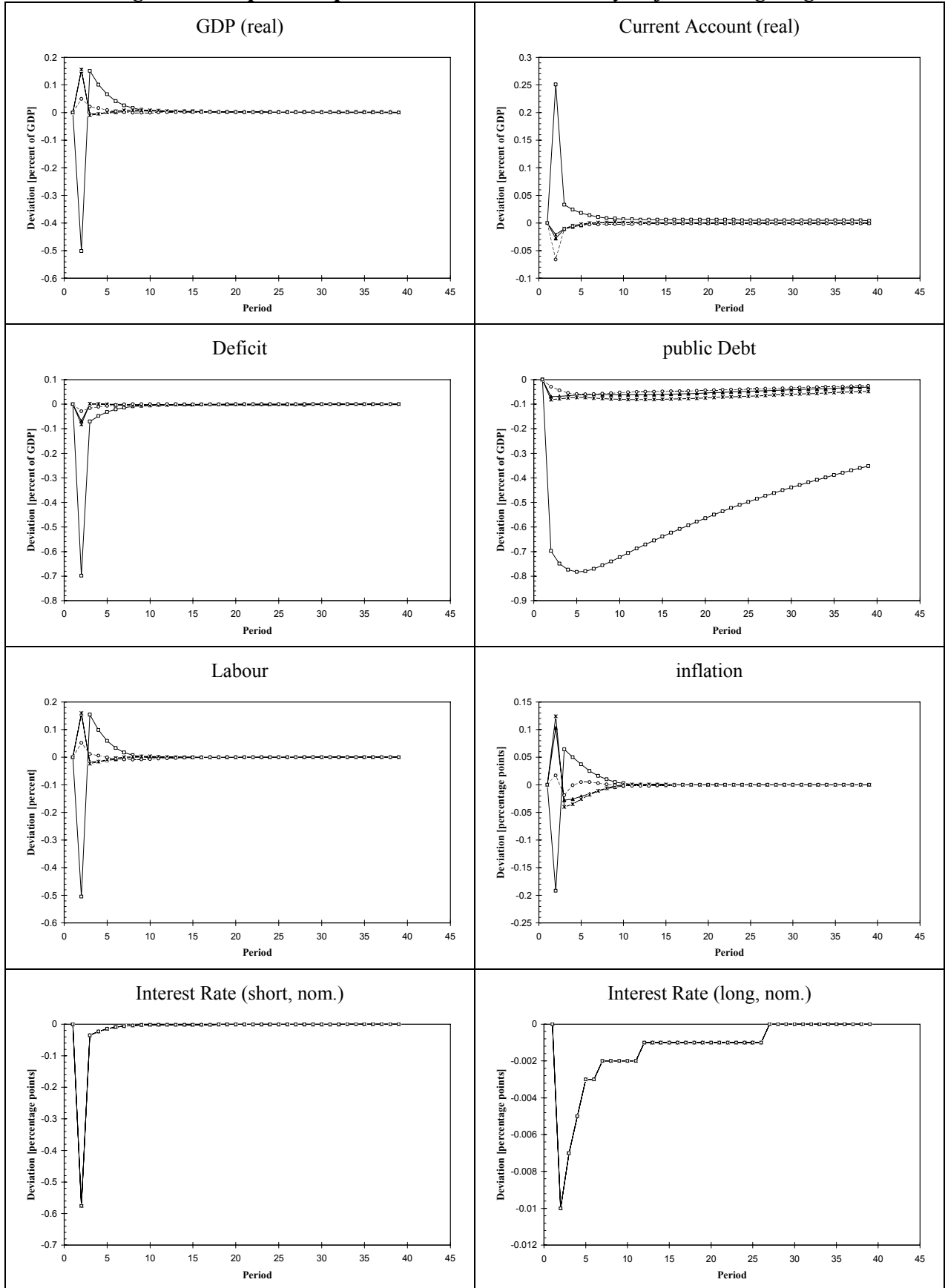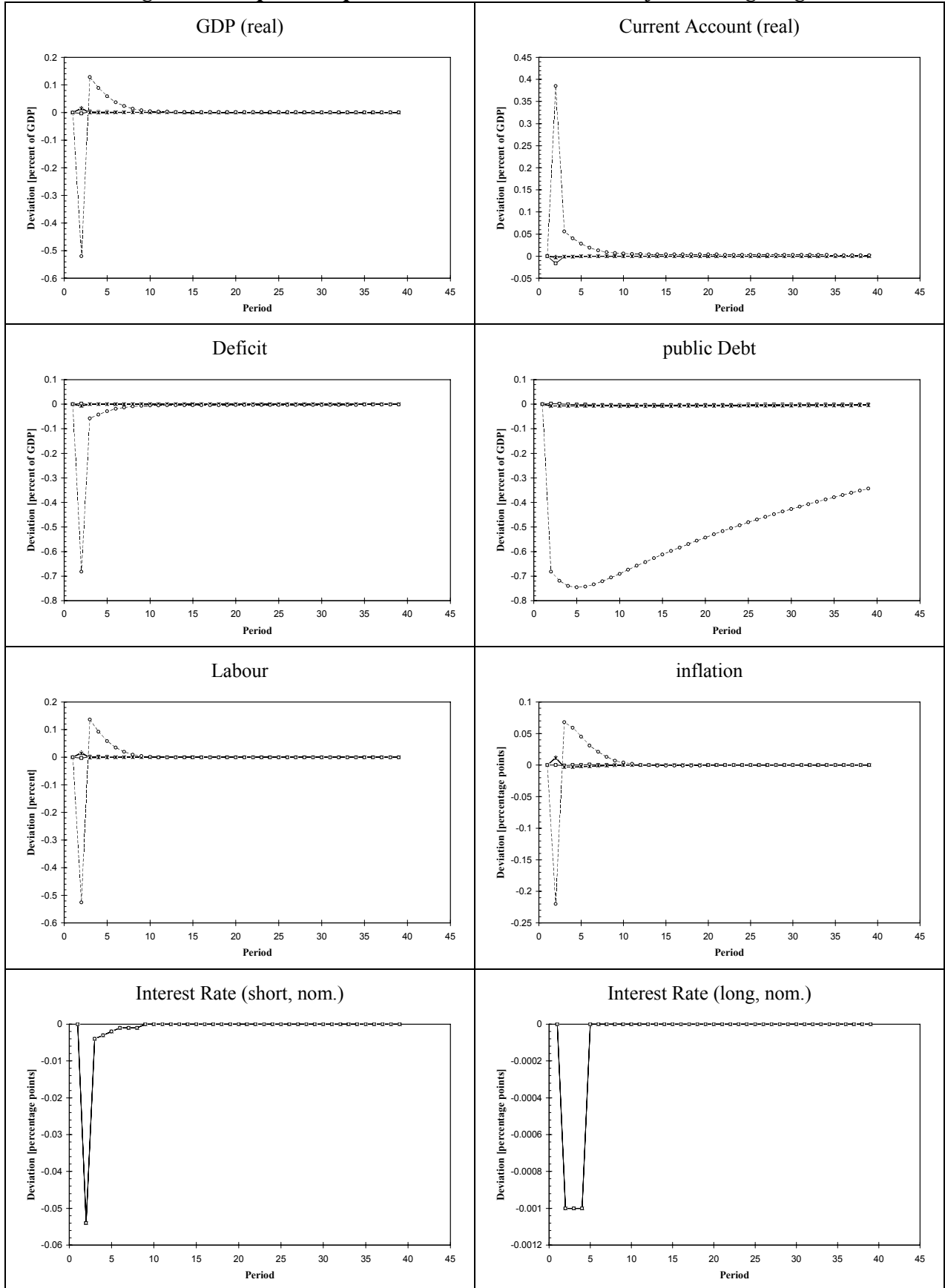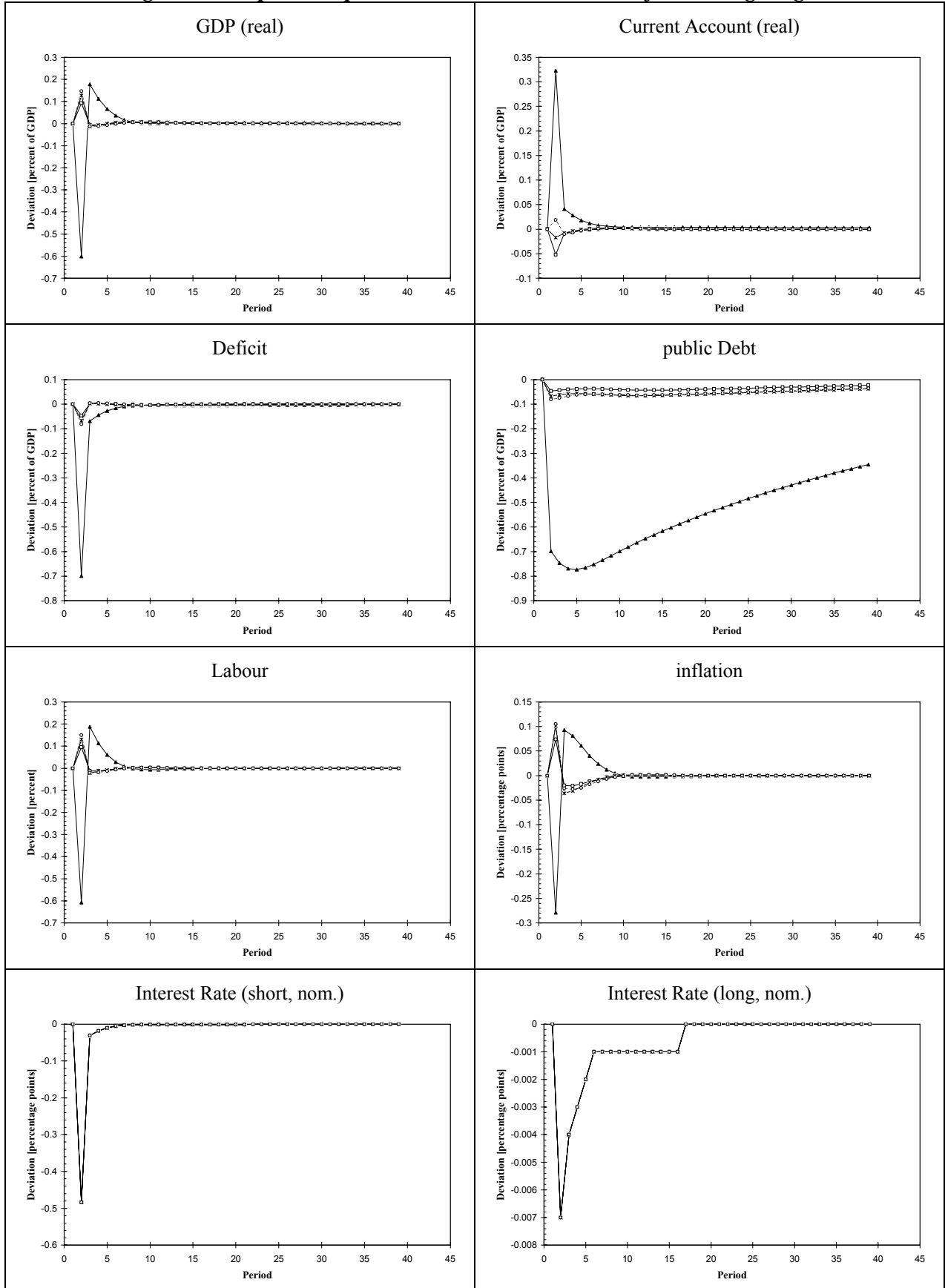**Figure 48: Impulse response, tax increase, France, monetary targeting**
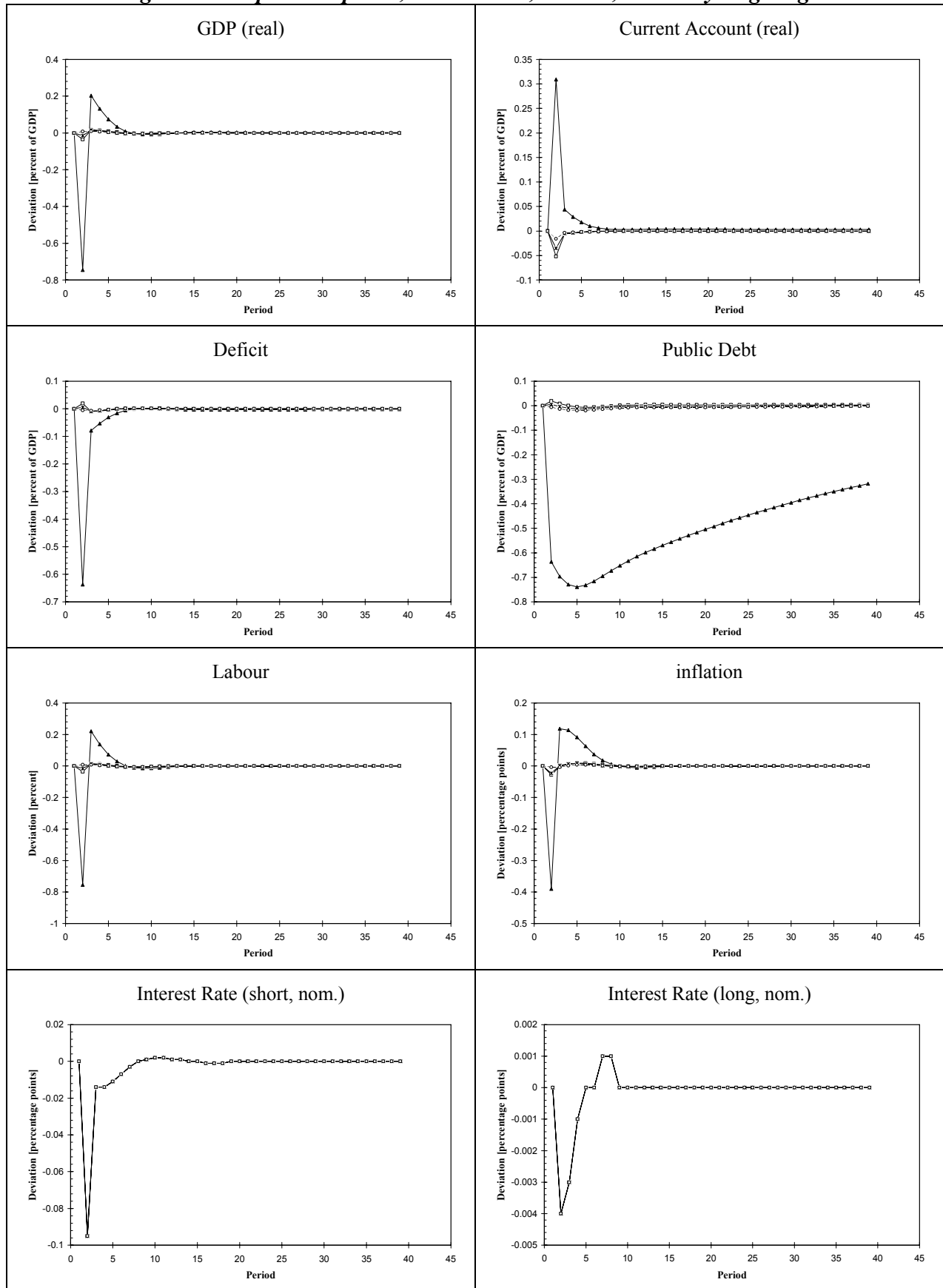
Figure 49: Impulse response, tax increase, Italy, monetary targeting
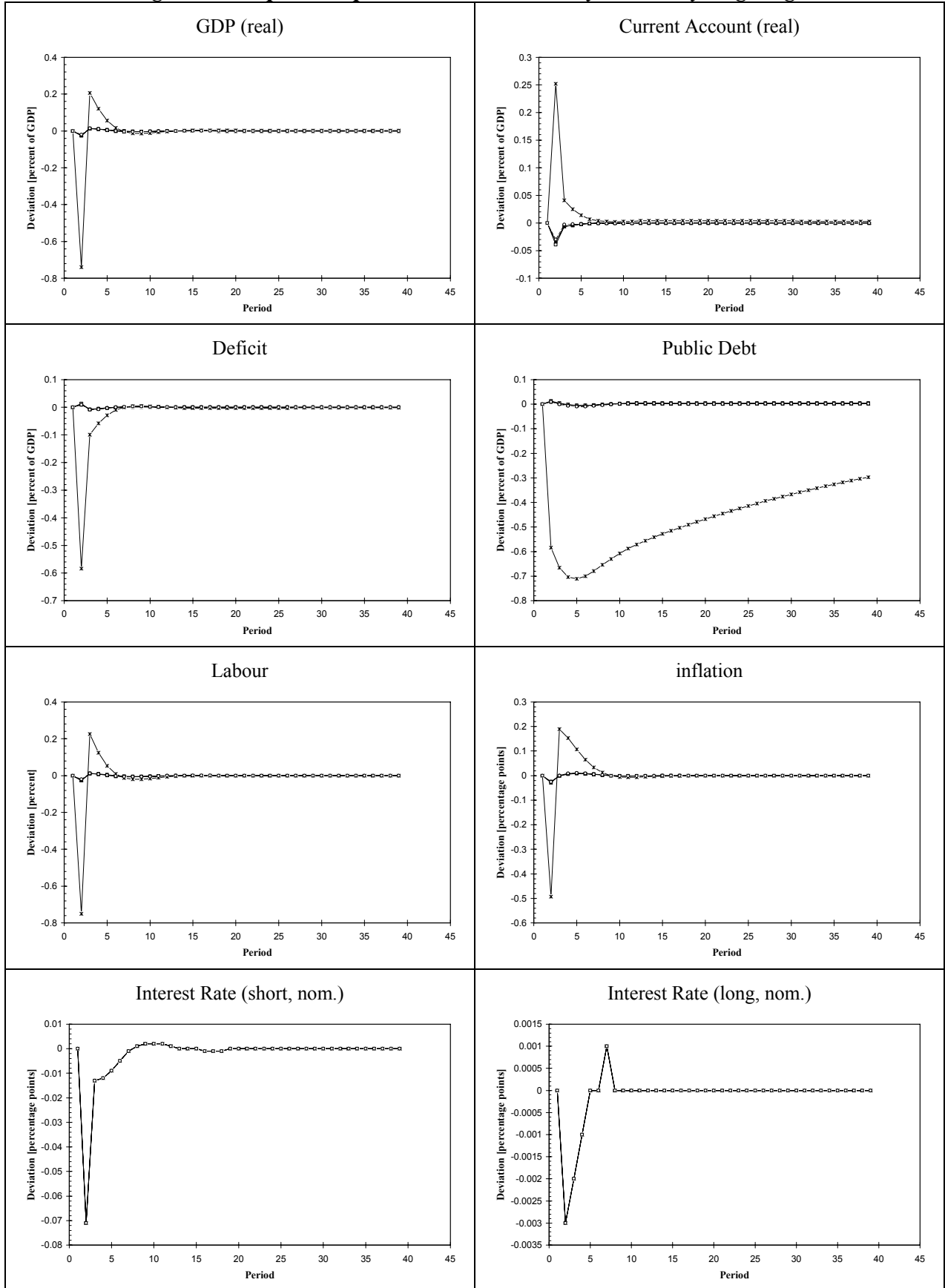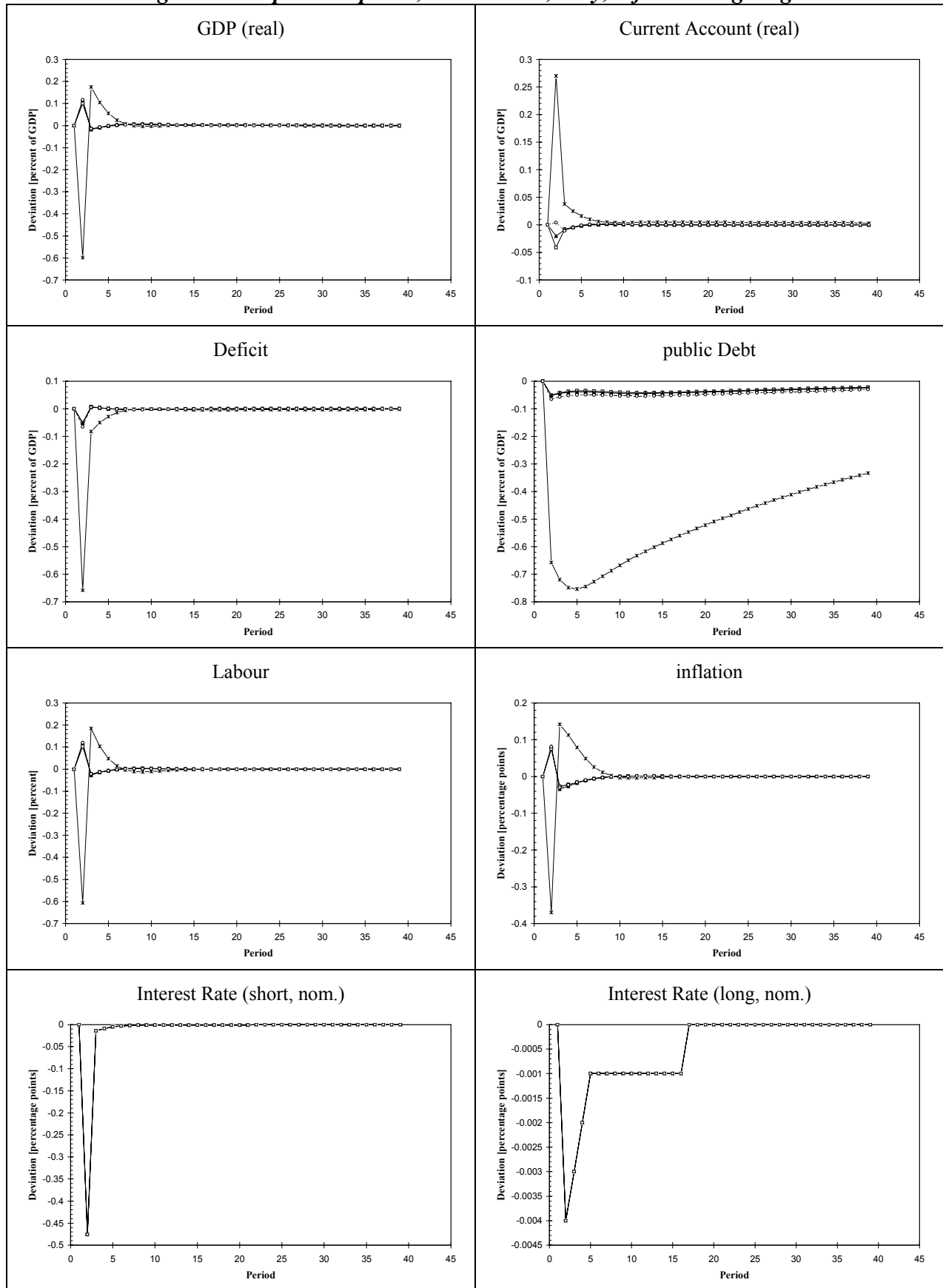
Figure 50: Impulse response, public consumption decrease, euro area, monetary targeting
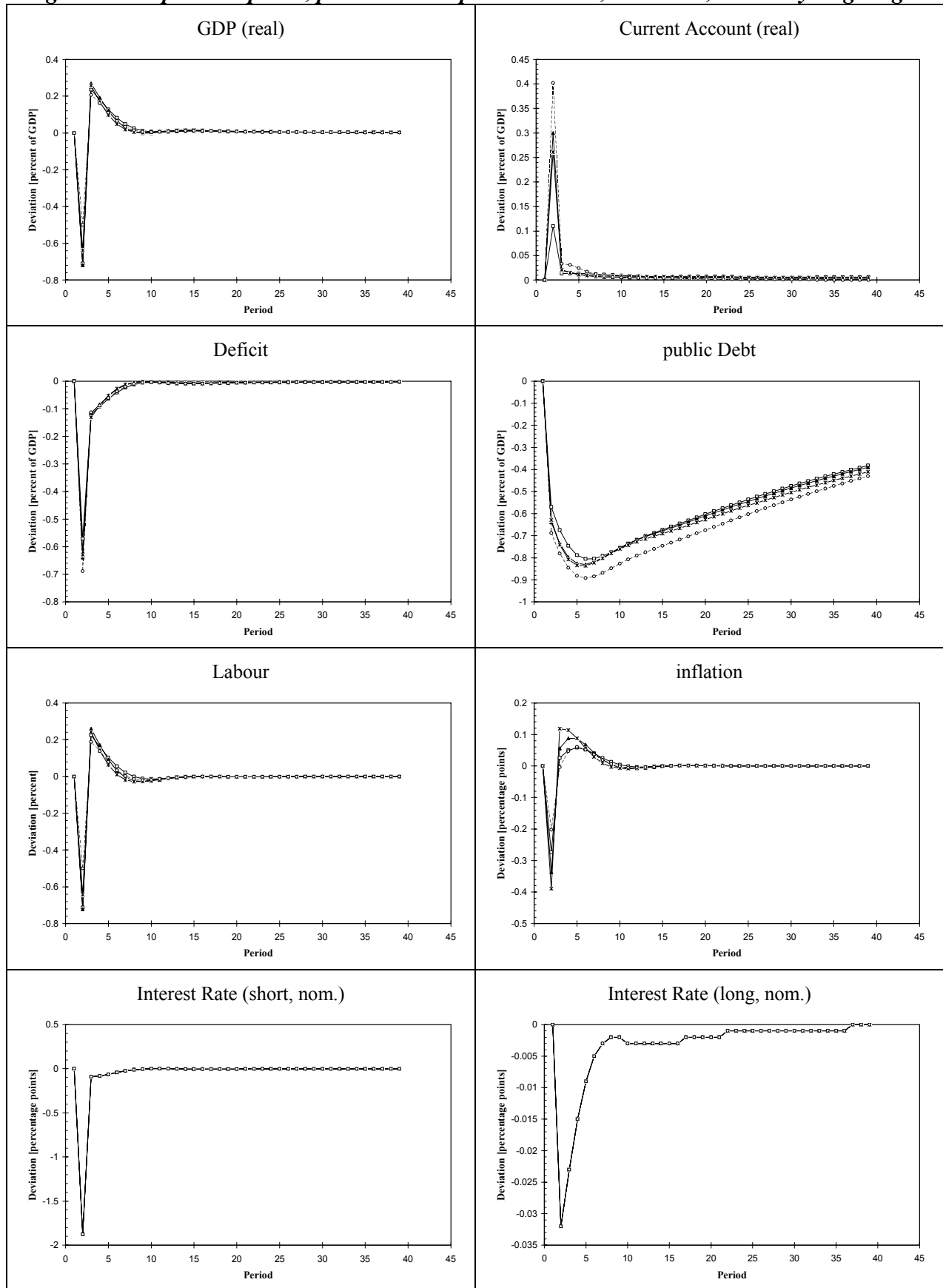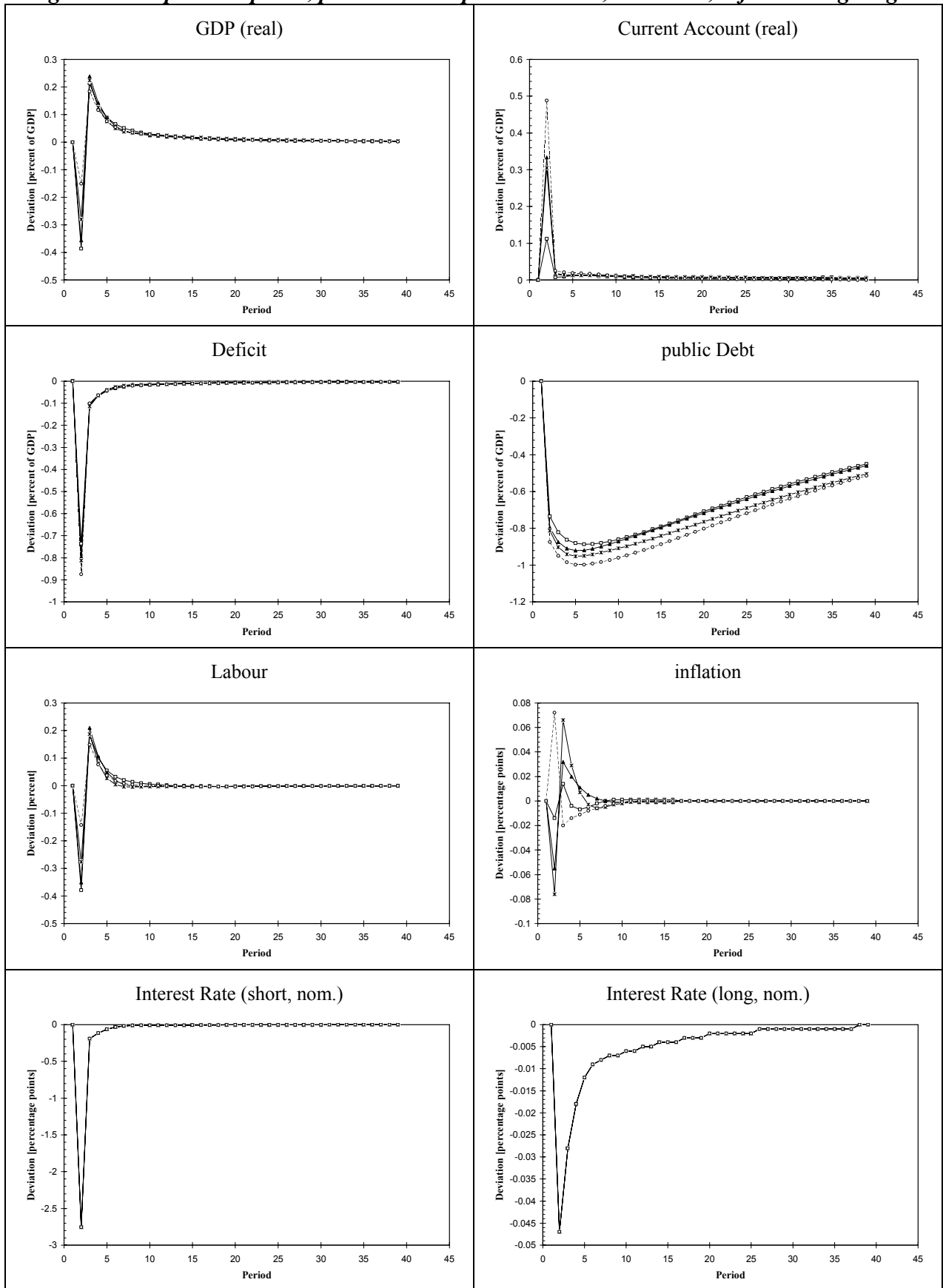
Figure 51: Impulse response, public consumption decrease, Germany, monetary targeting
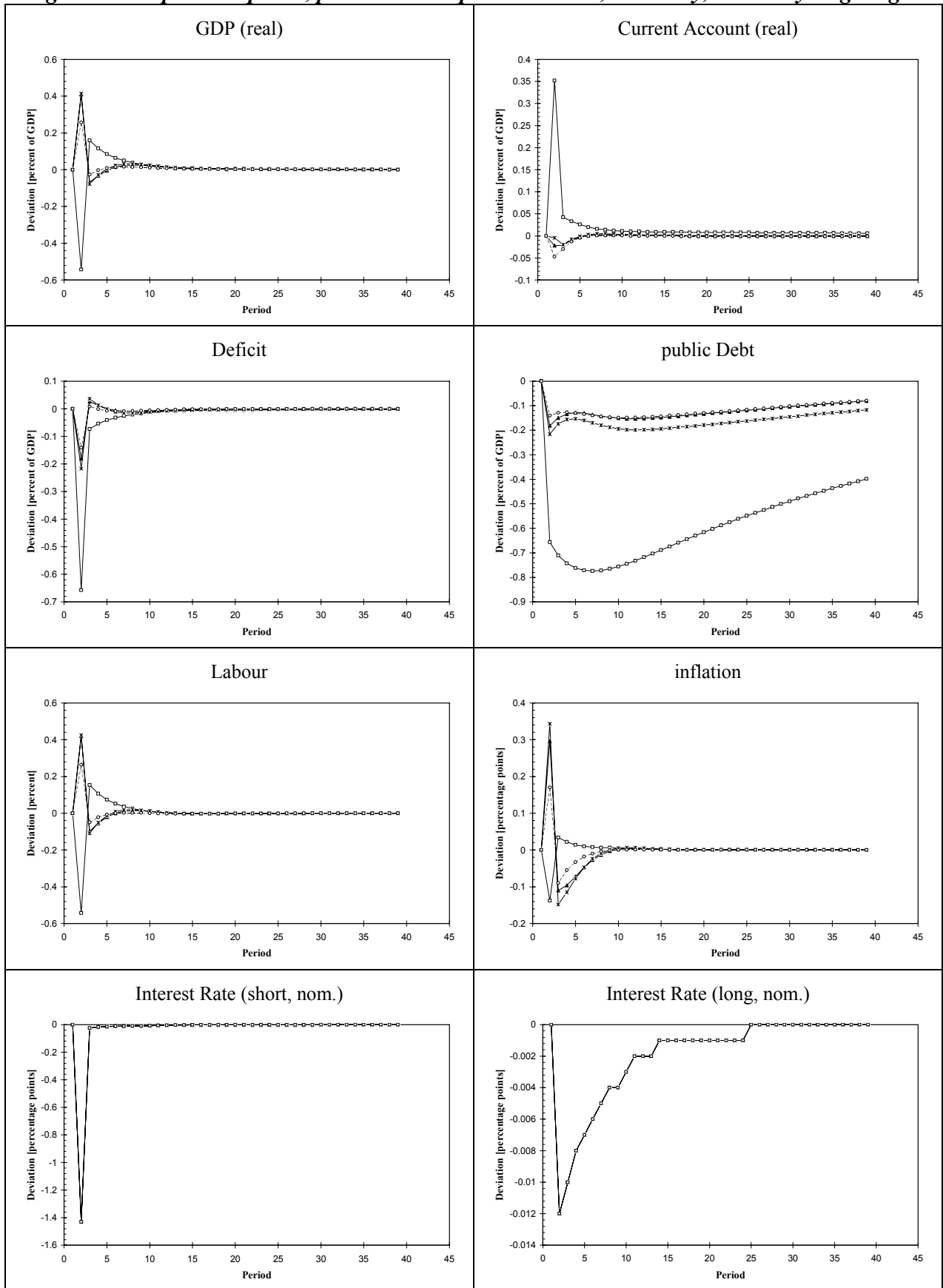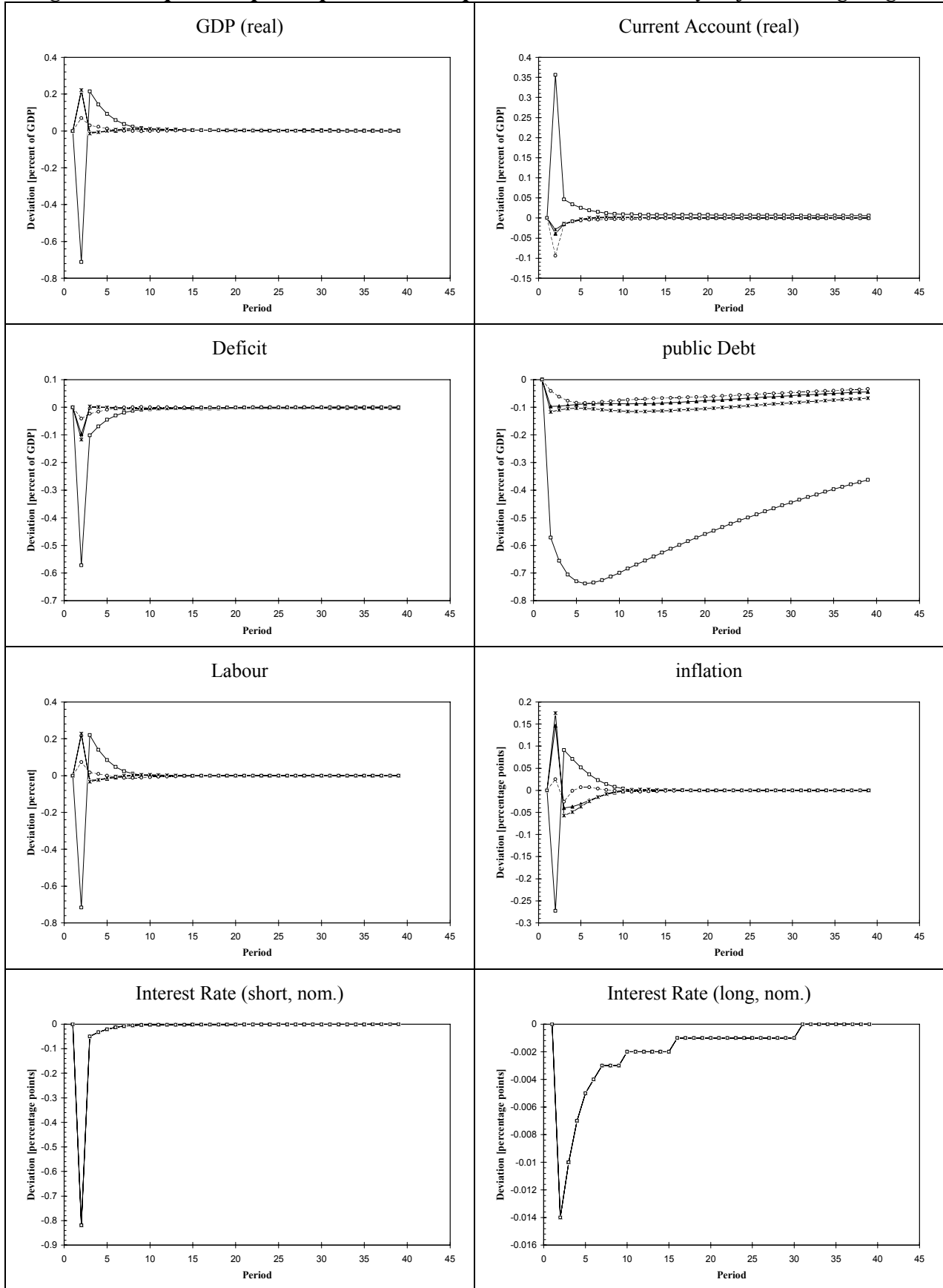
Figure 52: Impulse response, public consumption decrease, Austria, monetary targeting
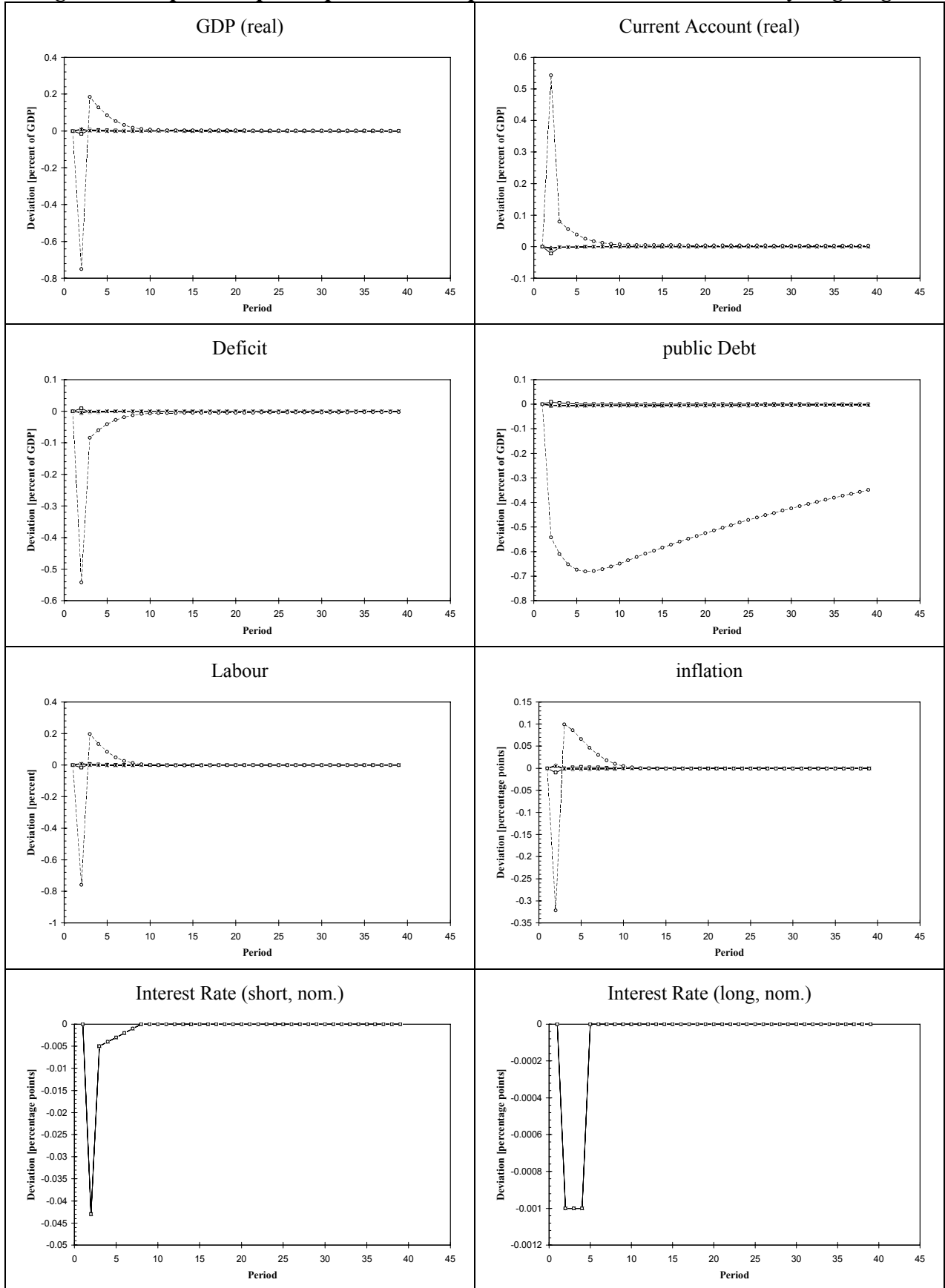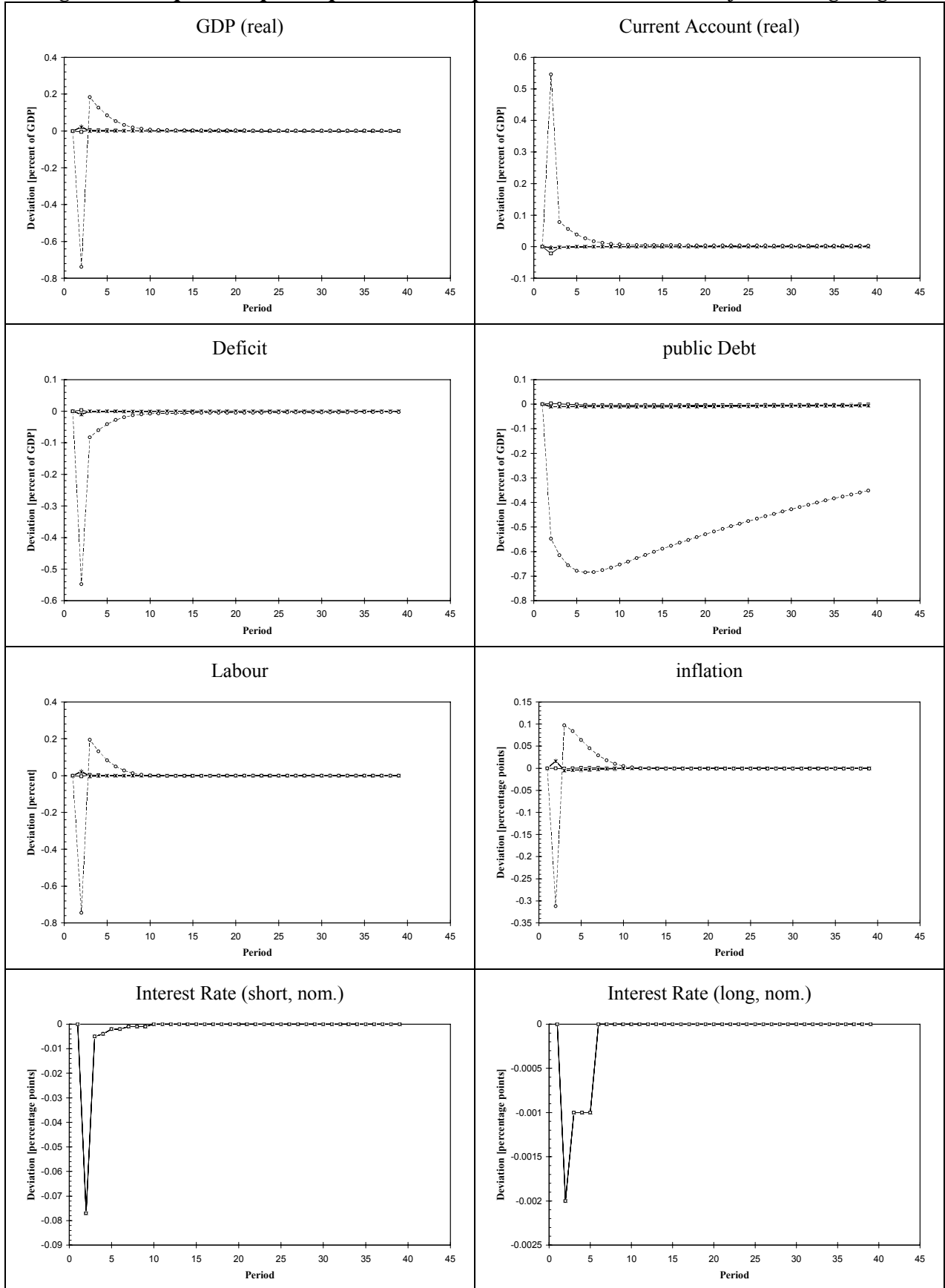
Figure 53: Impulse response, public consumption decrease, France, monetary targeting
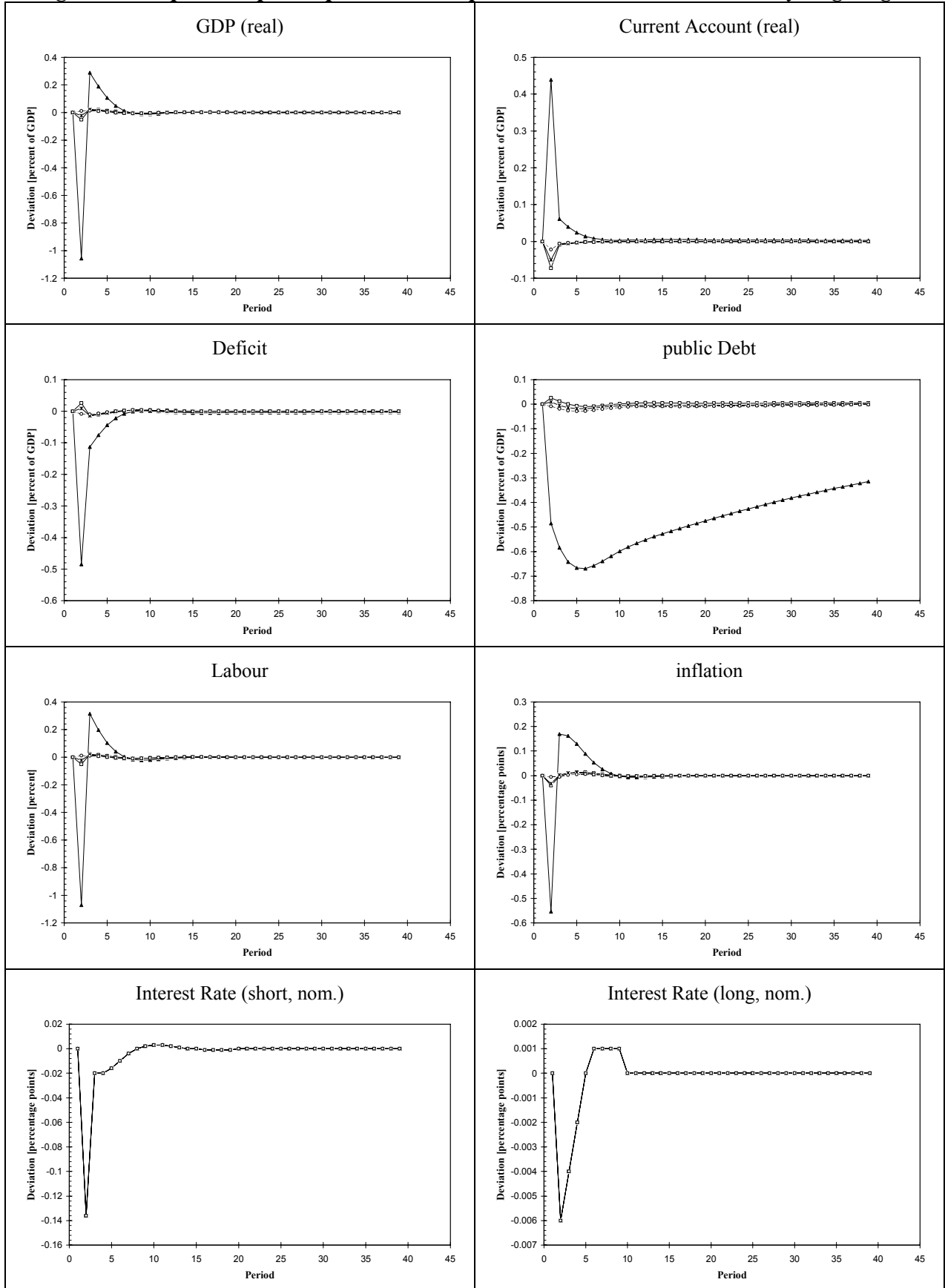
Figure 54: Impulse response, public consumption decrease, Italy, monetary targeting
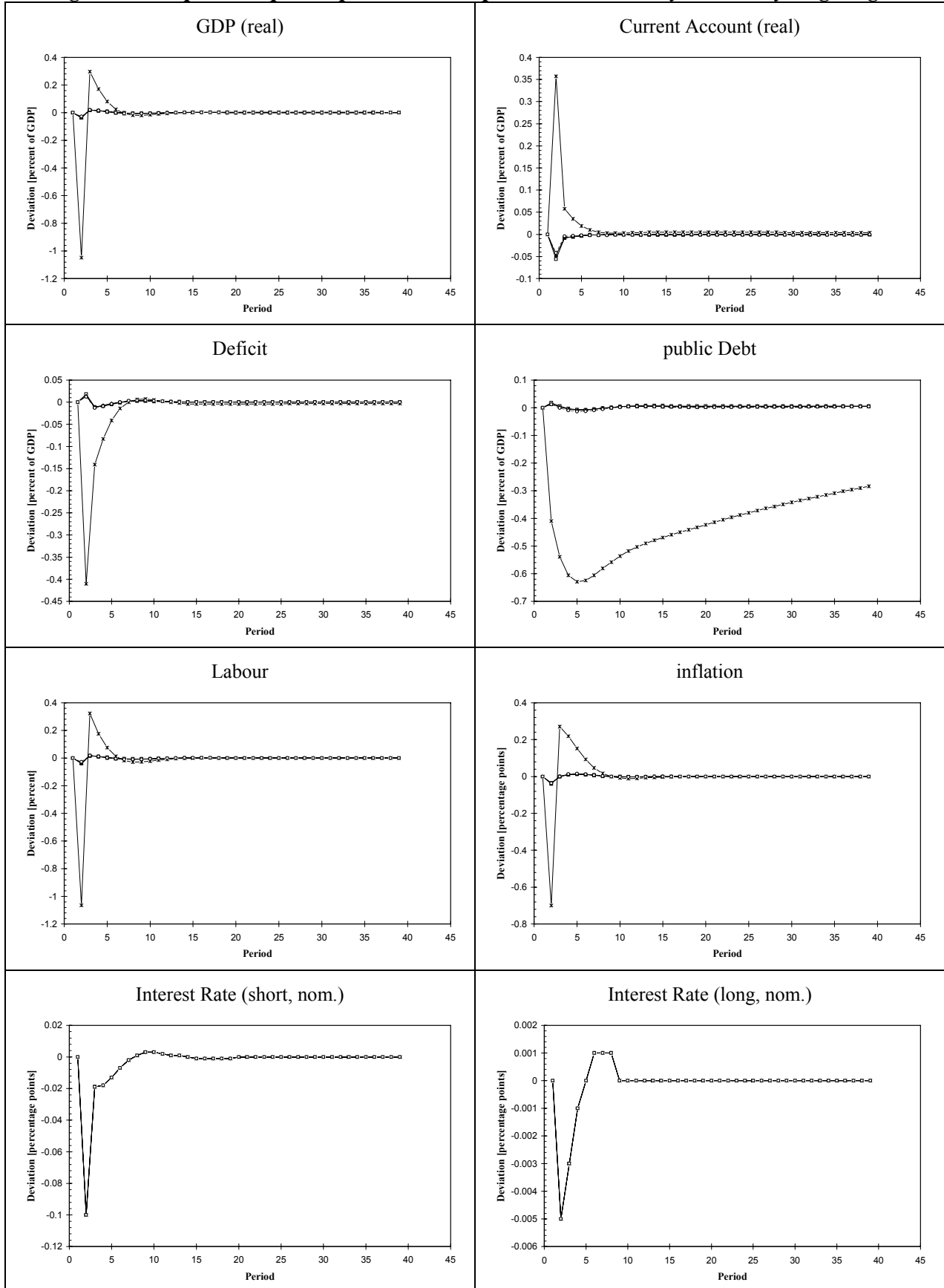
Figure 55: Impulse response, public Investment decrease, euro area, monetary targeting
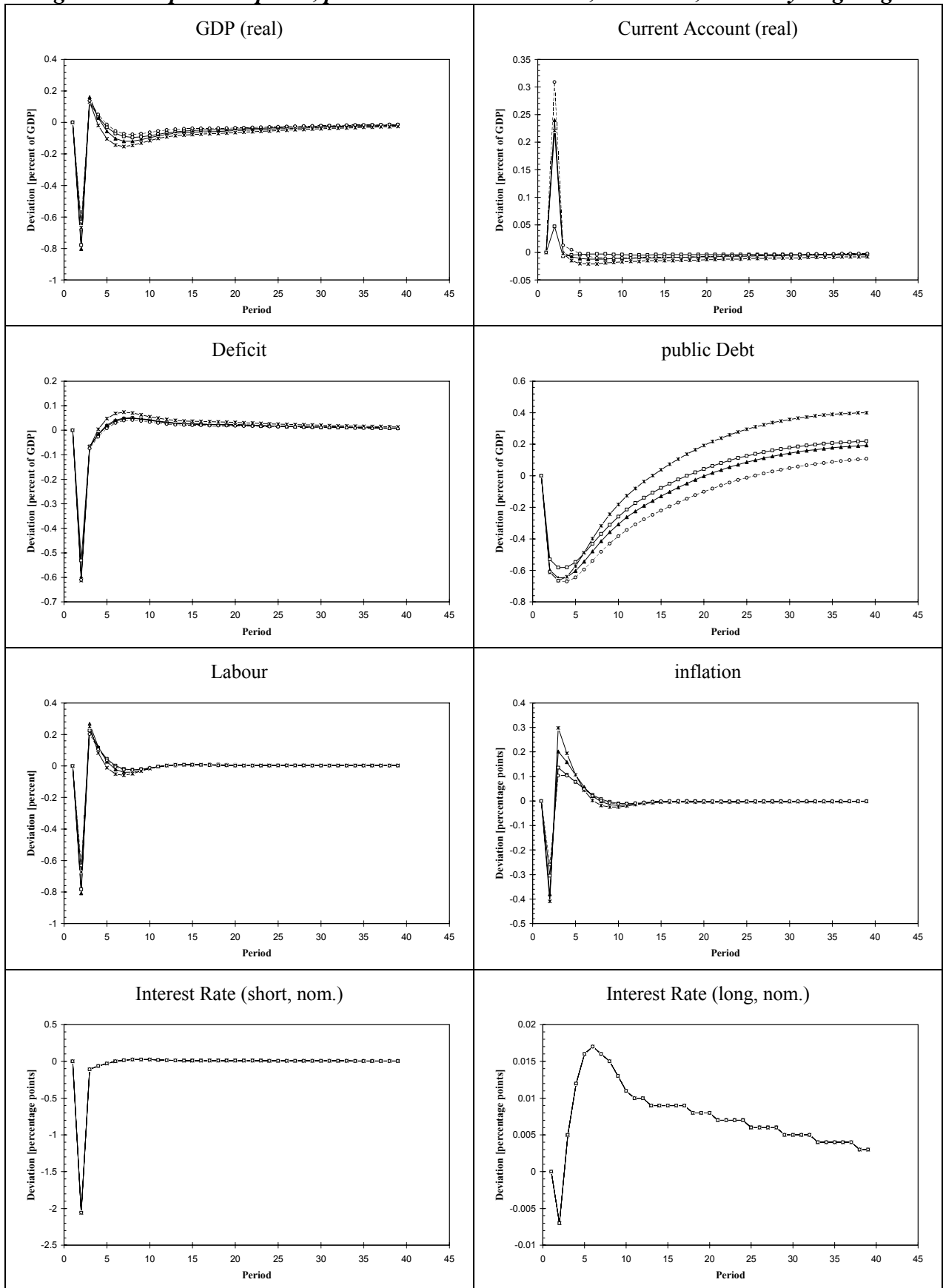
Figure 56: Impulse response, public investment decrease, Germany, monetary targeting
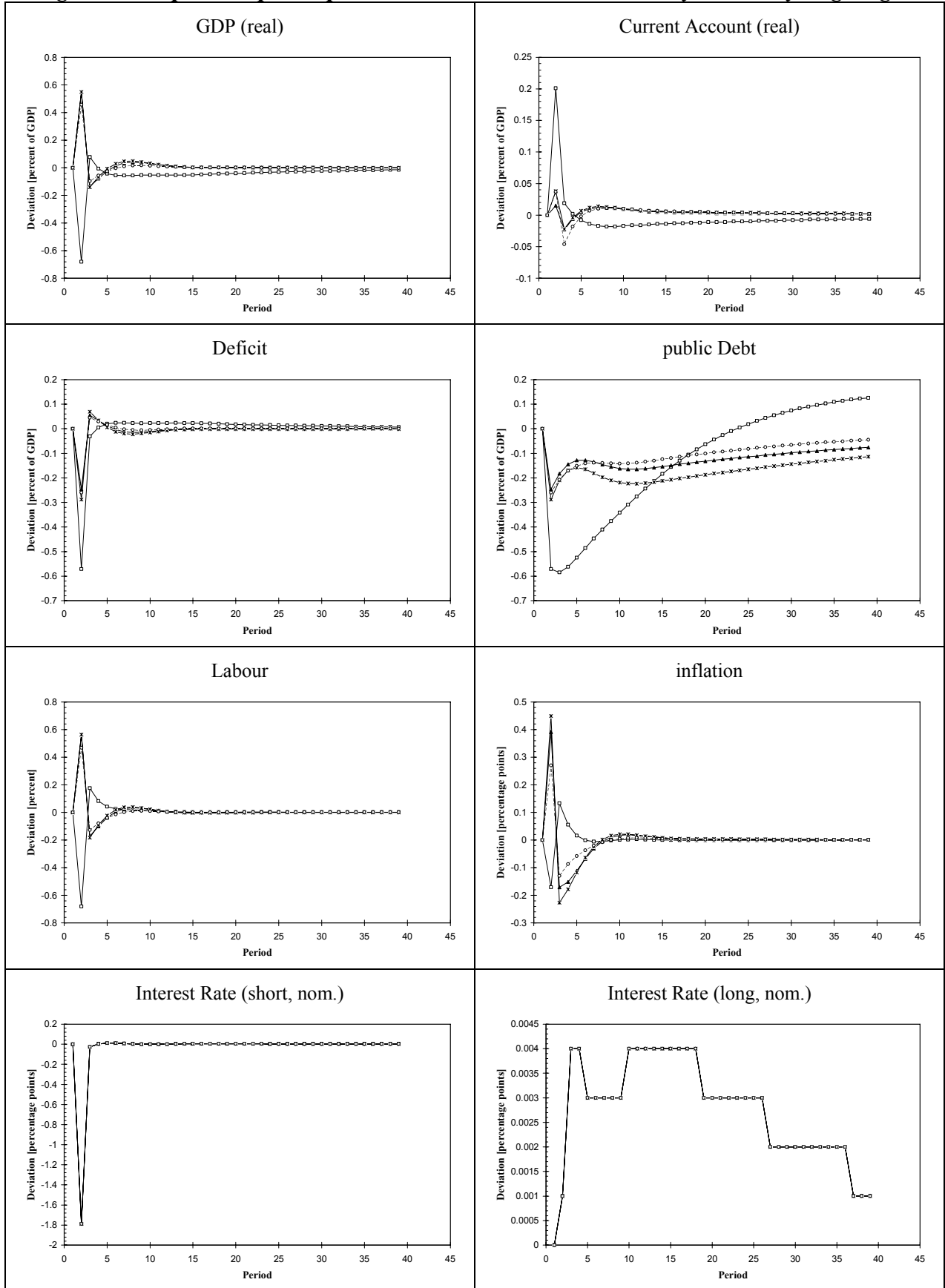
Figure 57: Impulse response, public investment decrease, Austria, monetary targeting
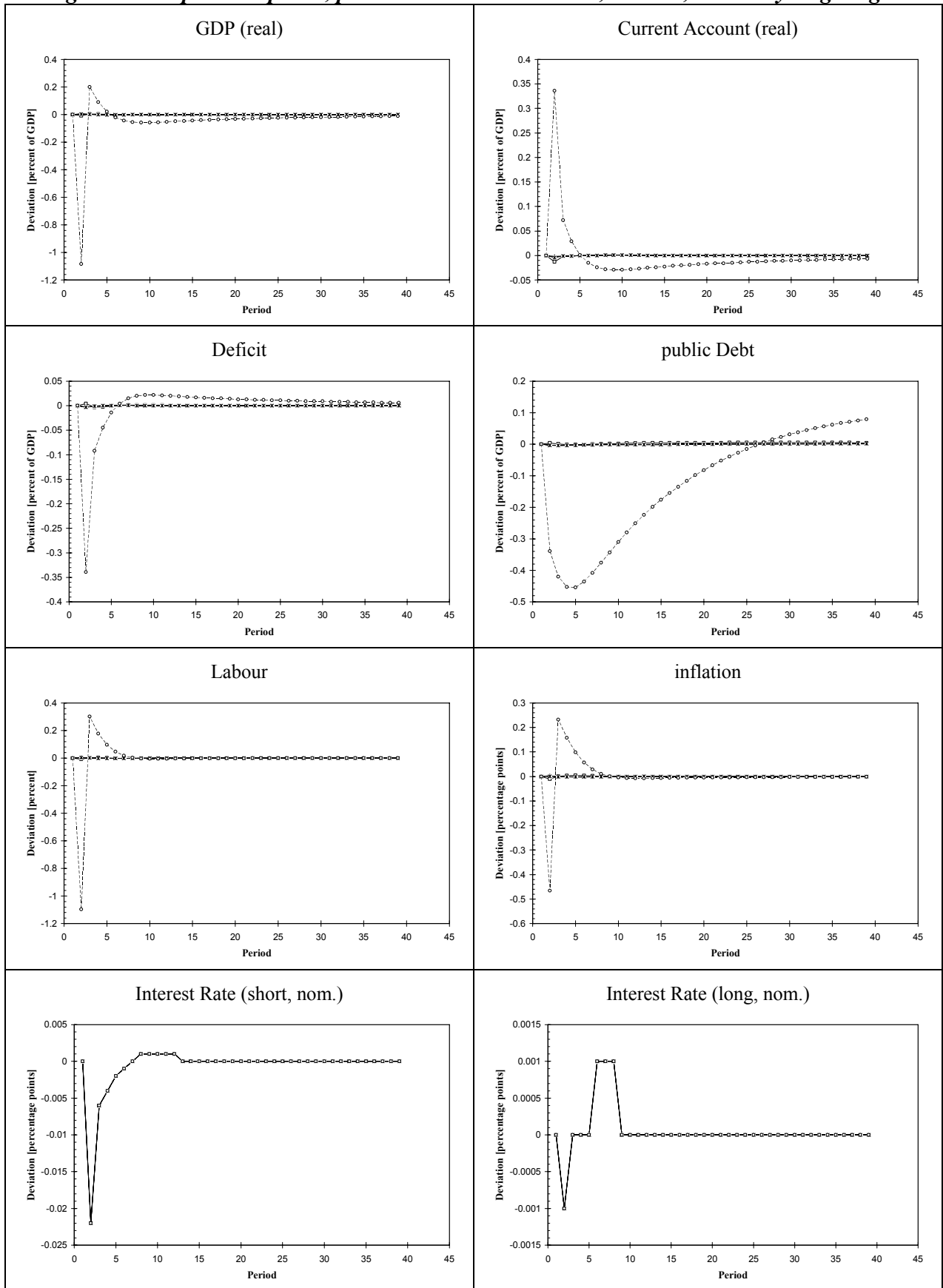
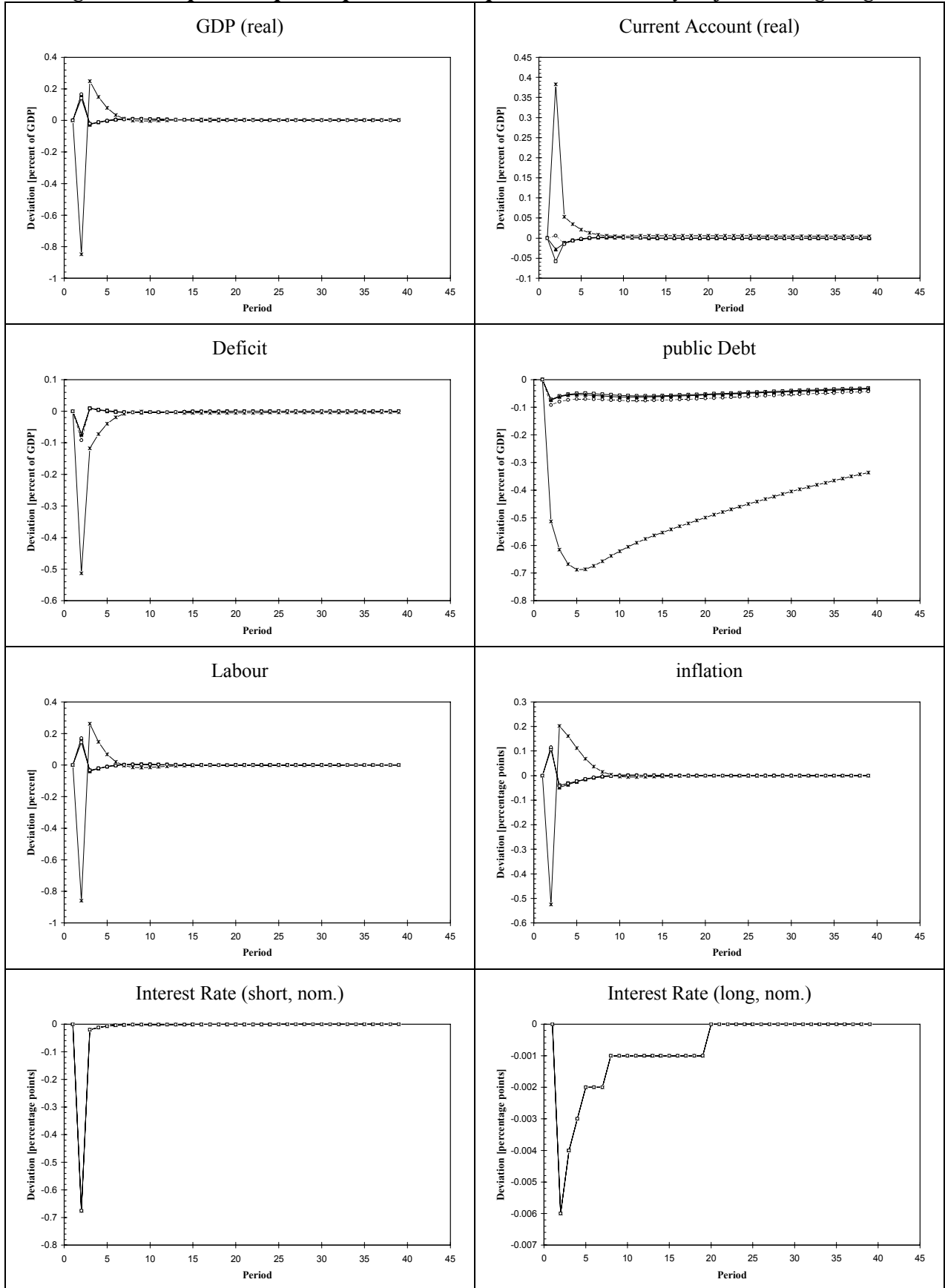**Figure 58: Impulse response, public investment decrease, France, monetary targeting**
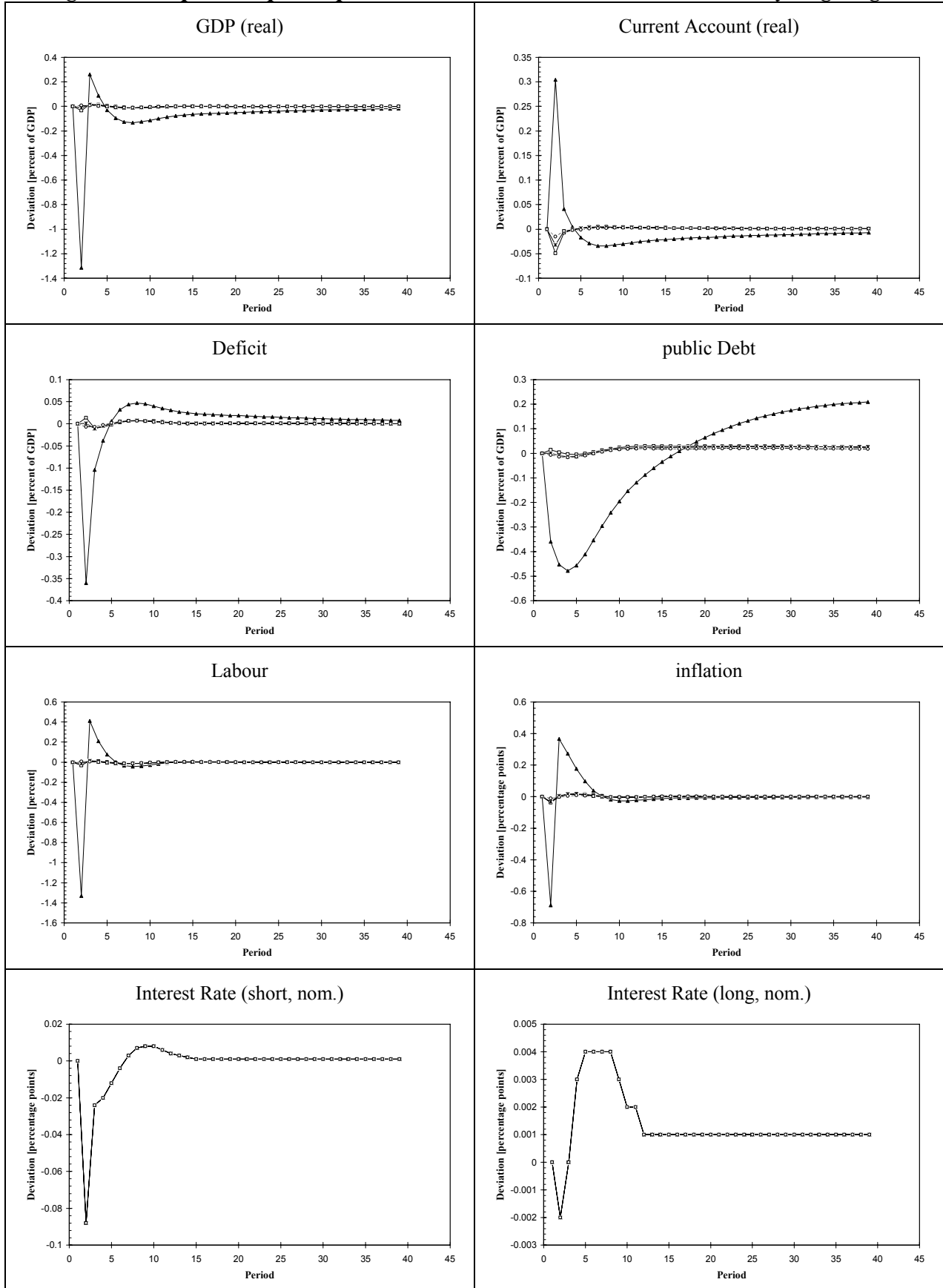
Figure 59: Impulse response, public investment decrease, Italy, monetary targeting

Figure 60: Impulse response, tax increase, euro area, inflation targeting

Figure 61: Impulse response, tax increase, Germany, inflation targeting

GDP (real)

Current Account (real)

Deficit

public Debt

Labour

inflation

Interest Rate (short, nom.)

Interest Rate (long, nom.)

Figure 62: Impulse response, tax increase, Austria, inflation targeting

Figure 63: Impulse response, tax increase, France, inflation targeting

GDP (real)

Current Account (real)

Deficit

public Debt

Labour

inflation

Interest Rate (short, nom.)

Interest Rate (long, nom.)

Figure 64: Impulse response, tax increase, Italy, inflation targeting

Figure 65: Impulse response, public consumption decrease, euro area, inflation targeting

Figure 66: Impulse response, public consumption decrease, Germany, inflation targeting
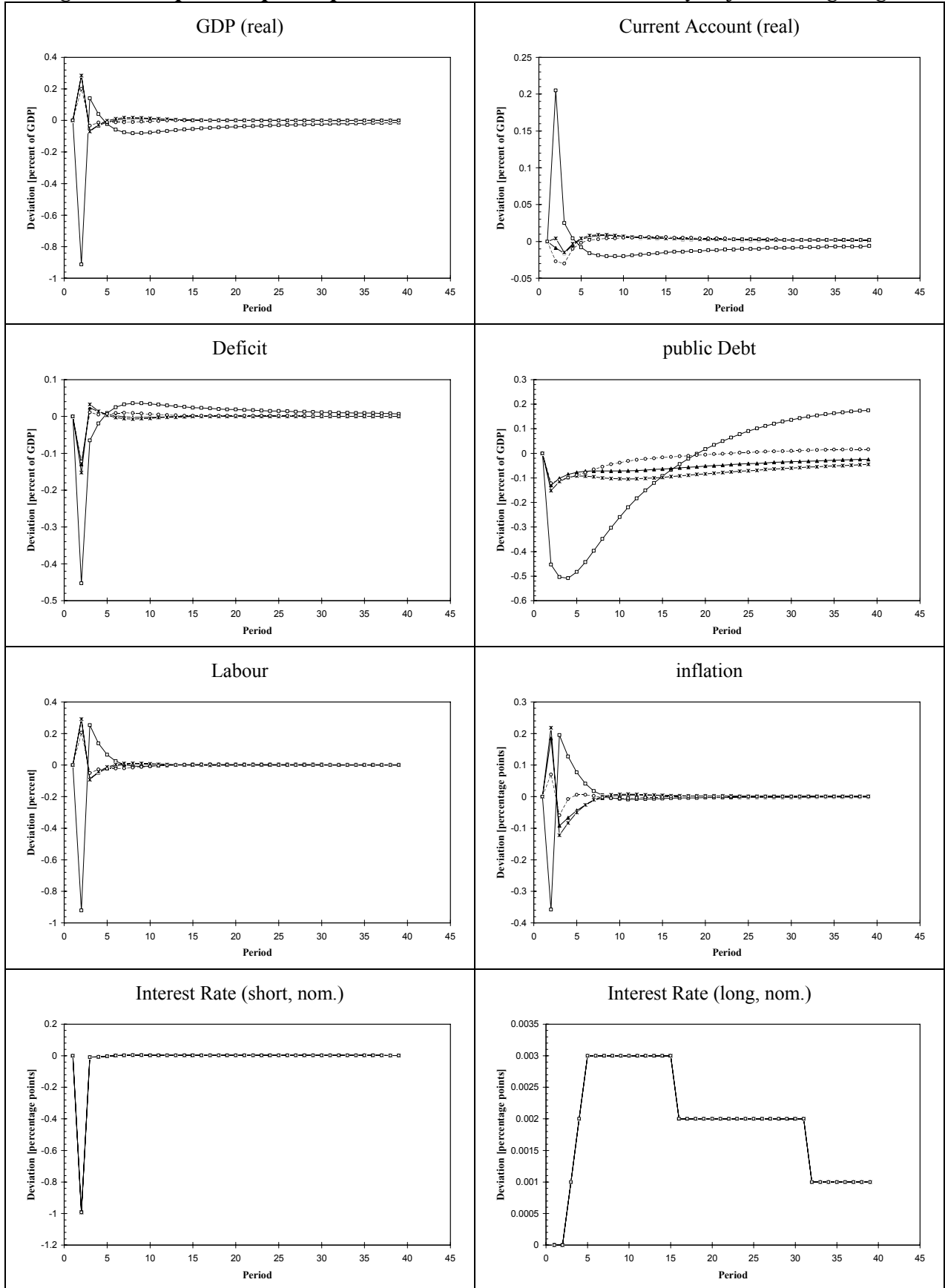
Appendix

Figure 67: Impulse response, public consumption decrease, Austria, inflation targeting

Figure 68: Impulse response, public consumption decrease, France, inflation targeting
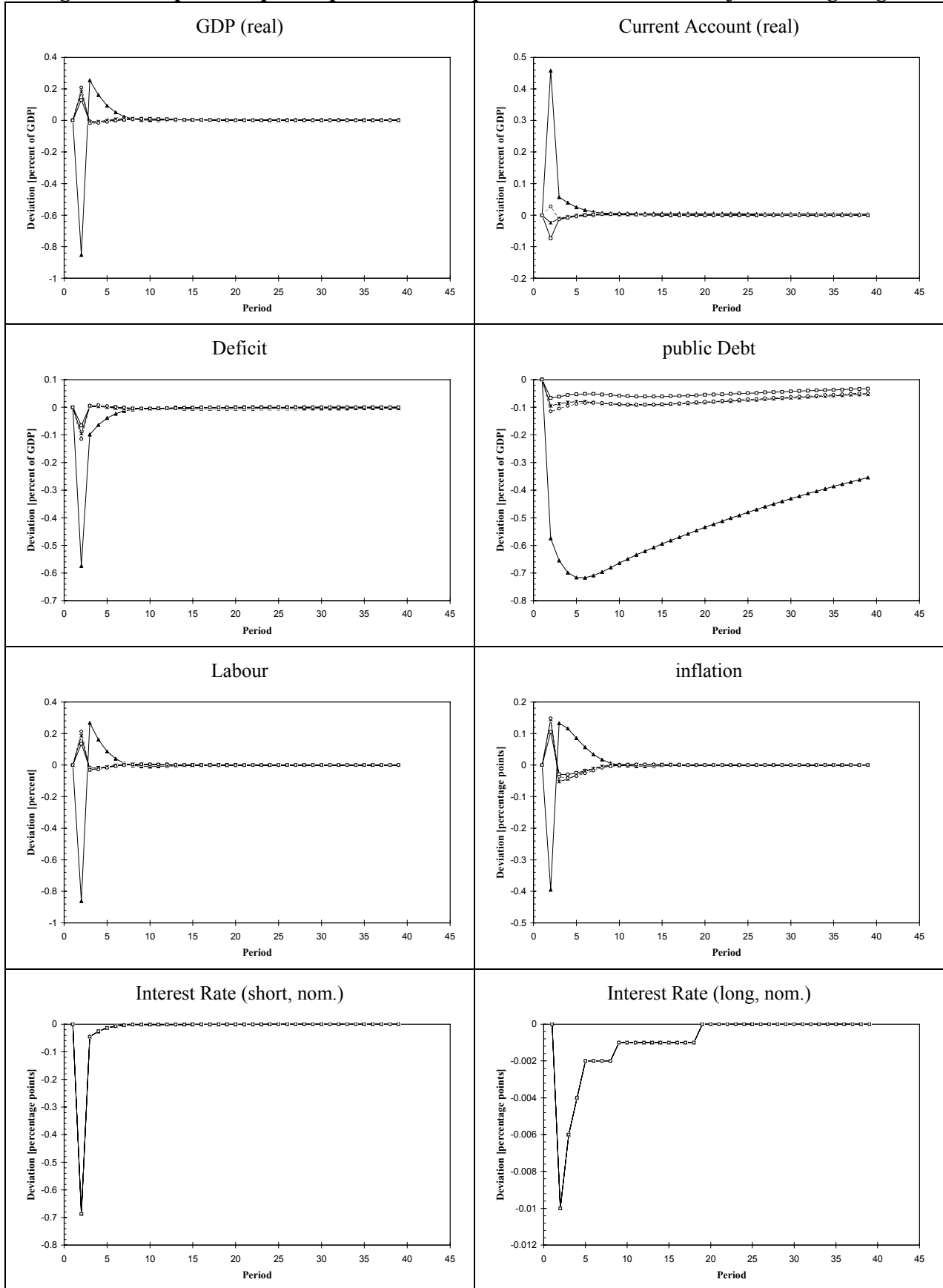
Figure 69: Impulse response, public consumption decrease, Italy, inflation targeting

Figure 70: Impulse response, public investment decrease, euro area, inflation targeting
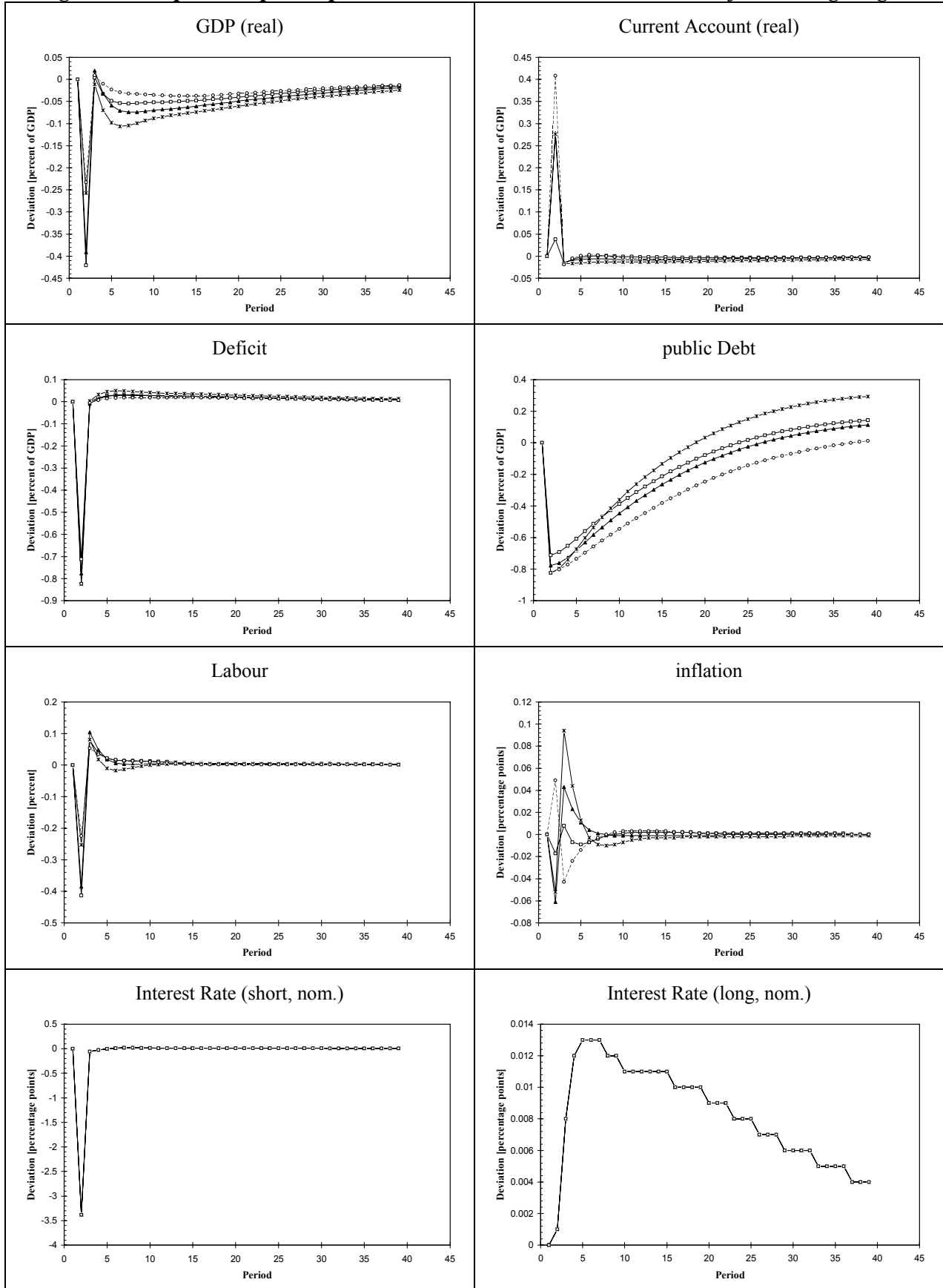
Figure 71: Impulse response, public investment decrease, Germany, inflation targeting

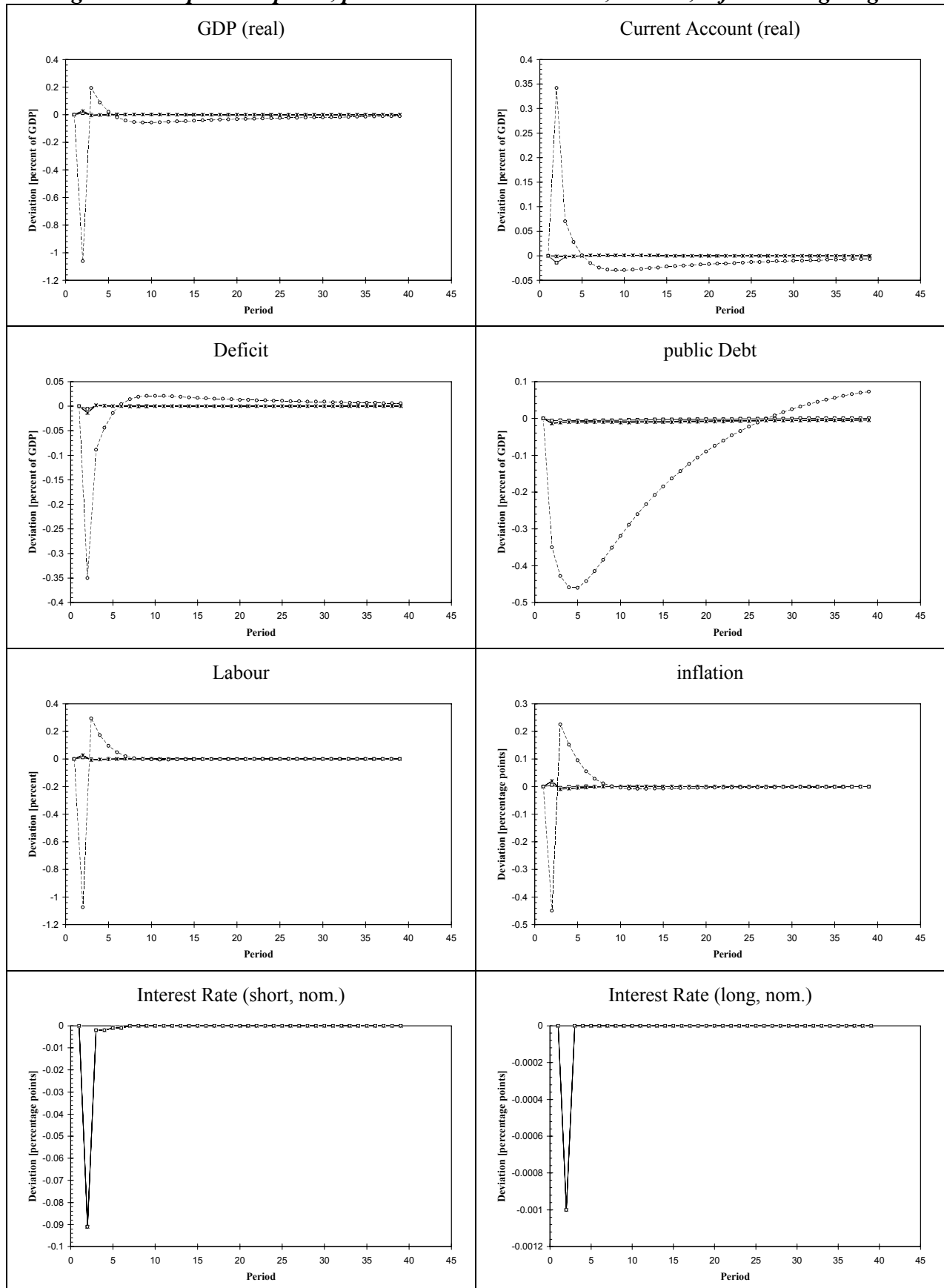***Figure 72: Impulse response, public investment decrease, Austria, inflation targeting***

Figure 73: Impulse response, public investment decrease, France, inflation targeting
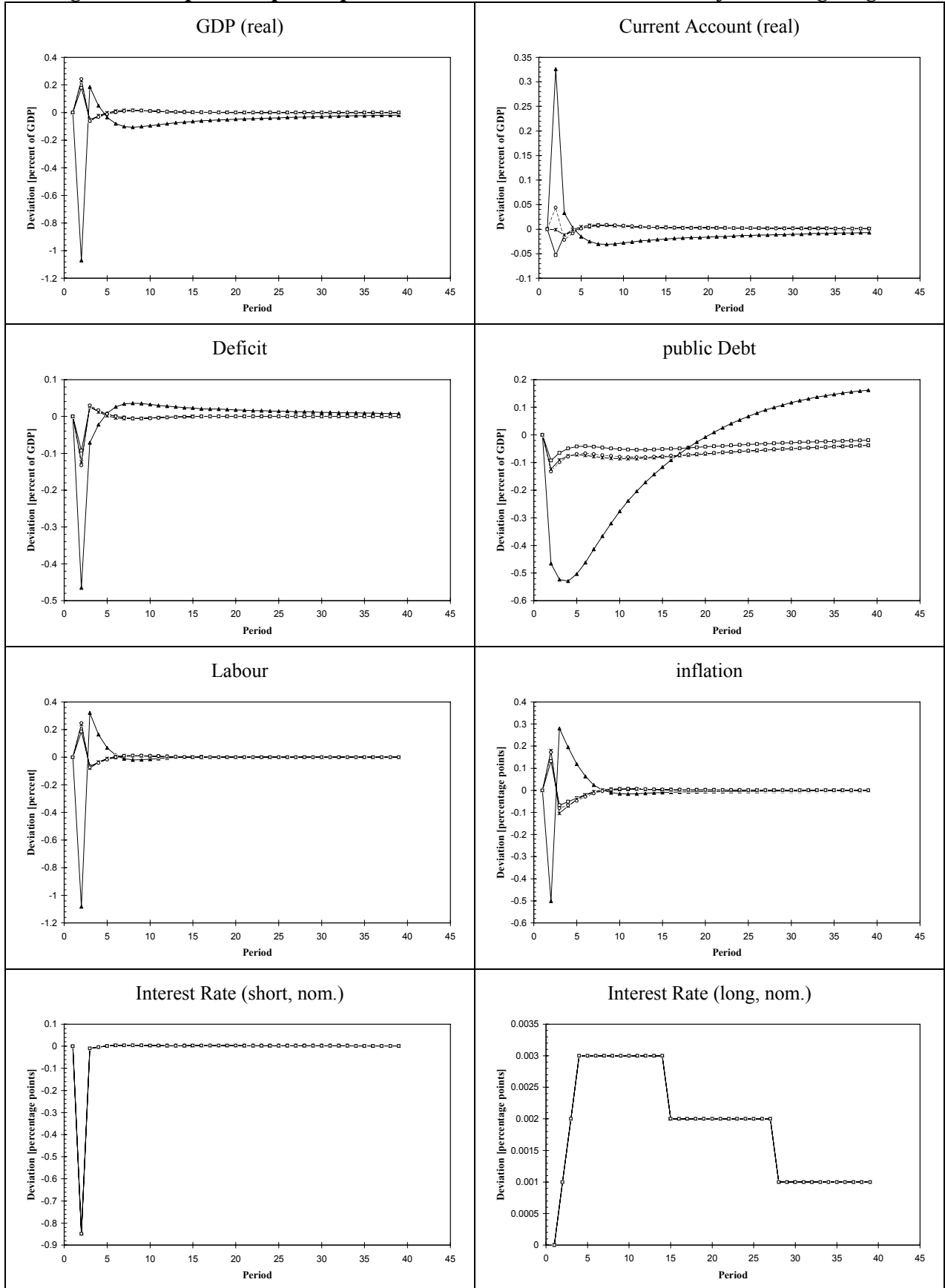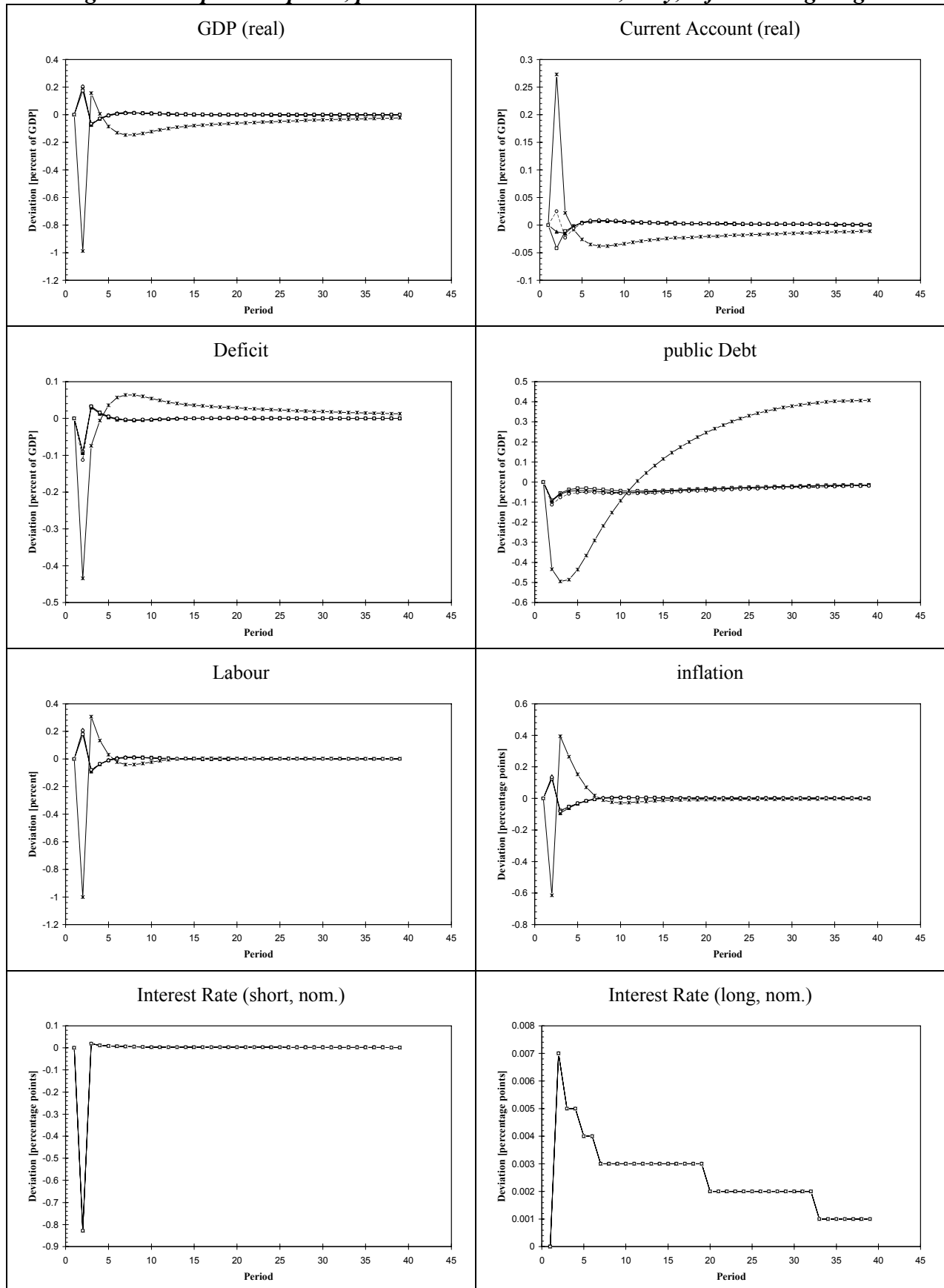
Figure 74: Impulse response, public investment decrease, Italy, inflation targeting

The results can be summarised as follows: In each case, real GDP of the country/region affected by the increase of lump-sum taxes (decrease of lump-sum transfers), decrease of public consumption, or decrease of public investment falls in the year of the policy change, overshoots then and returns to baseline values after about 5 years. Real current account improves in the short run (both due to reduced import demand and improvement of terms of trade). The government sector deficit falls in the first year and stays below baseline values for 5 more years. Government debt stays below baseline for a longer period. Employment behaves qualitatively and quantitatively in a similar way as real GDP. The short-term interest rate falls considerably, but only during the year of the policy shock. The long-term interest rate falls much less but stays below baseline for more years.

The following differences between the effects of different policy instruments are found: Short-run negative effects on GDP and employment are strongest under a decrease of public investment, less so under a decrease of public consumption, and weakest under an increase of lump-sum taxes or decrease of lump-sum transfers. As the public-sector deficit reacts endogenously on GDP changes, the opposite is true for the deficit and the public debt. Negative effects on short-term interest rates are strongest for the public investment decrease and weakest for the tax increase/transfer decrease. For long-term interest rates and public debt, there is an important difference: Upon a one-time tax increase/transfer decrease or increase of public consumption, public debt returns monotonically and very slowly to the baseline. After a decrease of public investment, however, long-term interest rates overshoot and stay above baseline values, with negative effects on capital and wealth. This leads to public debt overshooting in later periods of the simulation; hence the original improvement of the public sector's debtor position is reversed in the long run for the countries/regions affected by the shock to public investment. From this, we can conclude that both the short-run and the long-run effects clearly speak against using public investment as a means of consolidating the budget of the public sector. The policy conclusion regarding the decision between the instruments public consumption and taxes/transfers is not so clear, in particular if we keep in mind that we have changed *lump-sum* taxes or transfers and hence neglected allocative effects (in particular, higher distortions when raising income or consumption taxes); also distributive effects are not considered in this macroeconomic analysis.

Differences between scenarios with different countries being shocked are largely as expected: The own-country effects are comparable to the euro area shocks in terms of own GDP-ratios

and percentage point values. Short-run negative GDP and employment effects are stronger and hence deficit and debt effects are weaker for the smaller economies of Austria, Italy and France than for Germany or especially the whole euro area. The latter result may be regarded as an argument in favour of policy coordination across the euro area. Spillover effects to countries not directly affected by the shock are positively related to the size of the country directly affected: For the shock to Germany, they are relatively strong for GDP and employment (and mostly anti-symmetric) but less so (and symmetric) for public deficit and debt; for the shock to Austria, they are virtually non-existent. The (one-time) effect on the common euro area short-term interest rate is non-negligible even in cases where only one country is affected by the shock. For instance, in the case of tax increase/transfer decrease with monetary targeting, the short-term interest rate falls by 1.3 percentage points under the euro area shock, by 1 percentage point under the Germany shock, by 0.1 percentage points under the France shock, by 0.08 percentage points under the Italy shock and by 0.03 under the Austrian shock. This shows that there are considerable spillover effects on the common financial sector within the euro area according to the MSG3 Model, even though spillover effects on flow variables of the "real" sector of the economy (GDP and its components, employment, etc.) are much smaller; effects on stocks (capital stock, private wealth) are again stronger.

If we compare the impulse responses under the assumption of monetary targeting and of inflation targeting by the ECB, respectively, the qualitative differences described above hold under both monetary policy regimes. The main difference is in the short run: Under monetary targeting (which in the MSG3 Model is equivalent to keeping money supply at fixed baseline values), inflation moves parallel to GDP and employment in the country affected directly by the shock (with changes amounting to roughly one half percentage point values than for these variables). This means that in the first year, where the effects are strongest, inflation is lower than in the baseline solution of the model. In later years, it can be higher, but never more than by 0.6 percentage points (mostly much less). Under inflation targeting, the ECB reacts upon the fall of inflation by increasing money supply, which keeps euro area average inflation (though not necessarily inflation in all euro area countries) very close to zero. This expansionary monetary policy weakens the decline of GDP and reinforces the decline of the public deficit and (mainly in the case of the common euro area shock) of the short-term interest rate. Although these short-run effects of inflation targeting are favourable, we do not consider such a reaction of the ECB to be likely. Given the ECB's primary objective of price

stability, it is more plausible that the ECB will not react upon a one-time fall of GDP and inflation by about one percent or less in an expansionary way, especially when the shock is accompanied by a considerable (endogenous) fall of the short-term interest rate. Therefore, we retain the assumption of monetary targeting for the ECB also in the simulations of structural and budgetary policies in chapter 7, which imply qualitatively similar scenarios as described above.

Appendix 5: Spillover effects of combined structural and budgetary consolidation policies

In this Appendix, we present simulation results that show all possible combinations of the effects of structural policies as assumed in section 7.1 and of budgetary consolidation policies as assumed in section 7.2 of chapter 7. This serves to demonstrate how these two types of policies interact and which kind of spillover effects exist between these policies, especially if different countries (Germany and Italy, in our case) or the entire euro area implement one or both of these policies. A summary interpretation of the results is given in section 7.3.

Figure 75: Public consumption decrease and structural policy in Germany
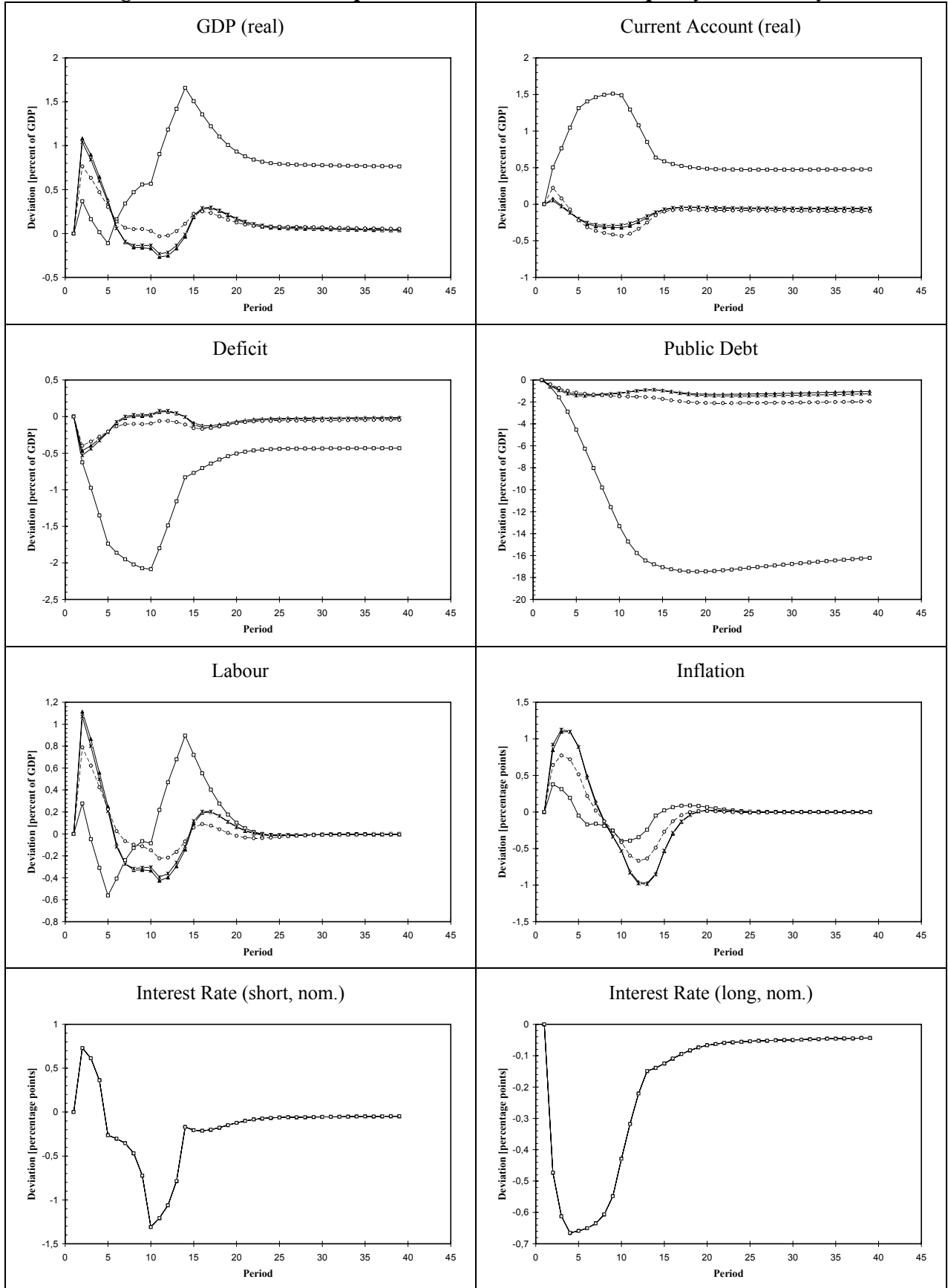
Figure 76: Public consumption decrease in Italy, structural policy in Germany
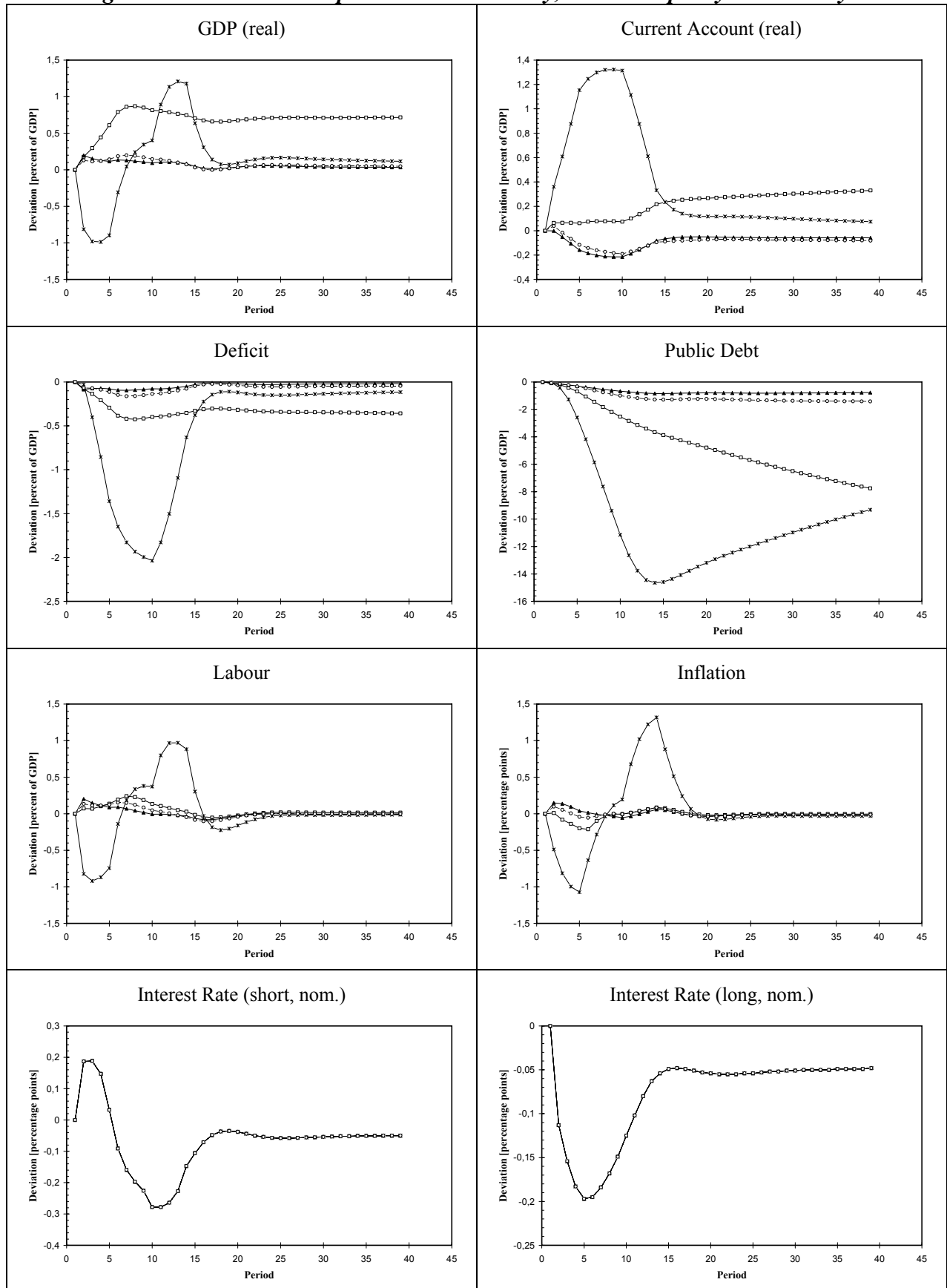
Figure 77: Public consumption decrease in euro area, structural policy in Germany
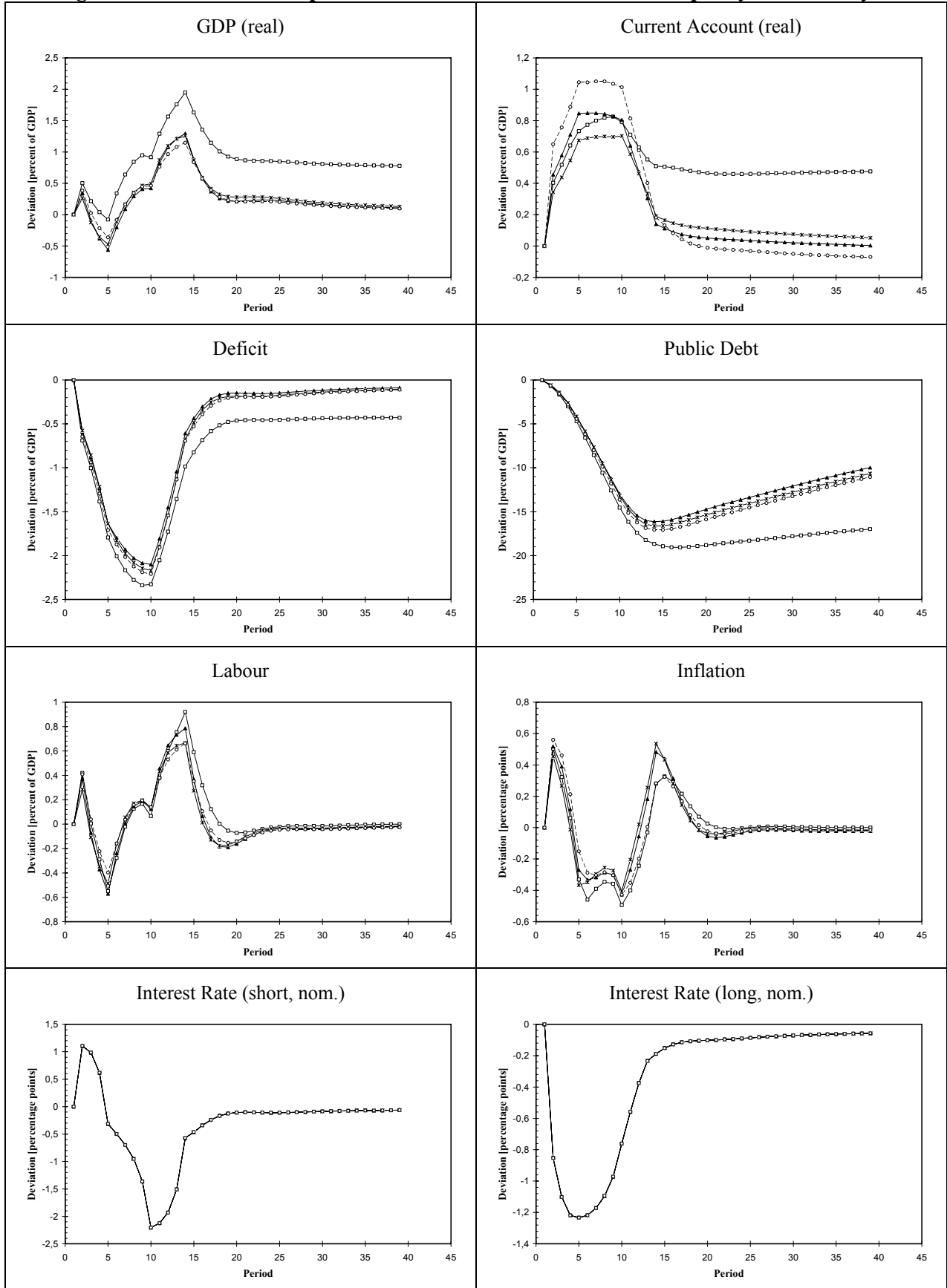
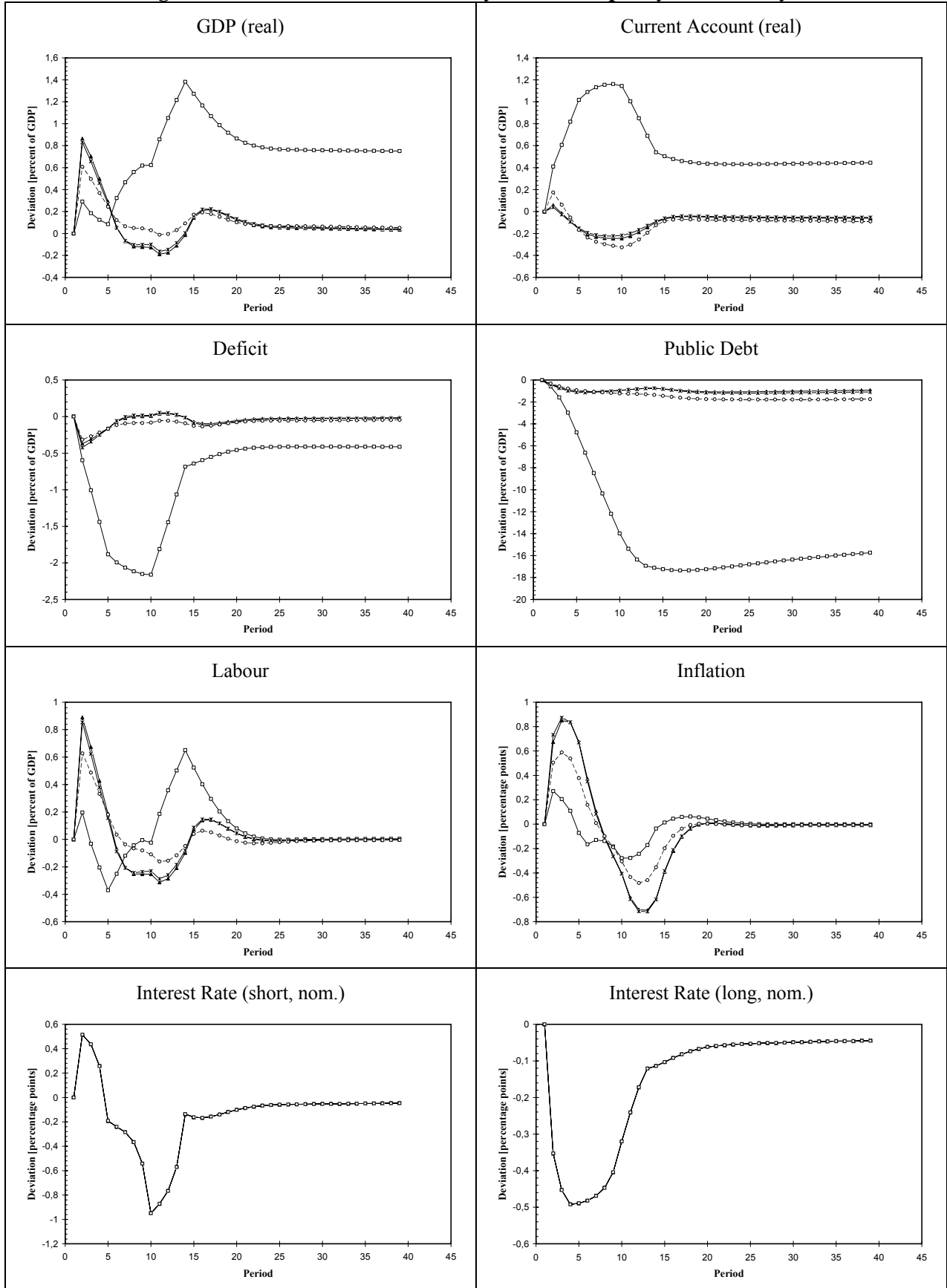*Figure 78: Tax increase in Germany, structural policy in Germany*

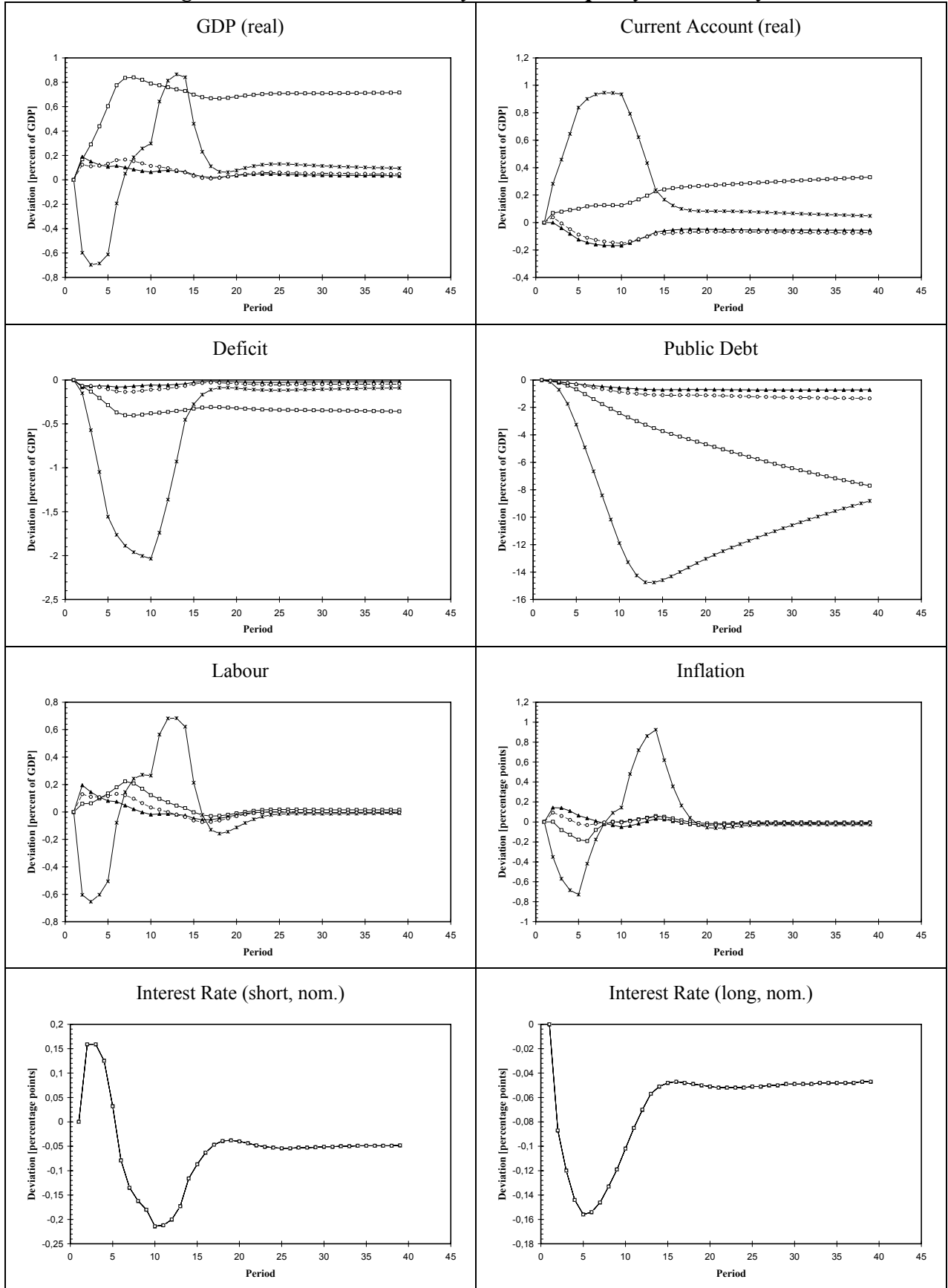*Figure 79: Tax increase in Italy, structural policy in Germany*

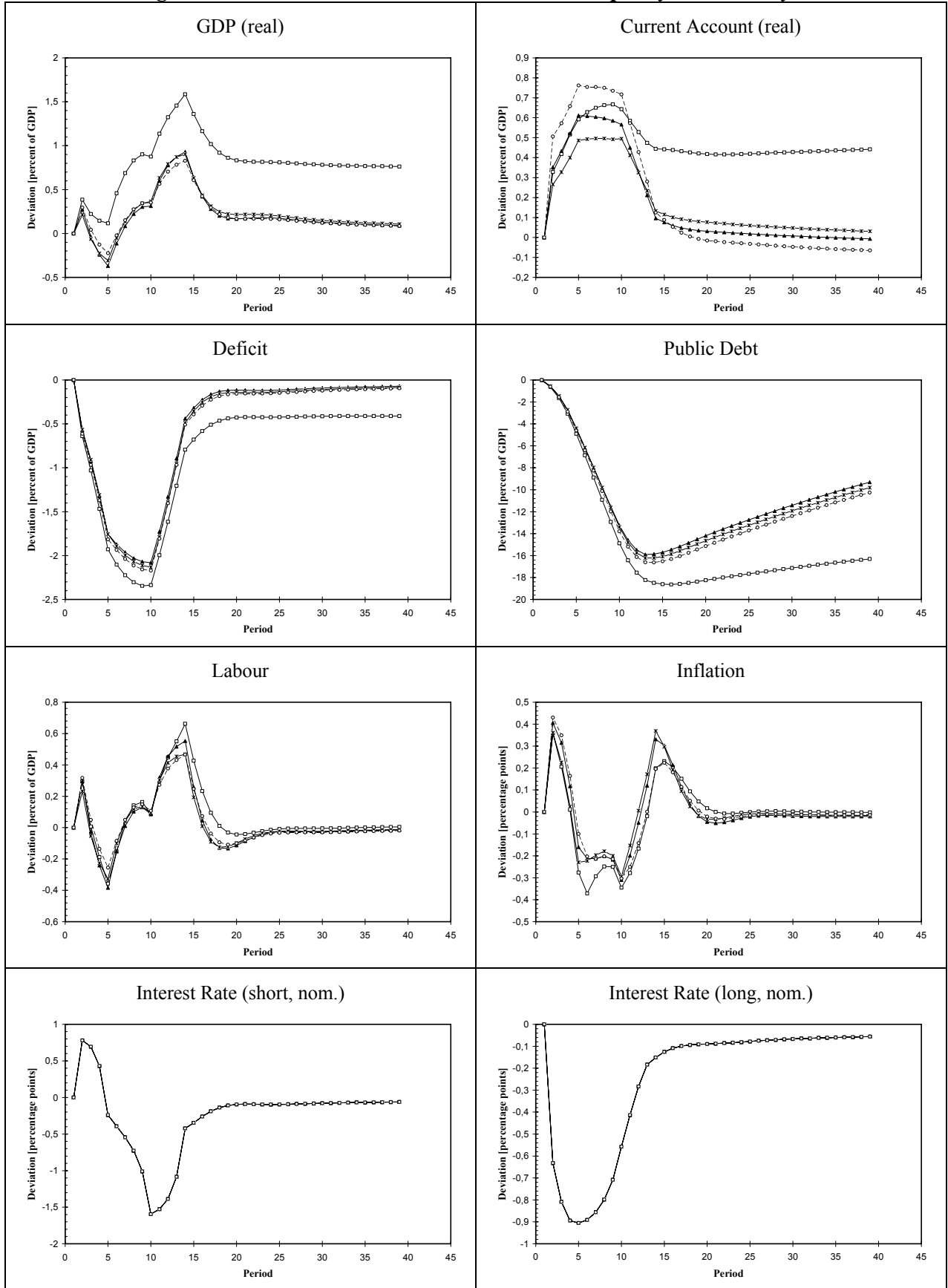*Figure 80: Tax increase in euro area, structural policy in Germany*

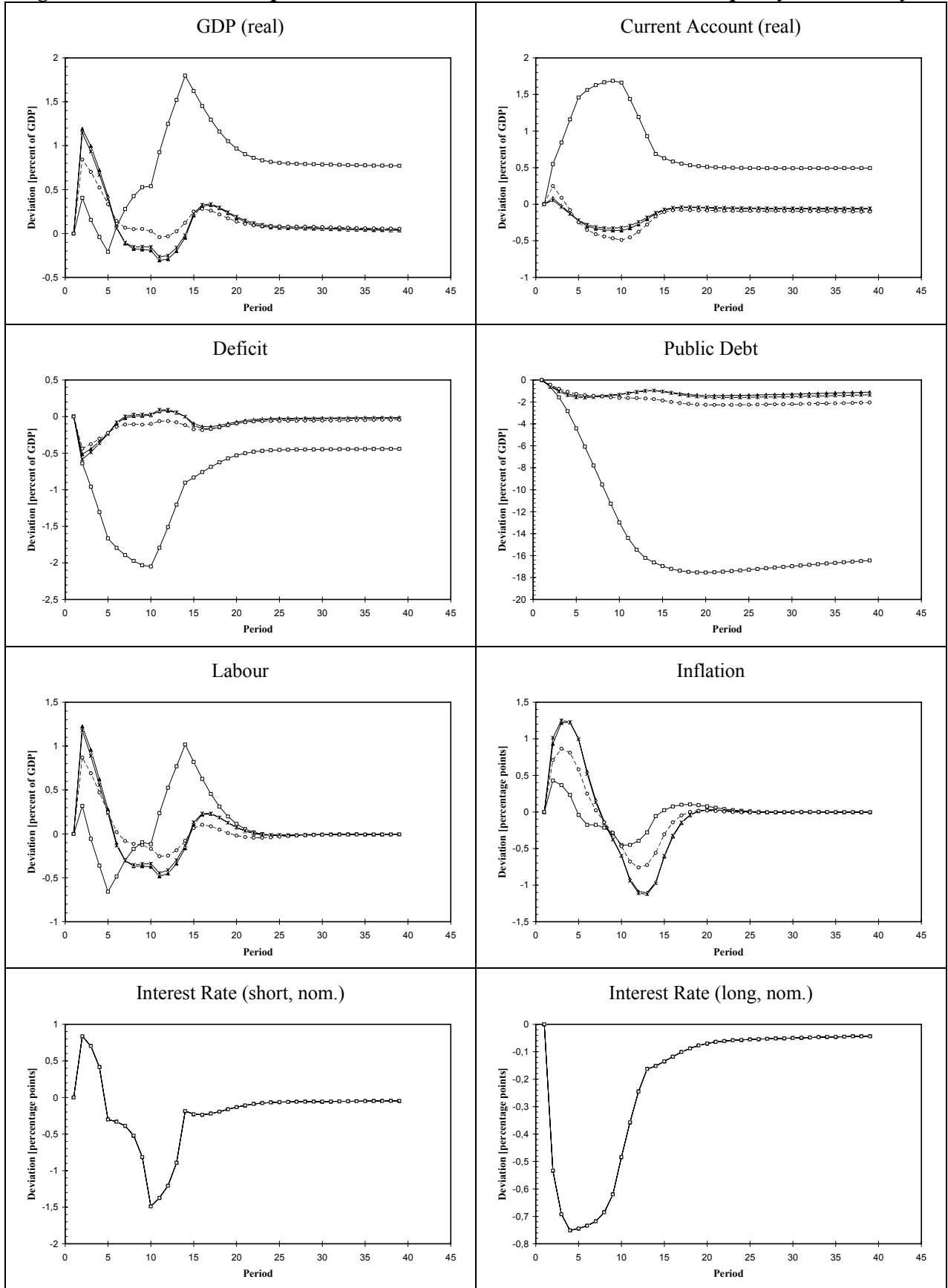***Figure 81: Public consumption decrease and tax increase and structural policy in Germany***

Figure 82: Public consumption decrease and tax increase in Italy, structural policy in Germany
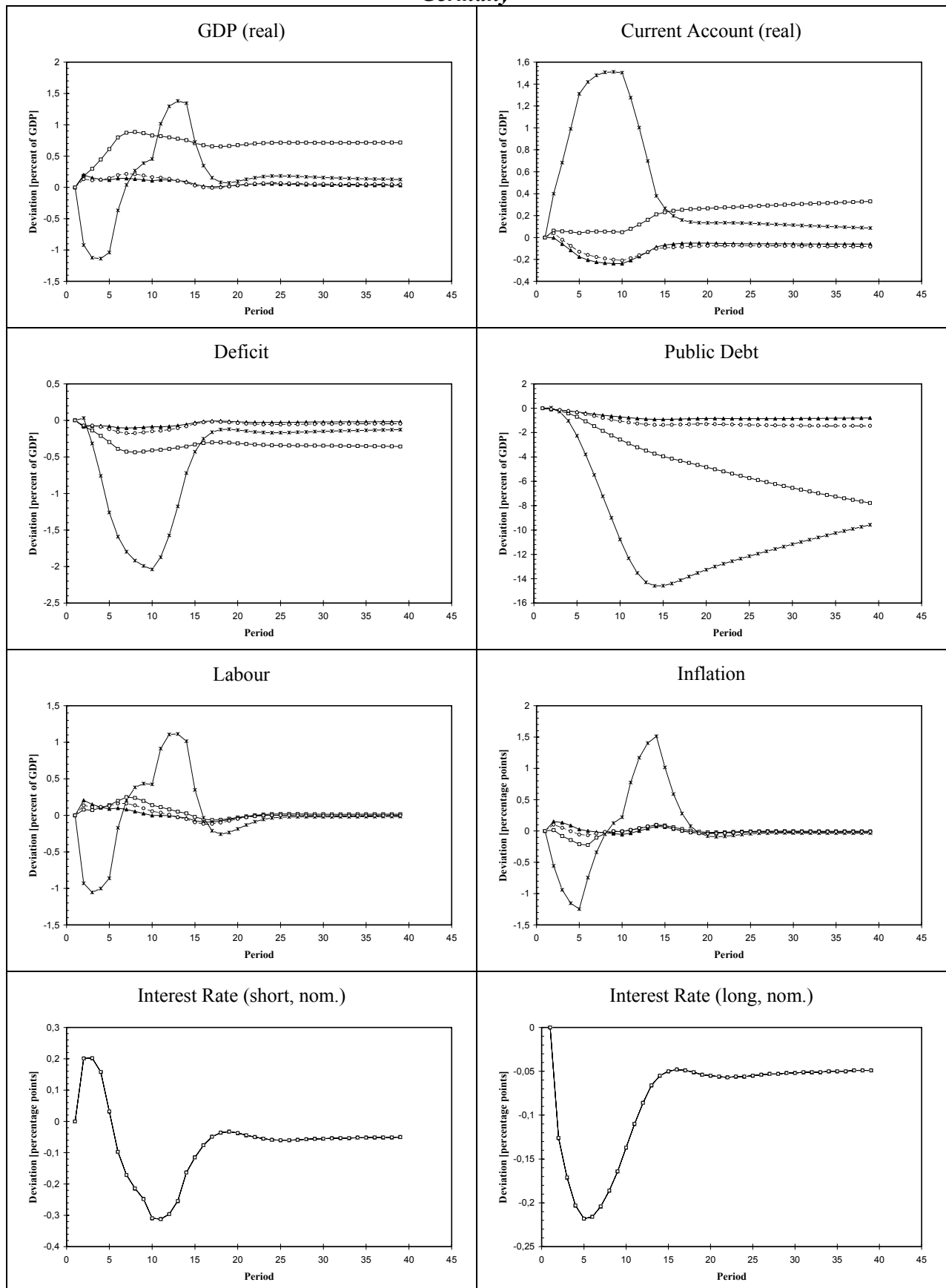
Figure 83: Public consumption decrease and tax increase in euro area, structural policy in Germany
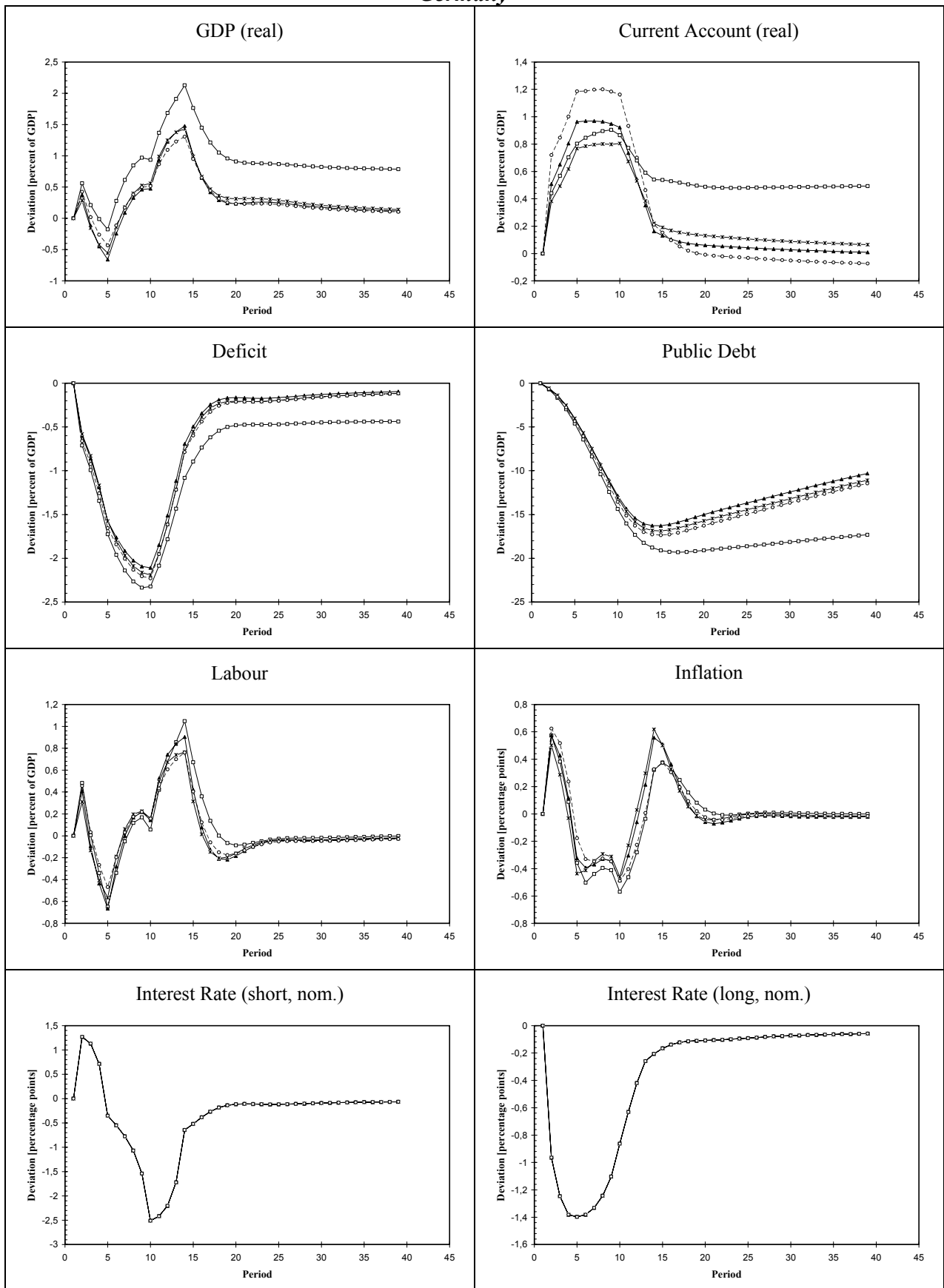
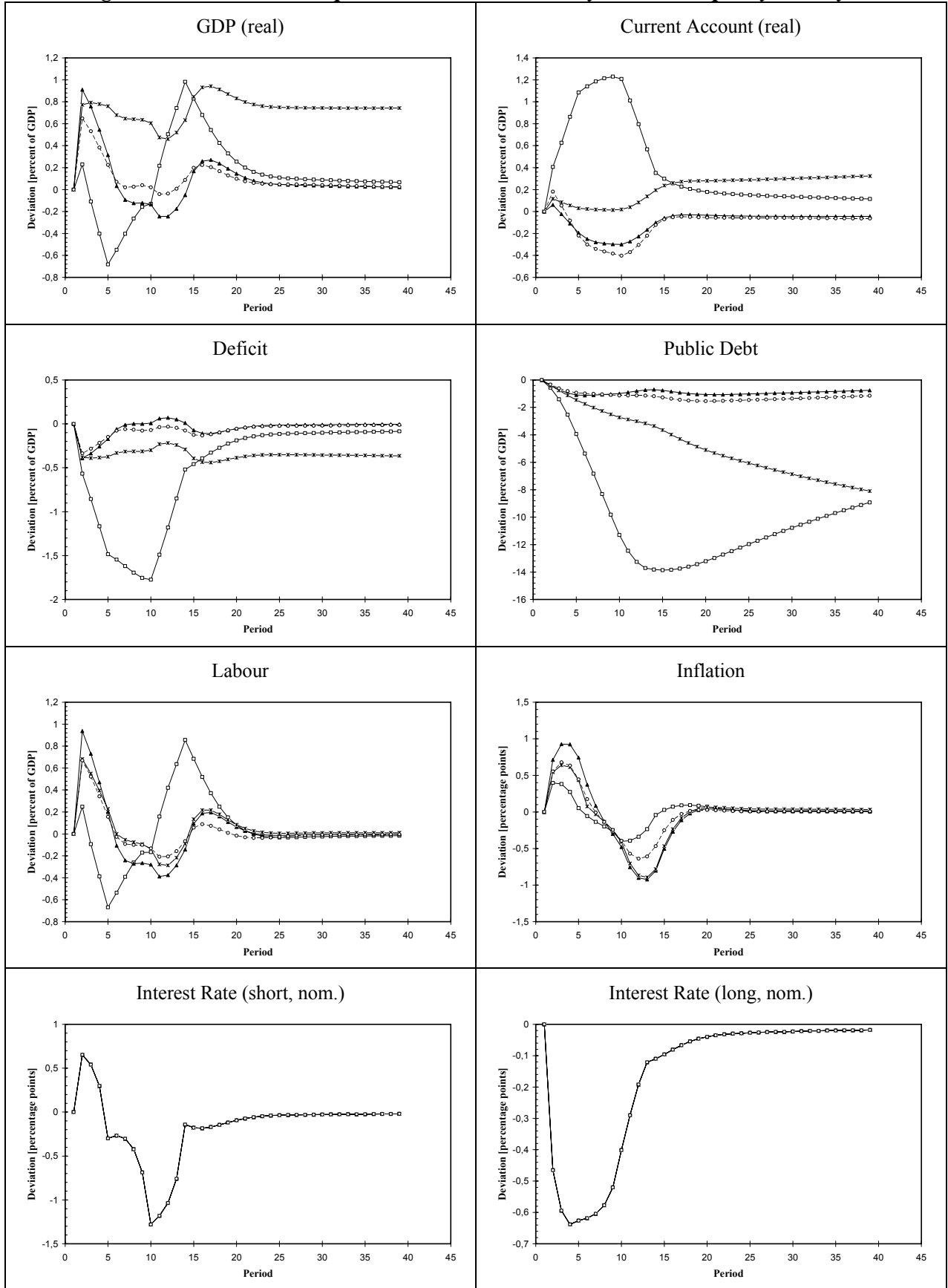***Figure 84: Public consumption decrease in Germany, structural policy in Italy***

Figure 85: Public consumption decrease and structural policy in Italy
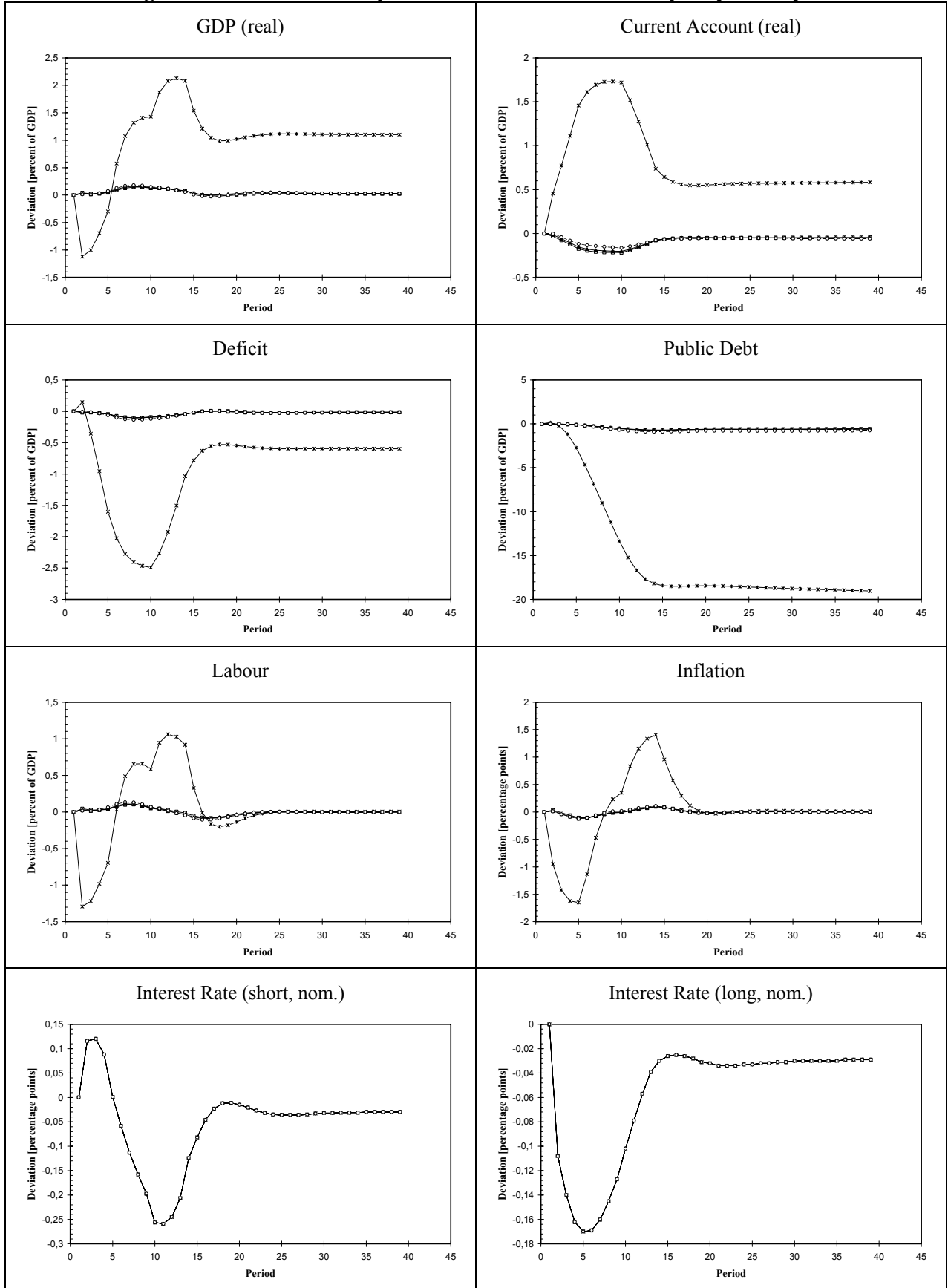
Figure 86: Public consumption decrease in euro area, structural policy in Italy
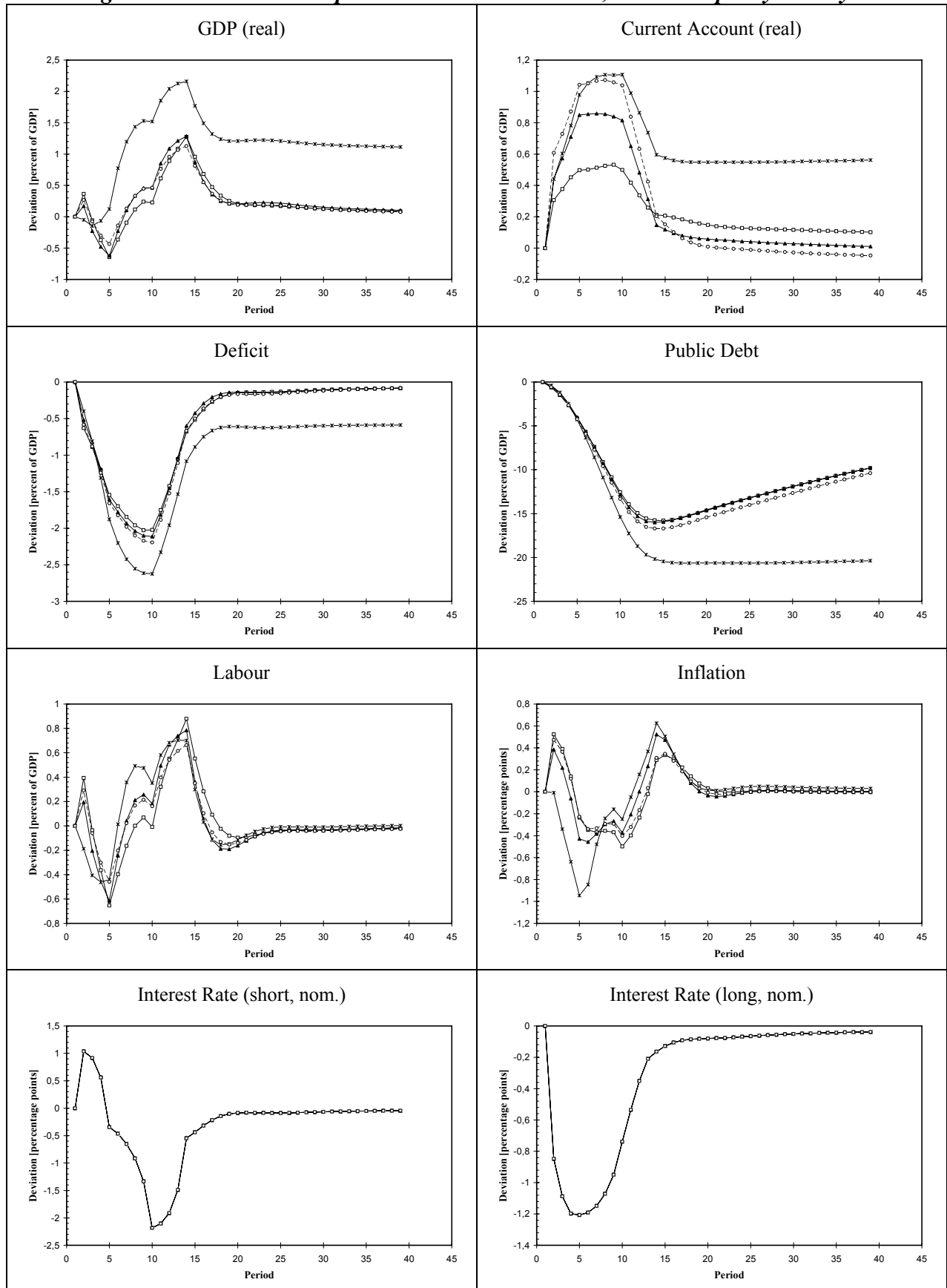
Figure 87: Tax increase in Germany, structural policy in Italy
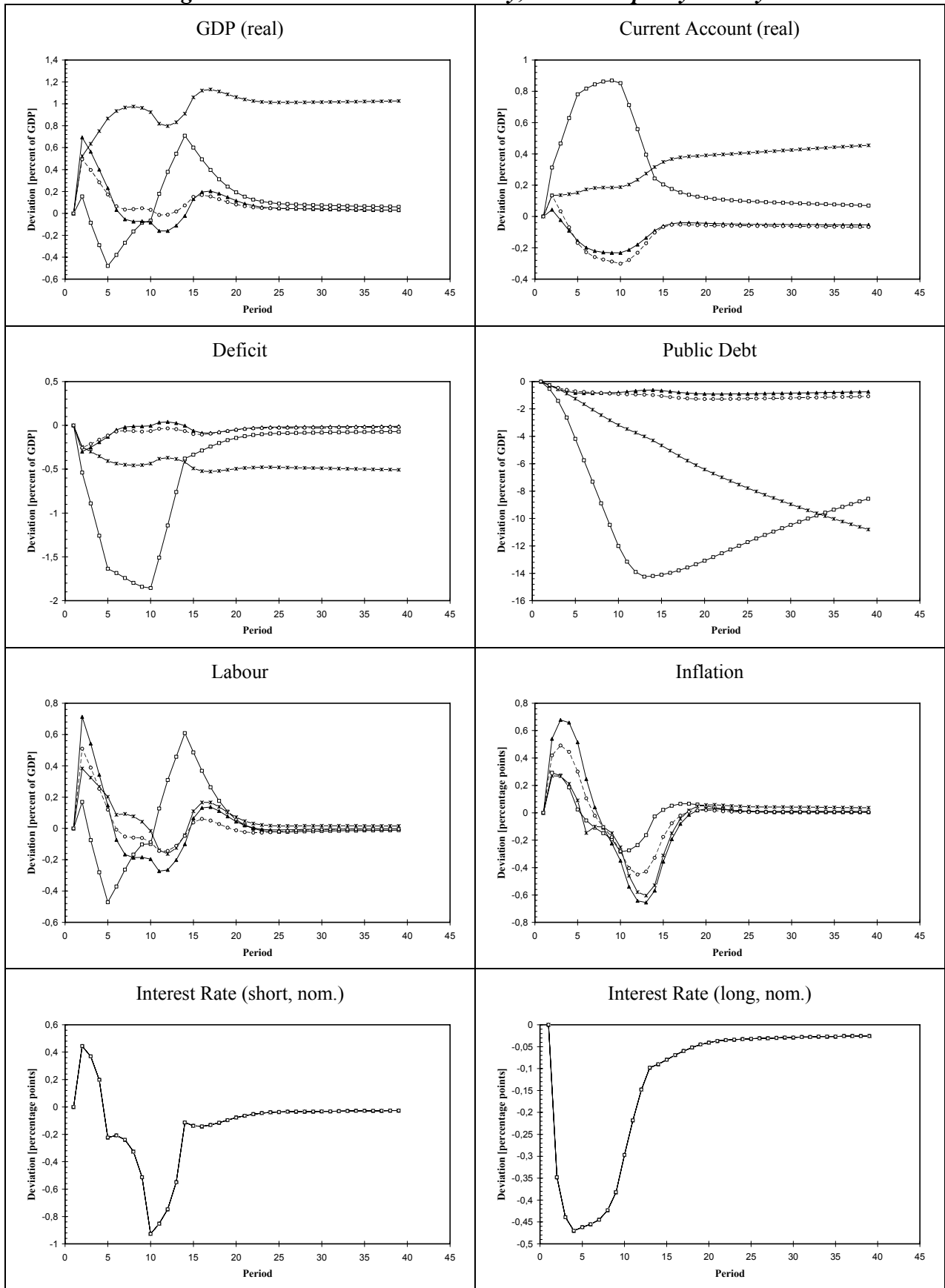
Figure 88: Tax increase and structural policy in Italy
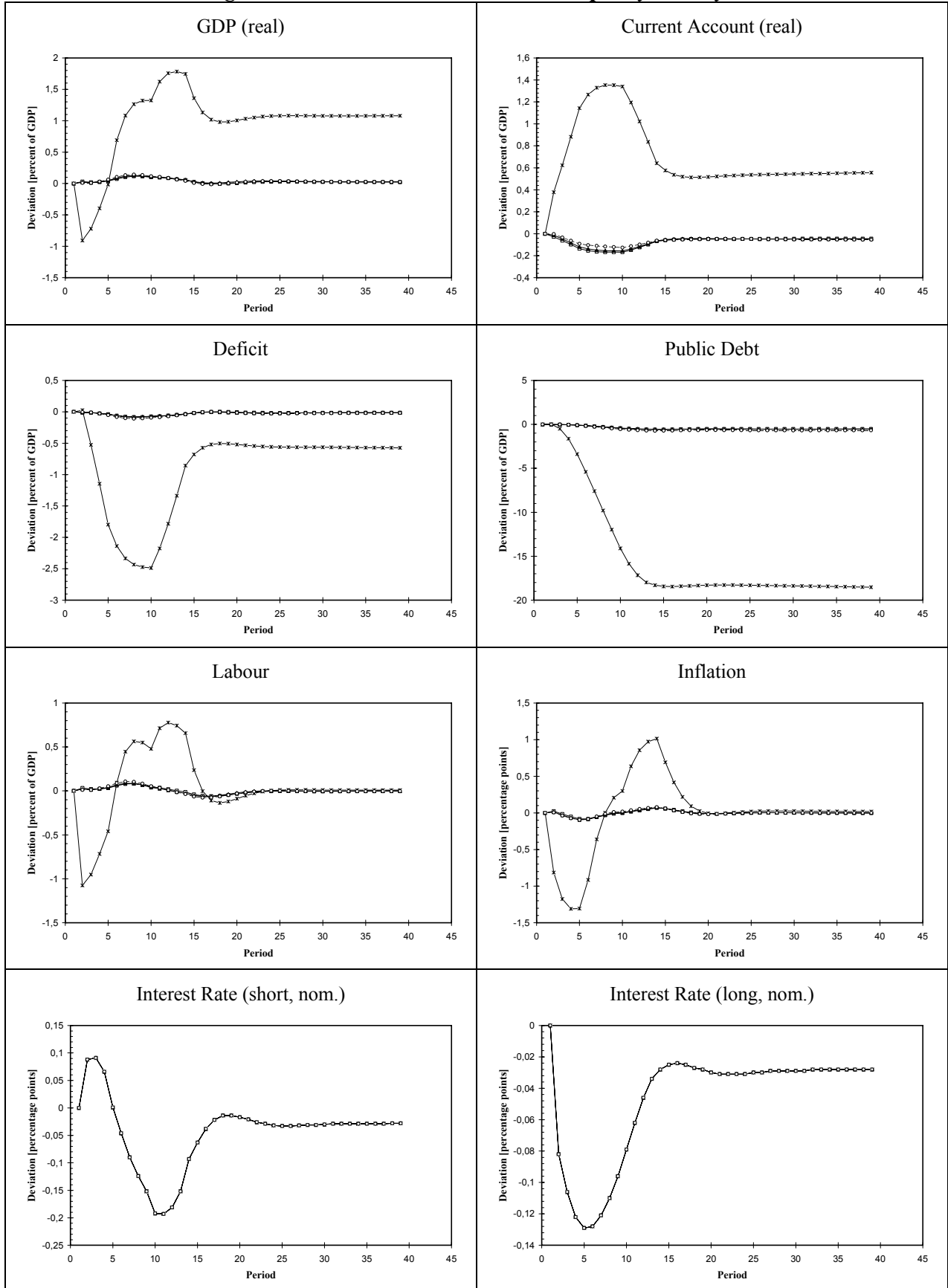
Figure 89: Tax increase in euro area, structural policy in Italy

Figure 90: Public consumption decrease and tax increase in Germany, structural policy in Italy

Figure 91: Public consumption decrease and tax increase and structural policy in Italy
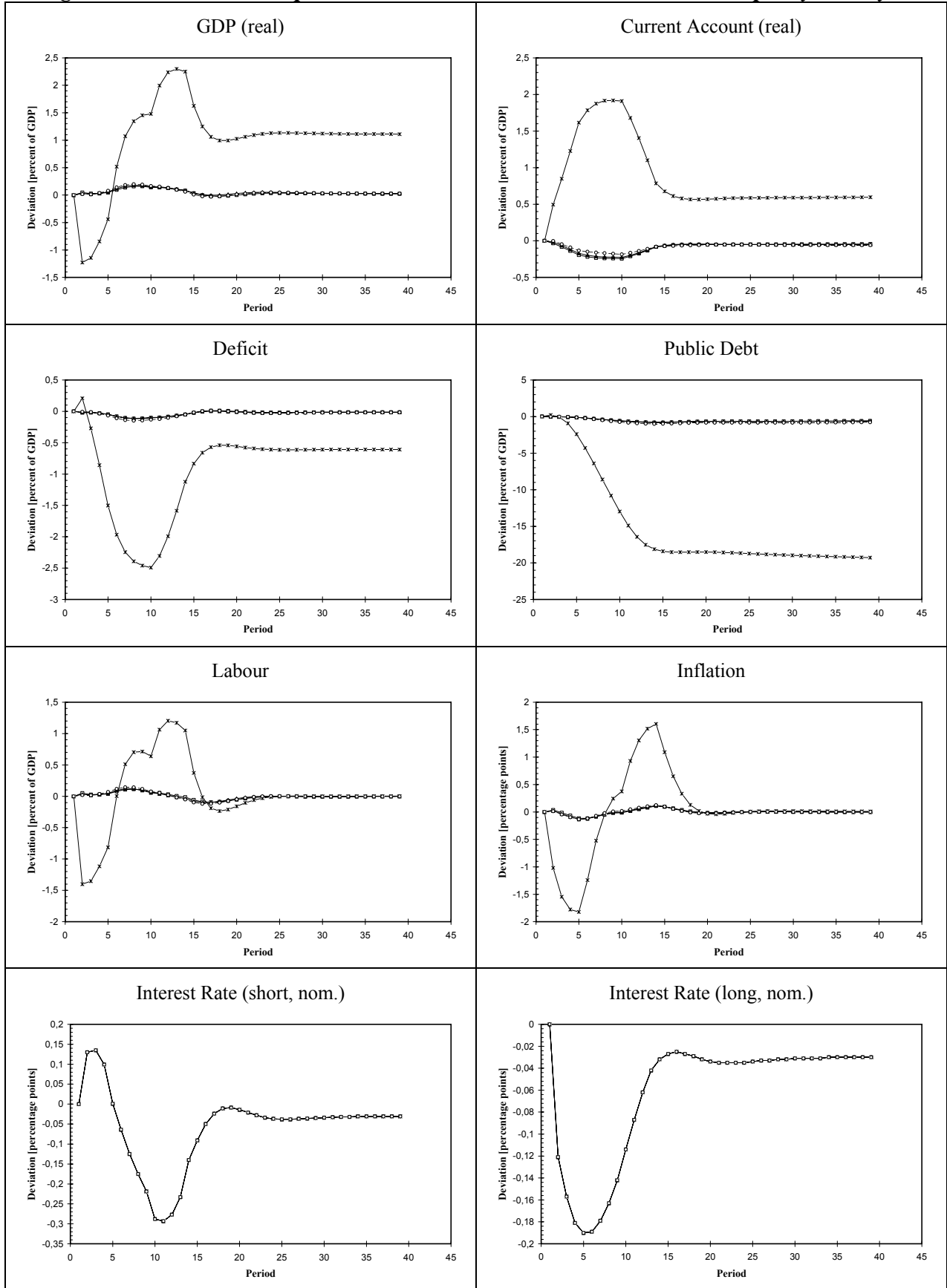
Figure 92: Public consumption decrease and tax increase in euro area, structural policy in Italy
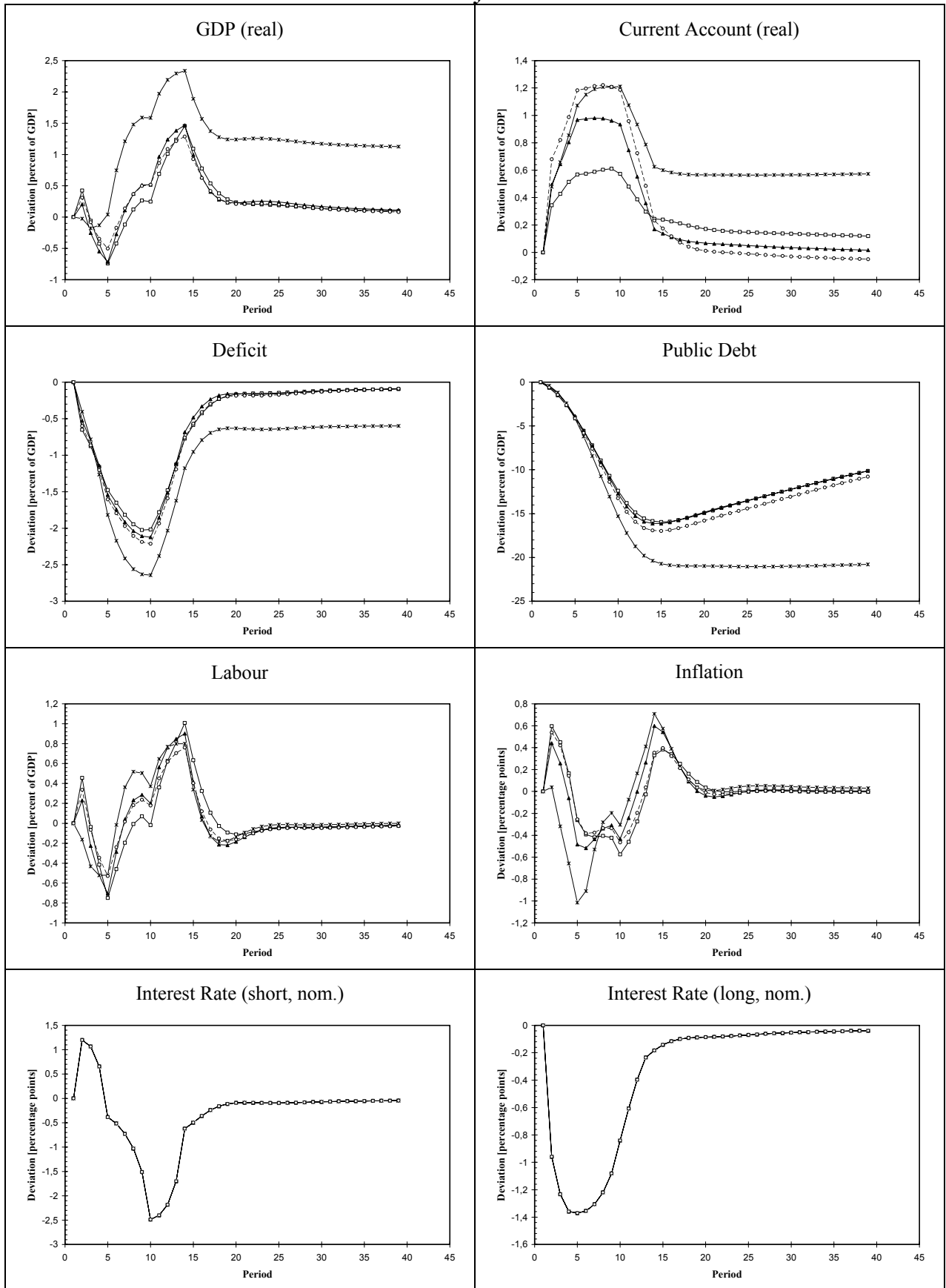
Figure 93: Public consumption decrease in Germany, structural policy in euro area
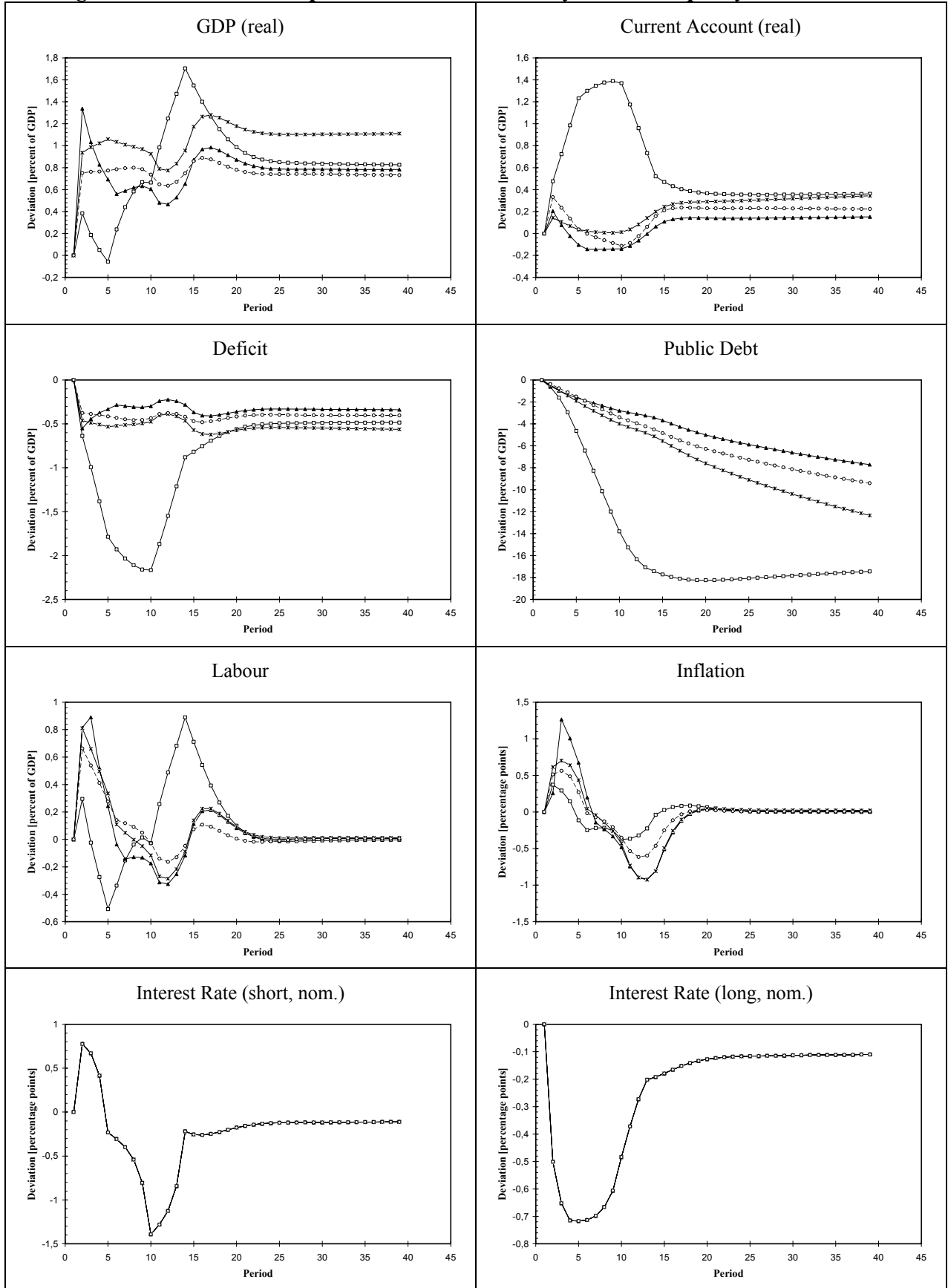
Figure 94: Public consumption decrease in Italy, structural policy in euro area
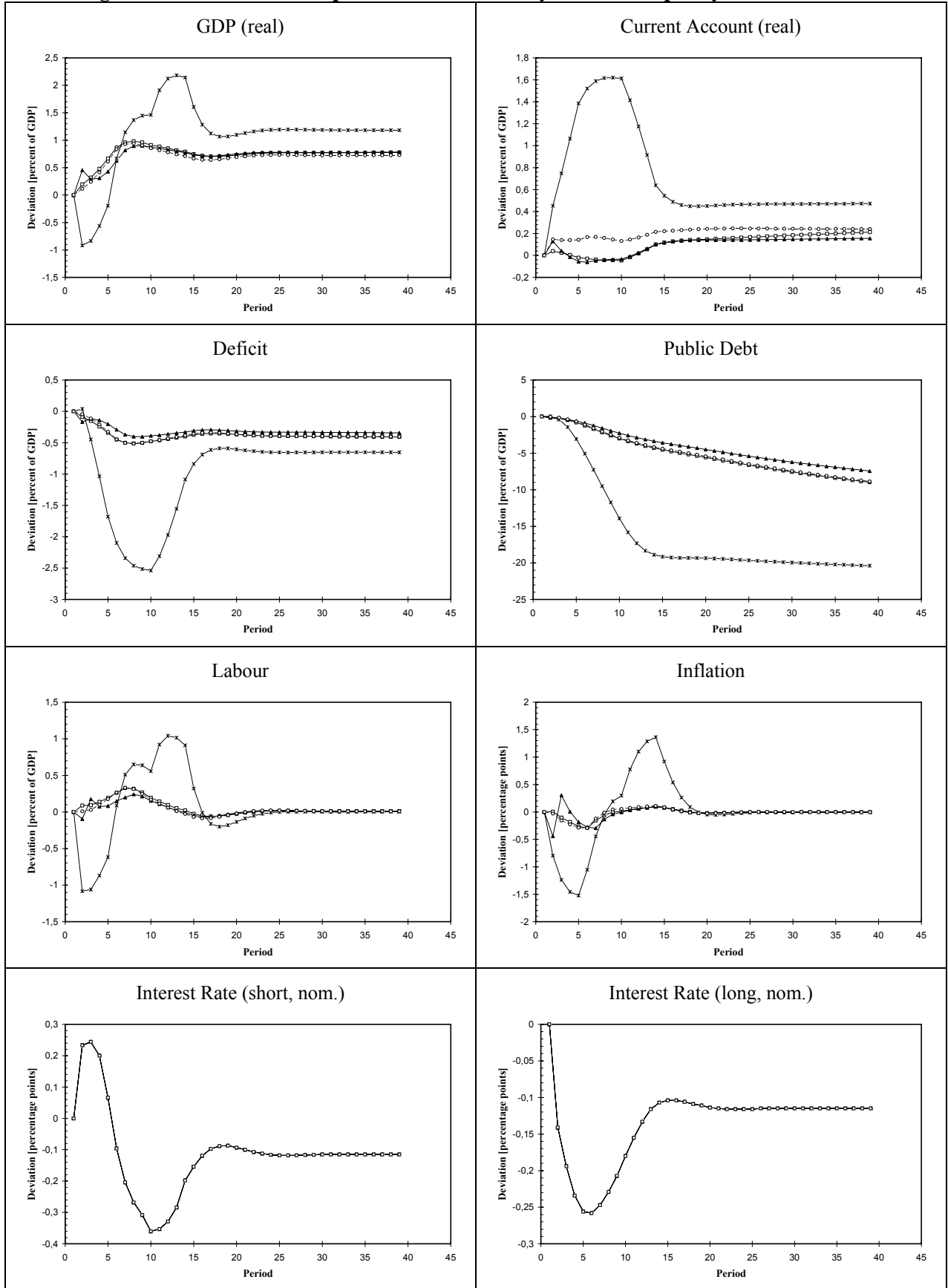
Figure 95: Public consumption decrease and structural policy in euro area
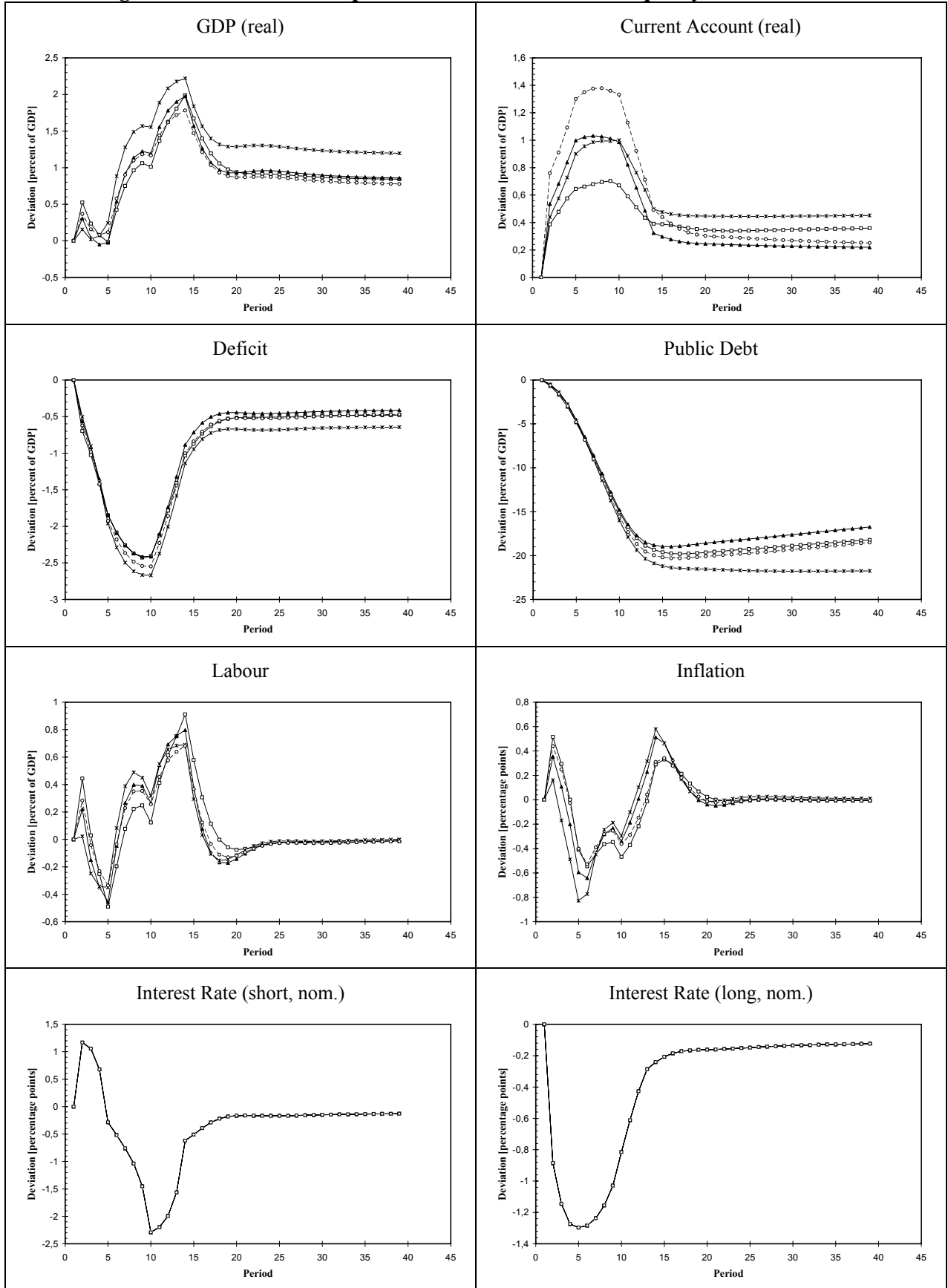
Figure 96: Tax increase in Germany, structural policy in euro area
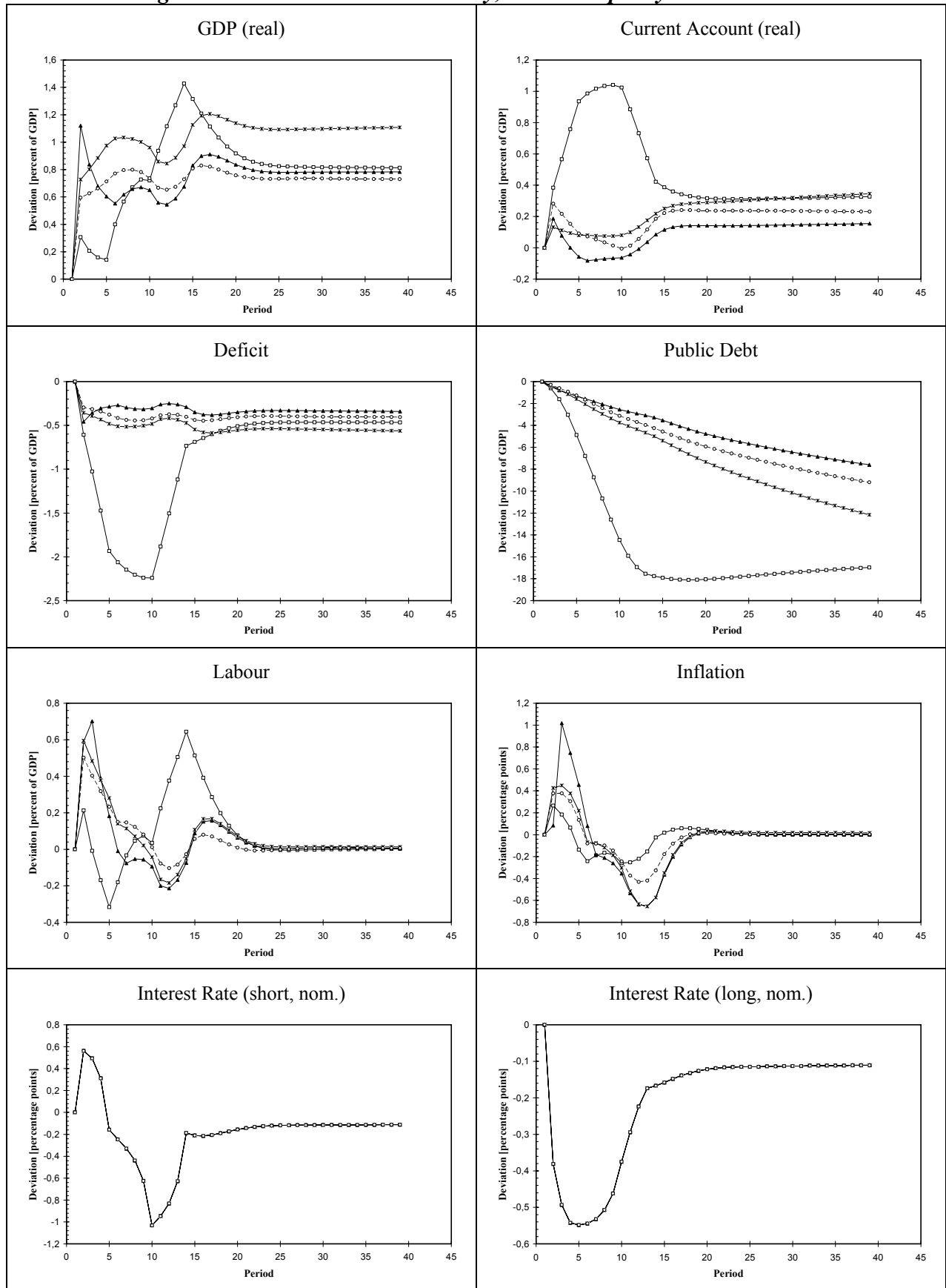
Figure 97: Tax increase in Italy, structural policy in euro area

Figure 98: Tax increase and structural policy in euro area

GDP (real)

Current Account (real)

Deficit

Public Debt

Labour

Inflation

Interest Rate (short, nom.)

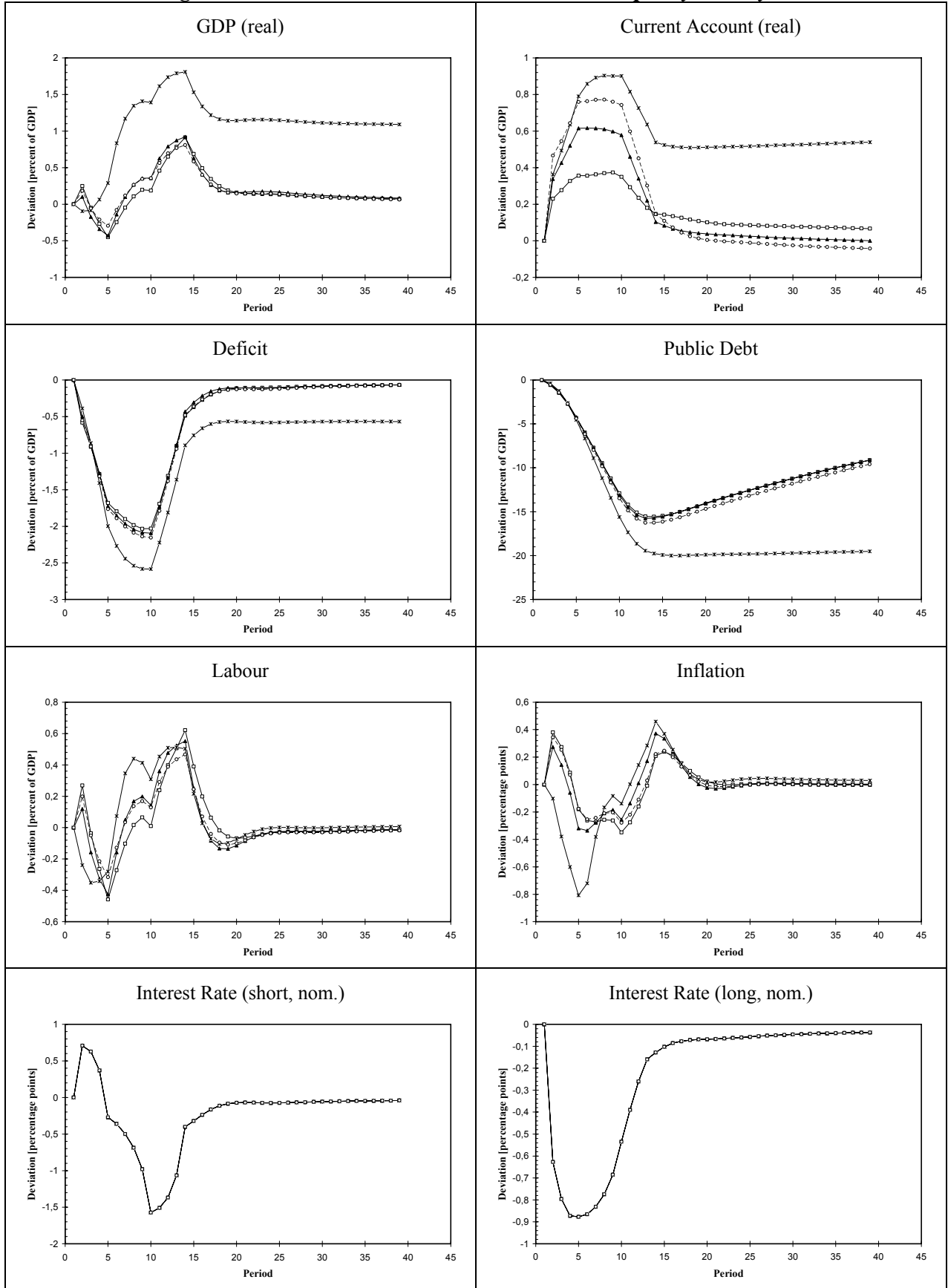Interest Rate (long, nom.)
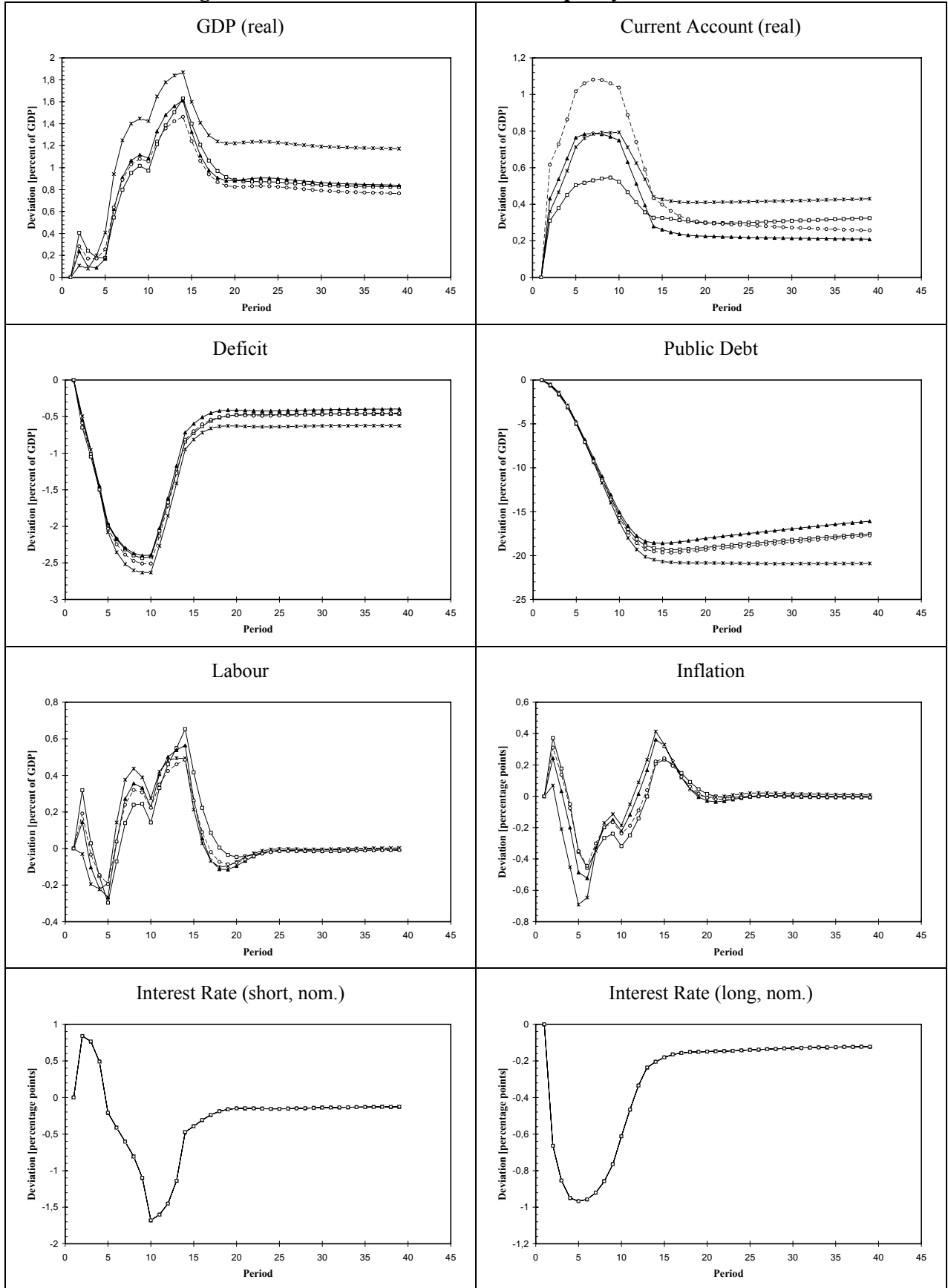
Figure 99: Public consumption decrease and tax increase in Germany, structural policy in euro area
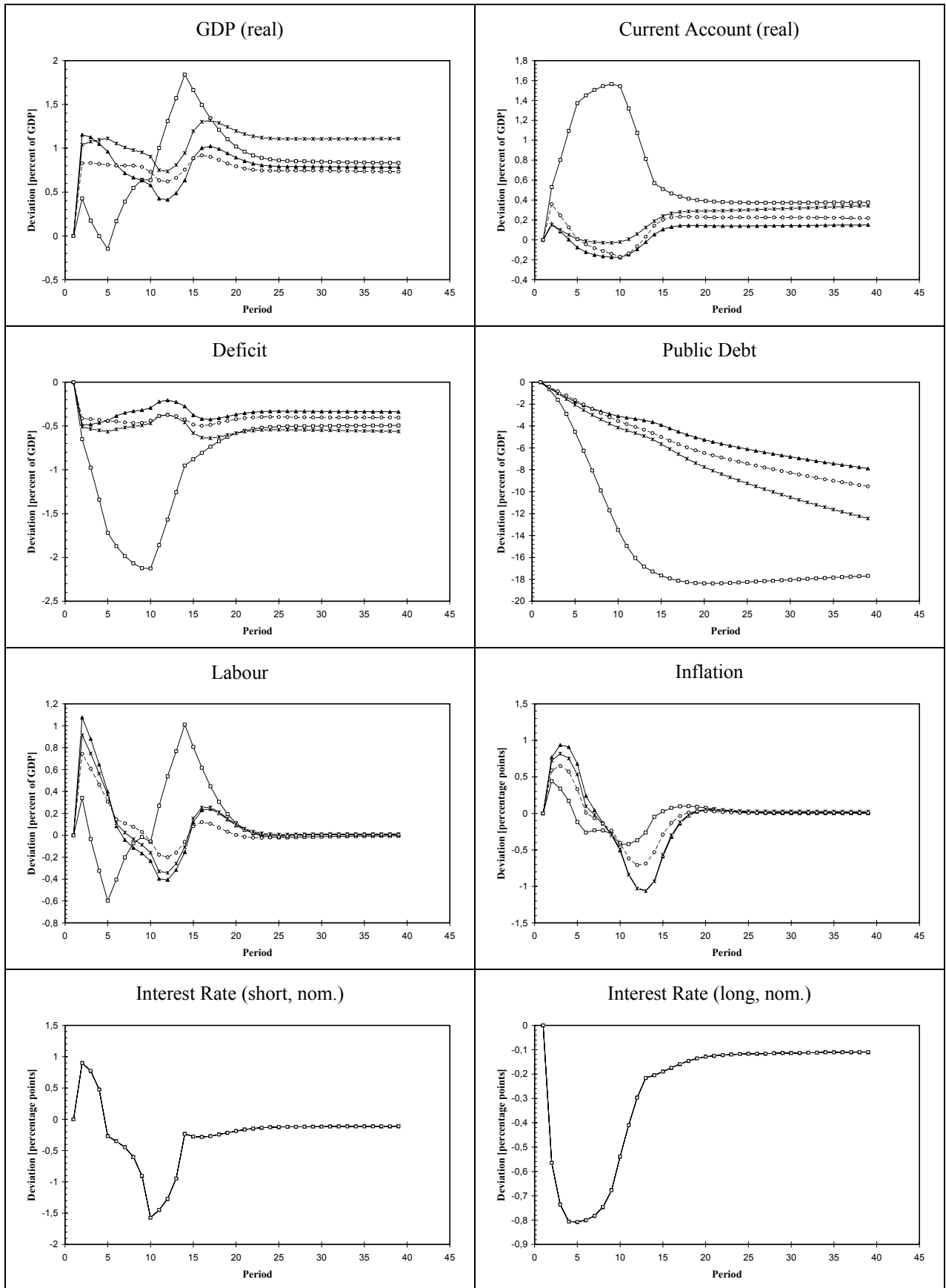
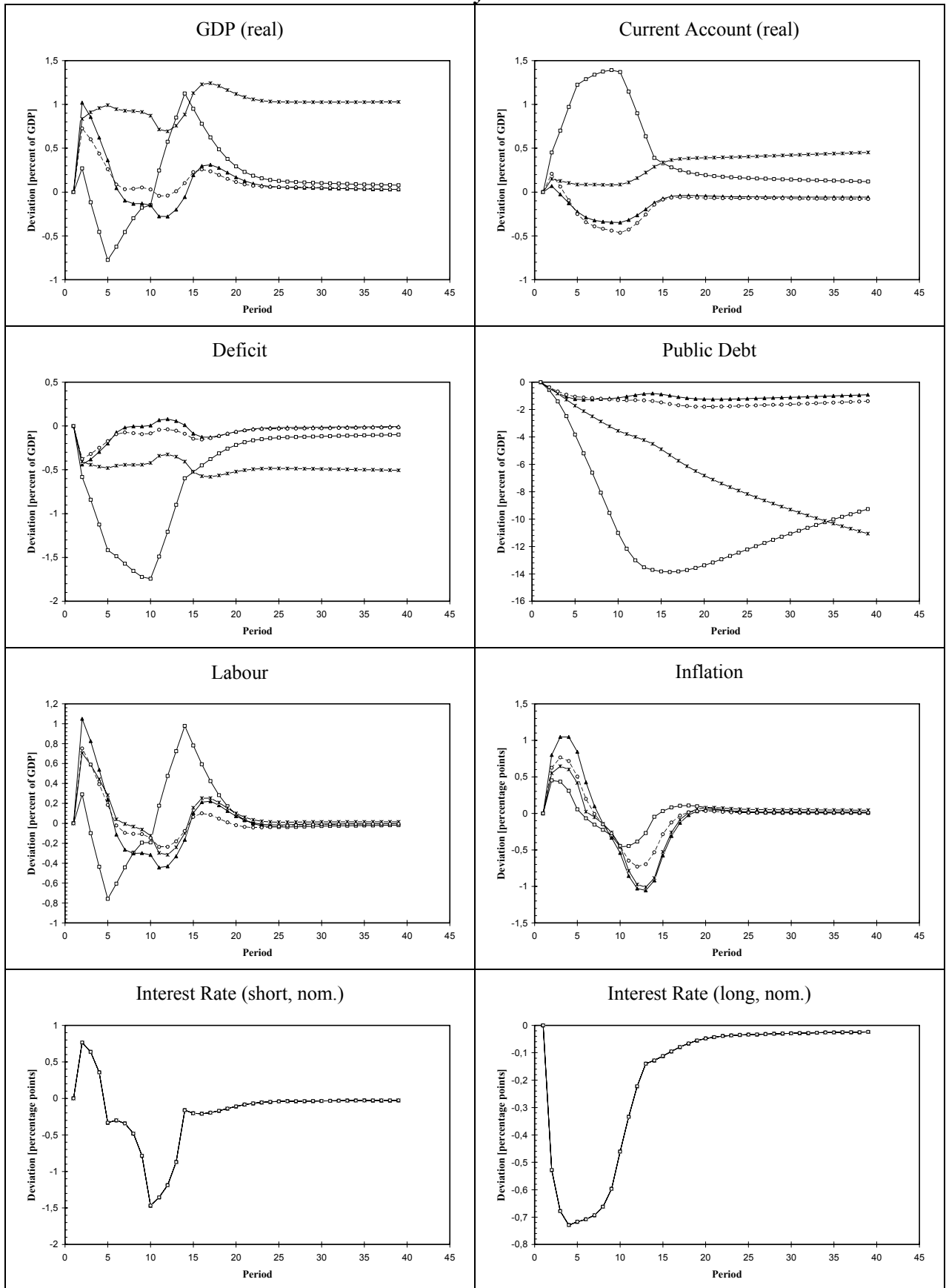**Figure 100: Public consumption decrease and tax increase in Italy, structural policy in euro area**
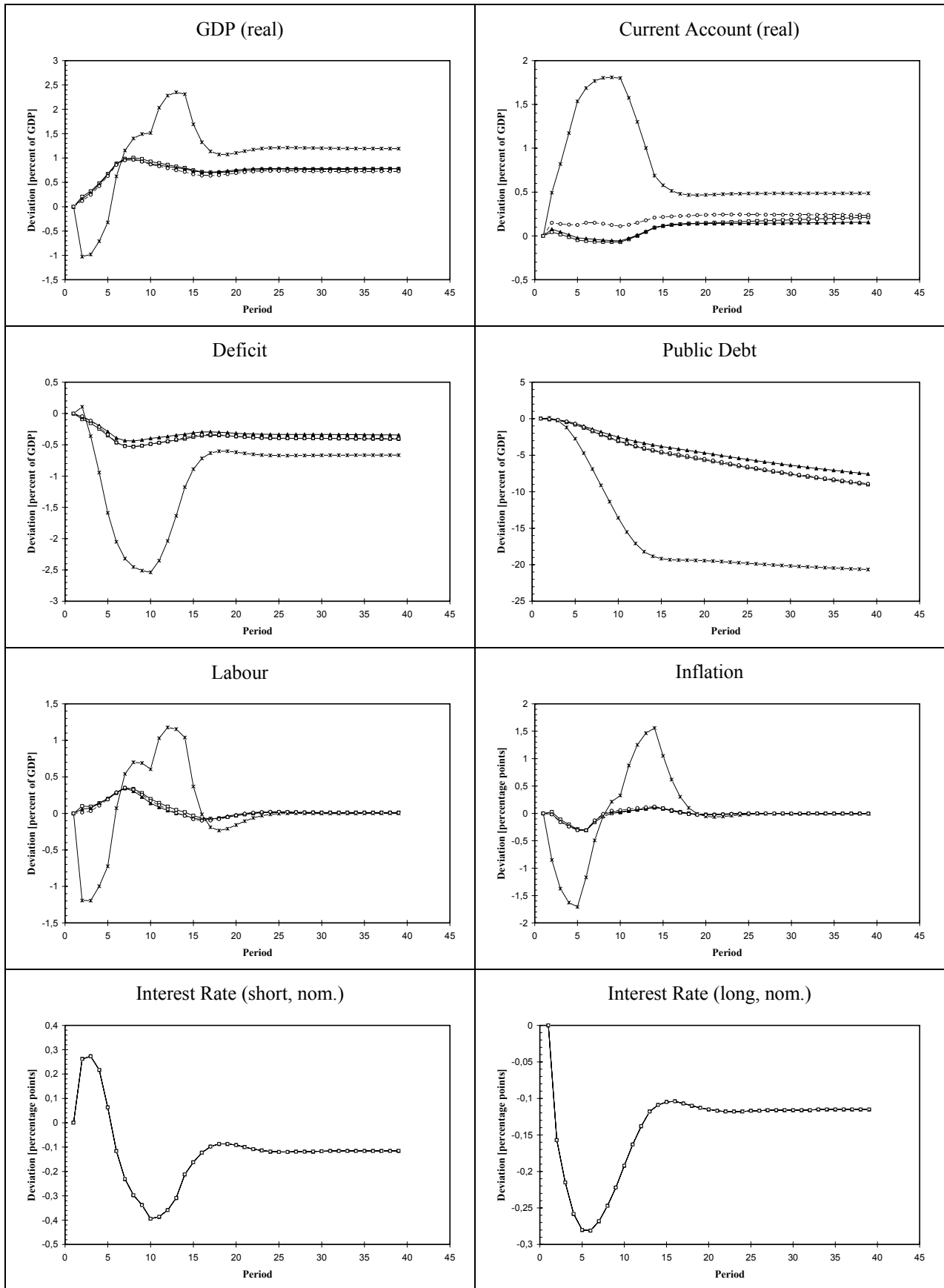
Figure 101: Public consumption decrease, tax increase and structural policy in euro area
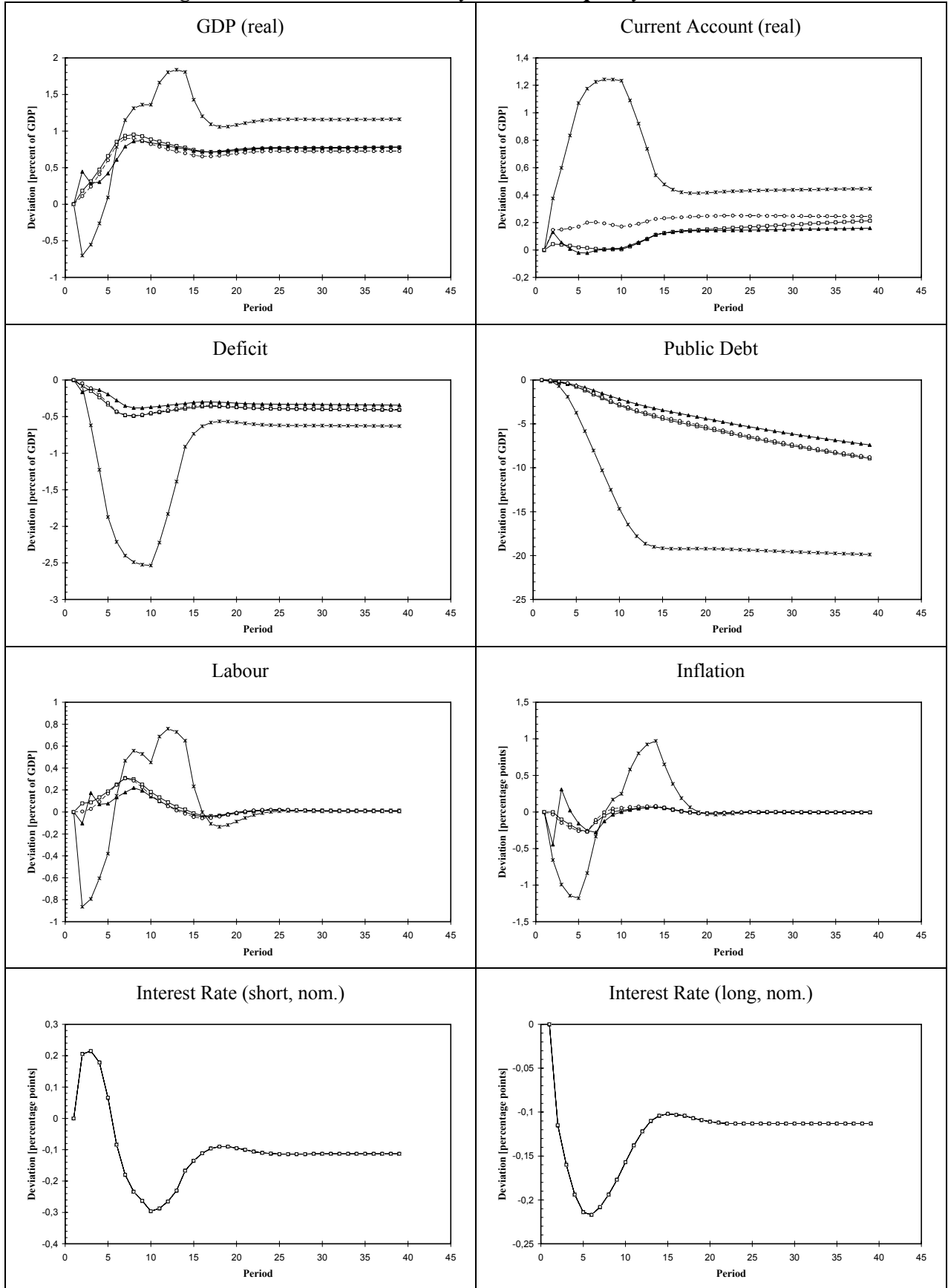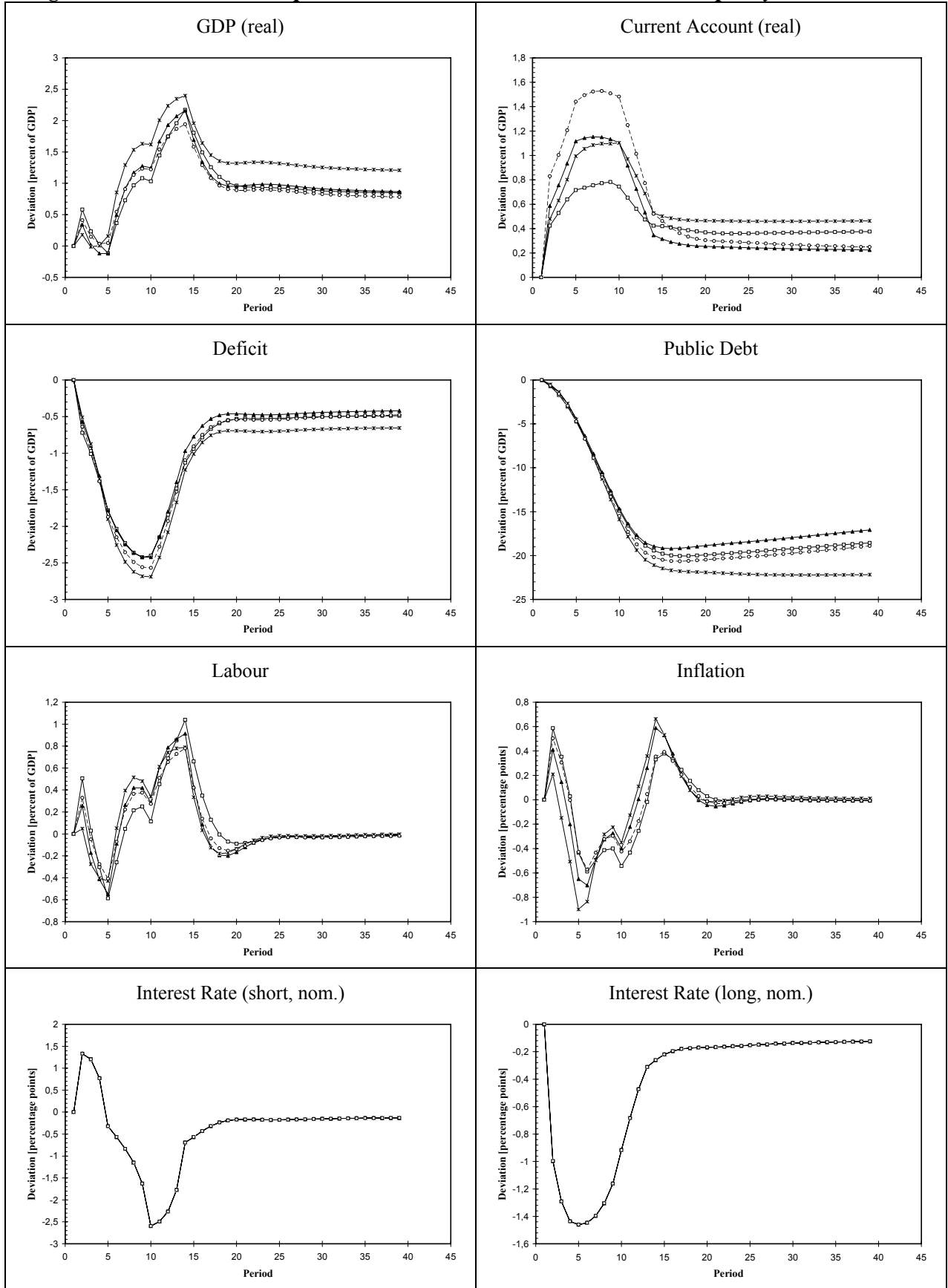
Appendix 6: Variables used in chapter 6

Acronym	Definition	Description	Source	Maximum time span	Minimum time span
UR	Unemployment rate	Unemployment rate	Nickell and Nunziata, 2001; EUROSTAT Euroindicators	1960 - 2004	1975 - 2004
EMP	Employment	Total employment	OECD, Economic Outlook	1960 - 2004	1969 - 2004
MARKUP	Mark-up	Mark-up of prices over cost	own calculations	1970 - 2004	1977 - 2004
PROD	Labour productivity	Real GDP over employees	own calculations	1960 - 2004	1969 – 2004
GTRENDPROD	Trend labour productivity	Growth rate of Hodrick-Prescott filtered labour productivity (PROD)	own calculations	1961 - 2004	1970 - 2004
GTFP	TFP growth (Solow residual)	Annual growth rate to total factor productivity	own calculations	1961 - 2004	1977 - 2004
BRR	Benefit replacement rate	Benefit in the first year of unemployment, as a percentage of earnings before tax	Nickell and Nunziata, 2001; Nickell 2003	1960 - 1999	1975 - 1999
BD	Benefit duration	Index; weighted average between ratio of BRR in 2nd year to BRR in 1st year and ratio of BRR in 4th year to BRR in 1st year	Nickell and Nunziata, 2001; Nickell 2003	1960 - 1999	1975 - 1999
CO	Bargaining coordination	Index {1,3}, increasing in degree of coordination in the bargaining process on the employers' and the unions' side	Nickell and Nunziata, 2001; Nickell 2003	1960 - 1998	1975 - 1998
LREG	Labour market regulation	Index (1;10), decreasing in regulation	Fraser Institute	1970 - 2002	1975 - 2002
SUB	Subsidies	Transfers and subsidies as a percentage of GDP	Fraser Institute	1970 - 2002	1975 - 2002

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