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The Effects of an Anticipated Future Change in Monetary Policy Regime

Juraj Antal and František Brázdik*

Abstract

In this paper, we investigate the effects of an anticipated future change in monetary policy regime in small open economies targeting either inflation or the exchange rate. The announcement of a future change in the monetary policy regime triggers an immediate change in the behavior of households and firms. As a result the economy starts to behave differently even though the current monetary policy rule remains the same for the whole period before the monetary policy regime change. Thus, the behavior of economic agents over the transitory period to the new monetary policy rule depends not only on the current monetary policy rule in this transitory period, but also on the anticipated future monetary policy regime. Given a common future monetary policy regime, the behavior of inflation and exchange rate targeting economies converges after the announcement.

JEL Codes: E17, E31, E52, E58, E61, F02, F41.
Keywords: Macroeconomics, new Keynesian DSGE models, small open economy, monetary policy rules, regime change.

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Nontechnical Summary

We study the changes in an inflation targeting economy and an exchange rate targeting economy due to the anticipated future monetary policy regime change in two alternative versions of exchange rate targeting, differing in the extent of nominal exchange rate stabilization.

We show that the announcement of the future regime change triggers an immediate change in the behavior of households and firms, which translates to different responses of variables before and after the announcement. The behavior of economic agents depends not only on the current monetary policy rule, but also on the future anticipated monetary policy rule. Economic agents start to care about exchange rate stabilization after the announcement of the regime change, because they prefer a smooth transition to the new regime. Thus, as soon as future exchange rate targeting is announced, the agents in the transitory inflation targeting economy start to behave such that the resulting inflation directs interest rates to stabilize the nominal exchange rate. They make the exchange rate more stable even though there is no weight on nominal exchange rate stabilization in the monetary policy rule before the regime change.

Our model predicts that in an inflation targeting economy the nominal exchange rate is stabilized at the cost of higher inflation volatility after the announcement of the future regime change. This results in a difference in macroeconomic volatility and impulse responses between inflation and exchange rate targeting economies, which is lower after the announcement due to the common future monetary policy regime.

1. Introduction

In this paper, we analyze the impact of an announced future change in monetary policy regime on small open economies. We focus on inflation targeting and exchange rate targeting economies in order to compare this effect on different monetary policy regimes. The economies are considering joining a monetary union in the future. Therefore, we assume that the economies will imitate the monetary union regime by operating strict exchange rate targeting. Two alternative versions of exchange rate targeting, differing in the weight put on nominal exchange rate stabilization, are investigated.

As long as the domestic and monetary union business cycles and inflation developments are not perfectly synchronized, the nominal interest rates of the independent inflation targeting economy will be different from those in the monetary union. Since the nominal interest rate differential is required to be close to zero in both alternative future regimes, the determination of domestic nominal interest rates will change after either regime change. Under both alternative future regimes, the nominal interest rate trajectory of the economy will be driven exogenously by the foreign (monetary union) interest rate.

The future adoption of the regime can be viewed as a test of the economy's readiness to maintain a fixed exchange rate against the union's currency. The fact that the domestic economy may even be required to undergo this test before joining the union (e.g. ERM2) motivates our analysis of the future adoption of exchange rate targeting.

Before the announcement of the future regime change, we refer to the economies as independent. After the regime change announcement but before the regime change itself, we refer the economies to as transitory. In the transitory economy, the model thus allows for the regime change. After the regime change, we refer to the economy as a unilateral peg. In the unilateral peg economy, agents do not foresee a future change in the monetary policy rule (the rule in the monetary union). Thus, we model not the entry into the monetary union but the change in the monetary policy rule. However, the change in the monetary policy rule is triggered by prospective future entry into the monetary union.

As soon as the independent economy becomes transitory, expectations change due to the change in the future monetary policy rule. Changes in the responses of the economy to shocks and changes in macroeconomic volatility are induced.

We aim to analyze the changes in an inflation targeting economy (transitory relative to independent) and an exchange rate targeting economy (transitory relative to independent) due to the anticipated future change in monetary policy in two alternative versions. A comparison of macroeconomic stability and welfare between the independent and transitory economies is provided.

A New Keynesian framework attributing the short-run real effects of monetary policy to the presence of nominal rigidities and monopolistic competition is implemented. We use a simple small open economy DSGE model along the lines of Justiniano and Preston (2004). A simple model that is able to describe the effect of the announced monetary regime change is suitable. We deliberately ignore other potential effects that might be triggered by the transition to a monetary union (productivity gains, foreign investment flows, etc.). Likewise, we avoid building a model structure that would go beyond our needs. Therefore, we abstract from the use of capital, the productivity growth trend, trend real exchange rate appreciation, risk premia, etc.

Similarly, perfect sustainability of exchange rate targeting is assumed and thus no speculation on exchange rate crises is allowed. The effect of the announced monetary regime change on the inflation targeting and exchange rate targeting small open economy and on macroeconomic stabilization within these economies constitutes the main contribution of our paper.

The paper proceeds as follows. Section 2 reviews the literature. Section 3 introduces the model and derives the small open economy dynamics. Section 4 provides and discusses the results of the simulations. Section 5 concludes.

2. Literature Review

The dynamic stochastic general equilibrium (DSGE) model structure of the New Keynesian models is consistent with the underlying behavior of optimizing economic agents. Clarida et al. (1999), Svensson and Woodford (2004), Woodford (2001), and Clarida et al. (2002), among others, popularized the closed economy New Keynesian models.

Most central banks today use a short-term nominal interest rate as their instrument for implementing monetary policy. The nominal quantity of money is then endogenously determined to achieve the desired nominal interest rate. The predictability of money demand becomes less relevant. Instead, the link between short-term and long-term interest rates as well as the link between interest rates and exchange rates become of crucial importance. Cashless economy models approximate the interest rate operating procedure type of monetary policy in the economy, where monetary aggregates have negligible effects on equilibrium outcomes. Woodford (2003) illustrates the major conceptual ideas in modern monetary economics with well-specified forward-looking elements in a cashless general equilibrium closed economy framework.

The literature on optimal monetary policy in closed economies has focused mainly on whether inflation stabilization should be the only objective. The presence of staggered prices brings in gains from minimizing relative price fluctuations, justifying the inflation stabilization objective. Goodfriend and King (1998) in a survey paper point out the trade-off between CPI inflation and output stabilization in the presence of cost-push shocks. The central bank should then aim to stabilize an index of sticky prices alone, a core price index, eliminating the trade-off between inflation and output variability

A number of papers, for example Aoki (2001) and Clarida et al. (2001) and 2002, extended the basic framework to the open economy context. Gali and Monacelli (2005) adopt the cashless framework for an open economy. In their model, money does not appear in either the utility function of consumers or the budget constraint. Since they specify monetary policy in terms of an interest rate rule, they do not need to introduce money explicitly into the model. Money plays the role of a unit of account only. Moreover, labor is the only technological input, as capital is left out of the model. These open economy contributions to the literature suggest that a welfare maximizing monetary policy should focus on stabilizing internal relative prices.

However, further analyses of open economy models, such as Devereux and Engel (2003), Sutherland (2005a), Sutherland (2005b), and Benigno and Benigno (2003), show that optimal monetary policy should involve some consideration of exchange rate volatility. Devereux and Engel (2003) and Sutherland (2005a) argue that incomplete pass-through from the exchange rate to local currency prices implies that exchange rate volatility can directly affect welfare. Thus, they conclude that when there is incomplete pass-through, optimal monetary policy should take the exchange rate volatility into account. Sutherland (2005b) shows that exchange rate volatility can become an important factor in welfare evaluation in the presence of full pass-through. Benigno and Benigno (2003) illustrate the potential welfare gains from monetary policy cooperation between economies in exchange rate adjustment.

Paoli (2006) generalizes the optimal loss function for a small open economy from the utility of a representative household. The small open economy prevents domestic policy from affecting the rest of the world and thus allows one to abstract from strategic interactions between economies. It is shown that the loss function is a quadratic expression in domestic producer inflation, the output gap, and the real exchange rate. The weights given to these variables depend on the structural parameters of the model. Movements in international relative prices can create a wedge between the marginal utility of consumption and the marginal disutility of production, which directly affect welfare. Hence, there are incentives to manage fluctuations in the exchange rate in order to affect this wedge. Allowing some additional volatility of inflation in order to reduce the volatility in the other variables in the loss function may turn out to be welfare improving. Paoli (2006) shows that pegging of the exchange rate outperforms an inflation targeting regime when the economy is relatively open, demand is sensitive to exchange rate movements (the intratemporal elasticity of substitution between domestic and foreign goods is high), and the intertemporal elasticity of substitution is small.

Recent literature on monetary policy shows that the optimal monetary policy rule can be implemented by minimizing the optimal loss function. However, practical implementation of such an optimal rule may be difficult. As Sutherland (2005a) shows, even in a relatively simple model the coefficients in the optimal loss function are quite complicated combinations of the model parameters. The structure of the optimal loss function is sensitive to uncertainty about the structure of the model and to uncertainty about the true values of the model parameters. It is therefore useful and typical to analyze the welfare performance of non-optimal but simple monetary policy rules.

Our paper adopts a simple inflation targeting and exchange rate targeting rule, and a future change in the rules. We study the impulse responses generated after the future change in this rule is announced, as well as the resulting conditional variances and welfare based on an ad hoc loss function. We are not aware of any previous papers analyzing the effect of an anticipated future change in monetary policy regime.

3. Model

We consider a small open economy model that is characterized by the presence of habit formation and indexation of prices. The following section sketches the derivation of the structural equations in line with the model presented by Justiniano and Preston (2004). The presented model is based on the studies of Gali and Monacelli (2002) and Monacelli (2003), where the microfoundations for a small open economy model and incomplete pass-through are summarized. We aim to implement a simple model that allows us to distill the pure effect of the declaration of the future regime shift.

3.1 Households

The small open economy considered is populated by a representative household that maximizes its lifetime utility function

$$E_t \sum_{t=0}^{\infty} \beta^t \varepsilon_t^g \left[\frac{C_t - H_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi} \right], \tag{3.1}$$

where $\beta,\ 0 < \beta < 1$ is the discount factor; σ and η are the inverses of the elasticities of intertemporal substitution and the labor supply, respectively; ε_t^g is the preference shock; and $H_t = hC_t$ is the external habit taken as exogenous by households. The parameter h indexes the importance of habit formation. Households consume a Dixit-Stiglitz composite of home and foreign goods

$$C_t = [(1-\alpha)^{\frac{1}{\eta}}(C_t^H)^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}}(C_t^F)^{\frac{\eta-1}{\theta}}]^{\frac{\theta}{\theta-1}}, \tag{3.2}$$

where α is the share of imported goods in domestic consumption and $\eta > 0$ is the intratemporal elasticity of substitution between domestic and foreign goods.

Given the specification for preferences, the minimization of expenditures for a given level of C_t implies, as in Walsh (2003), the following aggregate domestic consumer price index (CPI):

$$P_t = [(1-\alpha)(P_t^H)^{1-\eta} + \alpha(P_t^F)^{1-\eta}]^{\frac{1}{1-\eta}}, \tag{3.3}$$

where P_t^H and P_t^F are prices of the domestic and foreign Dixit-Stiglitz composite goods used to produce the final composite good.

In aggregate, the household maximizes lifetime utility according to the following budget constraint:

$$C_t = P_t C_t + E_t[Q_{t,t+1} D_{t+1}] \leq D_t + W_t N_t + T_t, \tag{3.4}$$

where W_t is the nominal wage; $Q_{t,t+1}$ is the stochastic discount factor; D_{t+1} are payments originating from the portfolio held at the end of period t; W_t is the nominal wage and T_t are transfers.

Households optimally (cost minimization) allocate their aggregate expenditures according to the following demand functions:

$$C_t^H = (1-\alpha)\left(\frac{P_t^H}{P_t}\right)^{-\eta} C_t$$

$$C_t^F = \alpha\left(\frac{P_t^F}{P_t}\right)^{-\eta} C_t. \tag{3.5}$$

The intratemporal optimality condition for the labor-leisure choice and the intertemporal condition that follow from the first order conditions of the household's optimization problem are given by :

$$C_t : \lambda_t = \varepsilon_t^g (C_t - hC_{t-1})^{-\sigma} \tag{3.6}$$

$$N_t : \lambda_t \frac{W_t}{P_t} = \varepsilon_t^g N_t^{\varphi} \tag{3.7}$$

$$D_t : \lambda_t Q_{t,t+1} = \beta E_t[\lambda_{t+1} P_t / P_{t+1}], \tag{3.8}$$

where in asset pricing equation $E_t[Q_{t,t+1}] = (1+i_t)^{-1} = R_t$, where $E_t[Q_{t,t+1}]$ is the stochastic discount factor for the one-period ahead nominal pay-off of the household's portfolio. R_t is then the gross interest rate on that bond. We assume that households have access to a complete set of internationally traded contingent claims. The households' optimality conditions imply the Euler equation given by

$$1 \;=\; (1+i_t)\beta E_t[\frac{\lambda_{t+1}}{\lambda_t}\frac{P_t}{P_{t+1}}]. \tag{3.9}$$

3.2 International Arrangements

Let us define the real exchange rate as the ratio of foreign prices in the domestic currency to domestic prices as $\hat{q}_t \equiv \hat{e}_t\frac{P_t^*}{P_t}$, where $\hat{e}_t$ is the nominal exchange rate and P_t^* the foreign consumer price index. Since, we assume that $P_t^* = P_t^{F*}$, the law of one price (LOP) gap is given by $\Psi_t^F \equiv \hat{e}_t\frac{P_t^*}{P_t^F}$, as in Monacelli (2003). When the law of one price fails to hold $\Psi_t^F \neq 1$.

The foreign economy is identical in preferences, therefore conditions similar to the optimality conditions (3.6) and (3.7) also apply.[1] The foreign economy is considered large enough, therefore the composite consumption bundle can be simplified and only foreign produced goods $C_t^{F*}(i),\ i \in< 0,1 >$ are considered.

Furthermore, under the assumption of complete international financial markets, arbitrage implies that the marginal utility of consumption in the foreign economy is proportional to that in the domestic economy. Therefore, the following condition must be satisfied

$$\beta\frac{\lambda_{t+1}}{\lambda_t}\frac{P_t}{P_{t+1}} = \quad Q_{t,t+1} \quad = \beta\frac{\lambda_{t+1}^*}{\lambda_t^*}\frac{P_t^*}{P_{t+1}^*}\frac{\hat{e}_t}{\widehat{e_{t+1}}} \tag{3.10}$$

The asset pricing equation, which determines the price of bonds in the domestic and foreign economy, together with the risk sharing condition (3.10), implies the uncovered interest rate parity condition (UIP):

$$E_t[Q_{t,t+1}(R_t - R_t^*(\frac{\widehat{e_{t+1}}}{\hat{e}_t}))] \;=\; 0. \tag{3.11}$$

The uncovered interest rate parity places a restriction on the relative movements of the domestic and foreign interest rate and the nominal exchange rate.

We define the effective terms of trade as the relative price of imports in terms of exports,

$$S_t \;=\; \frac{P_t^F}{P_t^H}. \tag{3.12}$$

Note that changes in the terms of trade reflect changes in the competitiveness of the economy.

[1] The superscript * denotes "foreign" throughout the paper.

3.3 Firms

Suppose that there is a continuum of firms indexed by $i,\ 0 \leq i \leq 1$. A typical firm in the home country produces a differentiated good with constant returns to scale according to the following function

$$Y_t(i) = \varepsilon_t^a N_t(i),$$

where ε_t^a is an exogenous technology shock. According to this production function firms face real marginal costs $MC_t = \frac{W_t}{P_t \varepsilon_t^a}$

Firms producing the domestic good are monopolistically competitive in Calvo style price setting with indexation to the past value of the inflation rate, where the inflation rate is defined as $\pi_t^H = log(P_t^H / P_{t-1}^H)$. A fraction $(1-\theta^H)$ of firms is allowed to sets its price optimally. The fraction θ^H set its price according to the following indexation rule

$$log(P_t^H(i)) = log(P_{t-1}^H(i)) + \delta \pi_{t-1}^H,$$

where $0 \leq \delta < 1$ is the degree of indexation. The price index evolves according to

$$P_t^H \quad = \quad \left[(1-\theta^H)(P_t^{H,new})^(1-\varepsilon) + \theta^H \left(P_{t-1}^H \left(\frac{P_{t-1}^H}{P_{t-2}^H} \right)^\delta \right)^{(1-\varepsilon)} \right]^{1/(1-\varepsilon)} . \qquad (3.13)$$

A firm i setting its price in period t and following the indexation rule faces in period $T,\ T \geq t$ the demand curve:

$$y_t^H(i) = \left(\frac{P_t^H(i)}{P_T^H} \left(\frac{P_{T-1}^H}{P_{t-1}^H} \right)^\delta \right)^{-\varepsilon} (C_t^H + C_t^{H*}),$$

where C_t^{H*} is foreign demand for the domestic good. Therefore, the firm's price-setting problem in period t can be stated as

$$E_t \sum_{T=t}^{\infty} (\theta^H)^{T-t} Q_{t,T} y_t^H(i) \left[P_t^H(i) \left(\frac{P_{T-1}^H}{P_{t-1}^H} \right)^\delta - P_t^H MC_T \right].$$

This implies the following first order condition.

$$E_t \sum_{T=t}^{\infty} (\theta^H)^{T-t} Q_{t,T} y_t^H(i) \left[P_t^H(i) \left(\frac{P_{T-1}^H}{P_{t-1}^H} \right)^\delta - \frac{\theta^H}{1-\theta^H} P_t^H MC_T \right].$$

The distortion occurs due to the monopolistic competition in the goods market.

Foreign good retailers import the foreign good so that the law of one price holds "at the docks" and resell it in a monopolistically competitive market. They use Calvo pricing with indexation to past inflation defined as $\pi_t^F = log(P_t^F / P_{t-1}^F)$.

A fraction $(1-\theta^H)$ of importers is allowed to set its price optimally in each period. The fraction θ^H sets its price according to the indexation rule

$$log(P_t^F(i)) = log(P_{t-1}^F(i)) + \delta \pi_{t-1}^F,$$

, where we assume the same degree of indexation as for domestic producers. The foreign good price index evolves according the following relation

$$P_t^F = \left[(1-\theta^F)(P_t^{F,new})^(1-\varepsilon) + \theta^F \left(P_{t-1}^F \left(\frac{P_{t-1}^F}{P_{t-2}^F} \right)^\delta \right)^{(1-\varepsilon)} \right]^{1/(1-\varepsilon)} .$$

Firm i setting its price in period t faces in period $T,\ T \geq t$ the following demand curve:

$$y_t^F(i) = \left(\frac{P_t^F(i)}{P_T^F} \left(\frac{P_{T-1}^F}{P_{t-1}^F} \right)^\delta \right)^{-\varepsilon} C_t^F .$$

Therefore, the firm's price-setting problem in period t can be stated as

$$E_t \sum_{T=t}^{\infty} (\theta^F)^{T-t} Q_{t,T} y_t^F(i) \left[P_t^F(i) \left(\frac{P_{T-1}^F}{P_{t-1}^F} \right)^\delta - \hat{e}_T P_t^F MC_T \right] .$$

This implies the following first order condition

$$E_t \sum_{T=t}^{\infty} (\theta^F)^{T-t} Q_{t,T} y_t^F(i) \left[P_t^F(i) \left(\frac{P_{T-1}^F}{P_{t-1}^F} \right)^\delta - \frac{\theta^F}{1-\theta^F} \hat{e}_T P_t^F MC_T \right] ,$$

which is the solution to this equation. This generates deviations from the law of one price in the short run, while complete pass-through is reached in the long-run as presented in Monacelli (2003).

3.4 Equilibrium

The market clearing condition in the domestic economy is given by the following equation

$$Y_t^H = C_t^H + C_t^{H*} . \tag{3.14}$$

Under the maintained assumption of a large foreign economy, market clearing in the foreign economy gives $Y_t^* = C_t^*$. Households are assumed to have identical initial wealth so they make identical consumption and portfolio decisions. The following analysis considers a symmetric equilibrium in which domestic producers, importers, and foreign firms set common prices P_T^H, P_t^F and P_t^*, respectively.

The distortion that occurs due to the monopolistic competition in the goods market introduces a wedge between the marginal rate of substitution in the labor consumption choice and the marginal rate of transformation. Under flexible prices, equilibrium implies a constant markup that is equivalent to the markup implied by a zero-inflation steady state with rigidities. As in Gali and Monacelli (2002) we assume that the government fully offsets the distortion by a subsidy that is financed through a lump-sum tax/transfer T_t to households.

3.5 Linearized Model

To analyze the behavior of the model, an approximation around the non-stochastic steady state of the presented model is obtained as in Justiniano and Preston (2004). For any variable, we denote by lowercase letters the log-deviation from the steady state of their uppercase counterparts. The deterministic steady state is characterized by $\varepsilon_t^a = \varepsilon_t^g = \varepsilon_t^m = 0$ in the domestic economy and $\varepsilon_t^\pi = \varepsilon_t^y = \varepsilon_t^i = 0$ in the foreign block.

As in Justiniano and Preston (2004), we assume a non-inflationary steady state $\pi_t = \frac{P_t}{P_{t-1}} = \frac{P_t^H}{P_{t-1}^H} = \frac{P_t^F}{P_{t-1}^F} = 1$ and a steady state interest rate $1 + i_t = \frac{1}{\beta}$.

Linearizing the domestic goods market clearing condition (3.14) together with the linearized version of demand functions (3.5) implies:

$$(1-\alpha)c_t = y_t - \alpha\eta(2-\alpha)s_t - \alpha\eta\psi_t^F - \alpha y_t^*, \tag{3.15}$$

where $\psi_t^F = (e_t + p_t^*) - p_t^F$ is the log linear approximation of the law of one price gap, and $s_t = p_t^F - p_t^H$ approximates the terms of trade given by equation (3.12). Time differencing of the terms of trade definition implies

$$\Delta s_t = \pi_t^F - \pi_t^H. \tag{3.16}$$

Using the approximations of the law of one price gap and the terms of trade, the following link between the terms of trade and the real exchange rate is defined:

$$q_t = \psi_t^F + (1-\alpha)s_t. \tag{3.17}$$

The log-linear approximations to the optimality conditions of domestic firms for price setting, the law of motion for domestic producer prices and the domestic price index (3.13) imply the following hybrid Philips curve:

$$\pi_t^H - \delta\pi_{t-1}^H = \frac{1-\theta^H}{\theta^H}(1-\theta^H\beta)mc_t + \beta E_t[(\pi_{t+1}^H - \delta\pi_t^H)], \tag{3.18}$$

where

$$mc_t = \varphi y_t - (1+\varphi)\varepsilon_{a,t} + \alpha s_t + \sigma(1-h)^{-1}(c_t - hc_{t-1}) \tag{3.19}$$

denotes the real marginal cost function of each firm, which originates from approximation of the aggregate production function and the household's optimality condition for labor choice.

Similarly, the optimality condition for the pricing problem of retailers results in the following Philips curve

$$\pi_t^F - \delta\pi_{t-1}^F = \frac{1-\theta^F}{\theta^F}(1-\theta^F\beta)\psi_t^F + \beta E_t[(\pi_{t+1}^F - \delta\pi_t^F)]. \tag{3.20}$$

Following the arguments of Justiniano and Preston (2004) and the derivation presented by Gali and Monacelli (2002), the complete markets assumption together with the condition (3.10) imply the following approximate relation for the log-linear approximation of the Euler equation (3.9)

$$c_t - hc_{t-1} = y_t^* - hy_{t-1}^* + \sigma^{-1}(1-h)[\psi_t^F + (1-\alpha)s_t] + \sigma^{-1}(1-h)\varepsilon_t^g. \tag{3.21}$$

The log-linear approximation of the uncovered interest rate parity equation (3.11) gives $i_t - i_t^* = E_t \Delta e_{t+1}$ and using the definition of the real exchange rate we get

$$(i_t - E_t \pi_{t+1}) - (i_t^* - E_t \pi_{t+1}^*) = E_t \Delta q_{t+1}. \tag{3.22}$$

Note, that from the definition of the real exchange rate we have

$$\Delta e_t \;=\; \Delta q_t + \pi_t - \pi_t^*. \tag{3.23}$$

Finally, the approximation of the CPI equation (3.3) and the change in the terms of trade (3.16) gives the following relation:

$$\pi_t \;=\; \pi_t^H + \alpha \Delta s_t \tag{3.24}$$

Because the foreign economy (monetary union) is considered large enough, it is exogenous to the domestic economy. This gives us some flexibility in specifying the behavior of foreign variables. We assume that the paths of foreign variables π_t^*, y_t^*, and i_t^* are determined by the following VAR process:

$$\pi_t^* \;=\; \omega_\pi^\pi \pi_{t-1}^* + \omega_y^\pi y_{t-1}^* + \omega_i^\pi i_{t-1}^* + \varepsilon_t^\pi, \tag{3.25}$$
$$y_t^* \;=\; \omega_\pi^y \pi_{t-1}^* + \omega_y^y y_{t-1}^* + \omega_i^y i_{t-1}^* + \varepsilon_t^y, \tag{3.26}$$
$$i_t^* \;=\; \omega_\pi^i \pi_{t-1}^* + \omega_y^i y_{t-1}^* + \omega_i^i i_{t-1}^* + \varepsilon_t^i, \tag{3.27}$$

where ε_t^π, ε_t^y, and ε_t^i are the structural shock vectors that drive the foreign economy.

3.6 Monetary Policy

The model is closed by the description of the monetary policy conducted by the domestic monetary policy authority.

We assume that the independent monetary policy authority conducts inflation targeting or exchange rate targeting according to the following inflation forecast based Taylor rule:

$$i_t \;=\; \rho i_{t-1} + \rho_\pi \pi_{t+1} + \rho_y y_t + \rho_e \Delta e_t + \varepsilon_t^m, \tag{3.28}$$

where ρs stand for weights describing the objectives of the domestic monetary authority and ε_t^m is the monetary policy shock. By the choice of weights, the rule given by equation (3.28) is used to model the behavior of the monetary authority, which conducts an independent inflation targeting or exchange rate targeting monetary policy. We find stabilization of the change in the nominal exchange rate preferable to stabilization of the level of the nominal exchange rate. This approach allows the nominal exchange rate to enter the new regime at any level and not at a particular level.

We assume that the monetary authority is free to set the weights of the rule. In our experiment, the independent inflation targeting economy sets the weight on inflation to 2, the weight on interest rate smoothing to 0.7, and the other weights to zero. Thus we call this economy $IT2$. The independent exchange rate targeting economy sets the weight on nominal exchange rate stabilization to 1, the weight on the interest rate smoothing parameter to 0.7, and the remaining weights to zero, and the economy is called $ET1$.

As soon as the economy enters the future regime, the monetary policy rule in the following form is used

$$i_t = \widehat{\rho_e}\Delta e_t. \tag{3.29}$$

where $\widehat{\rho_e} > 1$ is the measure for offsetting the change in the nominal exchange rate. This is the rule of the unilateral peg economy. We consider two alternatives of the rule. In the first the weight on nominal exchange rate stabilization is 3, and in the second it is 10.

The transitory economy is characterized by the announcement of a future change in the monetary policy rule. It arises as soon as the monetary authority announces the future shift from rule (3.28) to rule (3.29). Thus, the monetary policy rule of the transitory economy is given by:

$$i_t = regime_t(\rho i_{t-1} + \rho_\pi \pi_{t+1} + \rho_y y_t + \rho_e \Delta e_t + \varepsilon_t^m) + (1 - regime_t)\widehat{\rho^e}\Delta e_t, \tag{3.30}$$

where

$$regime_t = \begin{cases} 1, & \text{if } t < T; \\ 0, & \text{if } t \geq T, \end{cases}$$

and T is the time of the regime change.

The transitory inflation targeting economy moving to exchange rate targeting with weight 3 we denote $IT2 \rightarrow ET3$. Analogously we denote $IT2 \rightarrow ET10$, $ET1 \rightarrow ET3$ and $ET1 \rightarrow ET10$.

Our approach to modeling the transitory economies is based on creating an information buffer by extending the state space of the underlying model. The information buffer of length N takes the following form:

$$\begin{aligned} regime_t &= inf_{t,1} \\ inf_{t,1} &= \rho_{inf} inf_{t,2} + \nu_{t,1} \\ inf_{t,2} &= \rho_{inf} inf_{t,3} + \nu_{t,2} \\ &\vdots \\ inf_{t,N-1} &= \rho_{inf} inf_{t,N} + \nu_{t,N-1} \\ inf_{t,N} &= \nu_{t,N}, \end{aligned} \tag{3.31}$$

where $inf_{t,i}$, $i \in 1, \ldots, N$ are new endogenous variables, $\nu_{t,i}$, $i \in 1, \ldots, N-1$ are information shocks and $0 < \rho_{inf} < 1$. We assume that $\nu_{t,i} \sim N(0, \gamma^2), \forall i$ and $\gamma^2 \in \Re^+$ is a small number or zero. For computational purposes, the steady state of this system coincides with the model that uses rule (3.29).

The announcement in period t of the regime change that happens in period T means that ν_t,'s are realized with the following values:

$$\nu_{t,i} \;=\; \begin{cases} \rho^{1-i}, & i < T; \\ 0, & i \geq T, \end{cases}$$

in the initial period and $\nu_{t,i} = 0,\ \forall i$ in all subsequent periods.

The construction of the regime indicator implies non-linearities in the monetary policy rule Therefore, to solve and simulate the transition regime we use Dynare++. Dynare++ is a standalone C++ version of Dynare developed by Kameník (2007). Employing Dynare++, we are able to use the second order approximations in our experiments. Second order approximation is essential because of the quadratic nature of the monetary policy rule in the model of the transition regime.

To sum up, three types of economies are modeled: first, the independent economy with an inflation targeting or exchange rate targeting Taylor rule; second, the transitory economy, where the model allows for future regime change; and third, the unilateral peg economy having a monetary policy rule with weights of 3 or 10 on nominal exchange rate stabilization.

3.7 Calibration

We analyze the behavior of a generic economy rather than a particular one. However, we attempt to select parameter values that are consistent with recent empirical studies and that are used in theoretical studies such as Svensson (2003), Justiniano and Preston (2004), Natalucci and Ravenna (2002) and Lubik and Schorfheide (2005).

A summary of the parameter settings is presented in Table A.1 in the Appendix. We assume $\beta = 0.99$, which implies a riskless annual return of about 4% in the steady state. We choose Φ so that the elasticity of labor is $\frac{1}{2}$ according to Natalucci and Ravenna (2002). The calibration for the price stickiness parameters θ's is based on Lubik and Schorfheide (2005) and should reflect the evidence on US prices. The price indexation value is set to 0.5, although there do exist studies where the indexation value is set to unity. However, Smets and Wouters (2003) find this value significantly smaller.

We set the persistence of foreign shocks to 0.7, as is typically used in the literature (e.g. Natalucci and Ravenna (2002)), while find the values of Justiniano and Preston (2004) quite low. The rest of the parameters are derived from previous studies or are the same as those used by Justiniano and Preston (2004).

In calibrating the variances of the shocks, we reflect the evidence that monetary policy shocks and risk premium shocks exhibit lower variance than inflation shocks and output shocks.

The evidence suggests that small open economies differ in the extent of synchronization with the large neighbor foreign economy. If foreign and domestic business cycles are sufficiently synchronized (foreign and domestic shocks are correlated), the macroeconomic stabilities in independent inflation targeting and independent exchange rate targeting economies are expected to be close together. As a result, we would be limited in distinguishing between independent inflation and exchange rate targeting economies as far as macroeconomic stability and welfare are concerned, and also between the effect of the announcement of the future regime change on the transitory inflation targeting economy and that on the transitory exchange rate targeting economy. Therefore, we assume that the shocks in the foreign economy are independent of domestic shocks, and that allows for different macroeconomic stability and welfare in the independent inflation targeting economy compared to the independent exchange rate targeting economy.[2]

We performed a sensitivity analysis by changing the calibrated parameters to various plausible levels. For example, interest rate smoothing was chosen between 0.5 and 0.9 or the degree of openness between 0.2 and 0.6. Since the main story of the paper remained unchanged we do not report the results based on the alternative calibrations.

4. Results

The goal of this section is to investigate the independent economies ($IT2$ and $ET1$) and the transitory economies ($IT2 \rightarrow ET3$, $IT2 \rightarrow ET10$, $ET1 \rightarrow ET3$ and $ET1 \rightarrow ET10$) by means of impulse responses, macroeconomic stability (conditional variances) and welfare (given a particular loss function). All figures are in the Appendix.

4.1 Impulse Responses

4.1.1 No Regime Change

In figures B.1–B.7, we compare the impulse responses of the independent inflation targeting economy ($IT2$) with the independent exchange rate targeting economy ($ET1$) to a particular shock.

The technology shock (Figure B.1) can be viewed as a supply shock. In economy $IT2$, it leads to a fall in inflation, inducing a very moderate interest rate drop. This triggers an initial depreciation of the nominal exchange rate, Δe>0, and an expected appreciation. The real exchange rate depreciation induces an output and consumption expansion. As a result, inflation increases and returns to the steady state. Imported inflation follows the nominal exchange rate fluctuation. Since domestic inflation decreases and foreign inflation is unaffected (there is no transmission from the small open economy to the large foreign economy), the terms of trade worsen (increase). Since the LOP gap increases, the rise in the real exchange rate is larger than the rise in the terms of trade. Importers make profits at the beginning, but then their pricing behavior makes them increase import prices and a new equilibrium is established.

In $ET1$, the technology shock, also accompanied by an inflation drop, does not lead to even a moderate interest rate reduction, because that would induce a nominal exchange rate adjustment. Since the monetary policy rule is designed to keep the nominal exchange rate stable, the interest rate and the nominal exchange rate, which are linked together by UIP, remain stable.[3] The response of inflation is slightly more volatile than in $IT2$, as expected. The initial response of the real exchange rate and the terms of trade corresponds to the responses of inflation and the nominal exchange rate. Over time, the decreasing inflation leads to an improvement in the terms of trade, as the appreciation fades. It turns out that the differences between $IT2$ and $ET1$ come from the differences in the nominal interest rate, the nominal exchange rate, and the law

[2] Business cycle synchronization mitigates nominal exchange adjustment and the volatility of other variables. As a result, exchange rate targeting might provide better welfare if business cycles are synchronized.

[3] There might be some non-zero interest rate differential and some nominal exchange rate fluctuation, but its size is negligible.

of one price gap. Since the differences are small relative to the size of the responses, the other variables in $IT2$ and $ET1$ respond in the same way.

The preference shock (Figure B.2) can be viewed as a demand shock, that is, a shock to consumption. In $IT2$, it induces a rise in inflation and consequently in the nominal interest rate. Nominal exchange rate appreciation and higher inflation result in a real exchange rate appreciation that accounts for the fall in output and subsequent return of consumption to the steady state. The initial fall in real interest rates (nominal interest rates minus inflation) is followed by their subsequent increase. Real interest rates return to zero with the other variables. The rise in inflation results in an improvement in the terms of trade, but as importers catch up, they increase the price of imports and a new equilibrium is established.

The preference shock to $ET1$ leads to similar responses, except that the nominal exchange rate is held even more stable than in the independent $ET1$. As a result, nominal interest rates and the nominal exchange rate are stable, resulting in slightly different responses of the other variables in terms of magnitude, but the direction of the responses remains the same.

The response to the risk premium shock is depicted in Figure B.3. The real exchange rate and nominal exchange rate both depreciate and create appreciation expectations. Also, the real interest rate increases to compensate for the increased risk premium. The weak real exchange rate leads to output, consumption, and inflation increases. The terms of trade improve with the fall in inflation, and the different direction of the terms of trade response compared to the real exchange rate response is a result of a relatively large LOP gap. Since the risk premium shock leads to a real exchange rate depreciation and at the same time leads to an inflation increase, the nominal exchange rate is required to depreciate by more than the real exchange rate.

It turns out that the $ET1$ monetary regime results in a larger nominal exchange rate adjustment than the $IT2$ regime. In fact, if the risk premium shock is accompanied by such a shock, the nominal exchange should adjust in order to make the real exchange rate compensate for the higher risk premium. If the other shock does not induce a nominal exchange rate adjustment, the risk premium shock calls for a higher nominal exchange rate adjustment than if the other shock induces some nominal exchange rate adjustment in the same direction. The higher nominal exchange rate depreciation leads to higher inflation, so that the real exchange rate depreciates in response to the risk premium shock.

The responses to the monetary policy shocks are depicted in Figure B.4. The deviation dies out fast, since there is no persistence involved. The monetary policy shock leads to an exchange rate appreciation and a consequent drop in inflation and the real economy (consumption and output). The terms of trade worsen as a result of the inflation drop and, given the real exchange rate appreciation, we observe a large LOP gap deviation. The behavior in $IT2$ and $ET1$ is the same.

The foreign inflation shock (Figure B.5) directly affects the nominal exchange rate in $IT2$, which appreciates at once. Due to the persistence in the foreign inflation shock, the nominal exchange rate is expected to keep on appreciating at a decreasing rate. Hence, the nominal interest rate decreases to satisfy UIP and returns to the steady state later. The tight real exchange rate causes a fall in output, consumption, and inflation.

The real exchange rate in $ET1$ depreciates due to a negative inflation differential between domestic and foreign inflation. This contributes to easy monetary conditions along with an easy real interest rate. As a result, output, consumption, and inflation increase in $ET1$. In $IT2$, a nominal exchange rate appreciation directs inflation down. In $ET1$, the nominal exchange rate and interest rates remain stable and inflation thus increases. This translates to a terms of trade improvement in $ET1$ as opposed to $IT2$.

The foreign output shock (Figure B.6) translates to roughly the same responses in both $IT2$ and $ET1$. The nominal exchange rate depreciates, output, consumption, and inflation increase, calling for a monetary tightening, and so nominal interest rates increase. The rise in inflation and output soon inverts to negative values. The higher initial domestic inflation results in a terms of trade improvement, and since the LOP gap remains close to zero, the real exchange rate appreciates.

The impulse responses of the variables to the foreign interest rate shock (Figure B.7) are very close to the responses to the foreign output shock, except for the responses of the nominal interest and exchange rates in $ET1$. The foreign nominal interest rate shock leads to a nominal depreciation, calling for nominal interest rate increases. The nominal exchange rate and inflation are stabilized after a commensurate interest rate response. The rise in inflation improves the terms of trade and the increase in the LOP gap makes the real exchange rate depreciate. This depreciation is smaller in magnitude than the nominal exchange rate depreciation because of a positive inflation differential between the domestic and foreign economy.

The real exchange rate depreciation resulting from the foreign interest rate shock is required to be the same in both $IT2$ and $ET1$ in order to satisfy UIP. Because $IT2$ leads to lower inflation than $ET1$, and thus to a higher real depreciation than $ET1$, the nominal exchange rate is allowed to depreciate less in $IT2$ than in $ET1$.

4.1.2 Regime Change

In figures C.1–D.7, we compare the impulse responses of the transitory inflation targeting economies $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET10$ to a particular shock. In figures C.1–C.7, we study the responses after the announcement that the monetary policy rule will change in 20 periods, while in figures D.1–D.7 we study the announcement that the change will occur in 8 periods.

In figures E.1–F.7, we compare the impulse responses of the transitory exchange rate targeting economies $ET1 \rightarrow ET3$ and $ET1 \rightarrow ET10$, also for a 20 period ahead change (figures E.1–E.7) and an 8 period ahead change in monetary policy.

Right after the announcement of the future change in the monetary policy rule, the transitory economy arises and expectations adjust accordingly.

The impulse responses in $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET3$ match those in IT2 in terms of direction, apart from the foreign inflation shock, which causes a nominal appreciation that now leads to an inflation increase. The real exchange rate depreciates in these transitory economies, since the inflation differential between domestic and foreign inflation more than compensates for the nominal exchange rate appreciation.

However, the volatilities in the transitory economies differ from those in $IT2$. The nominal exchange rate and the variables linked to it (interest rates and import prices) are much less volatile than in $IT2$. On the other hand, the volatilities of inflation and other variables increase.

Since the monetary policy rule after 20 periods (8 periods) stabilizes the nominal exchange rate, the impulse responses of the nominal exchange rate and interest rate return to the steady state within 20 periods (8 periods). Import prices follow the nominal exchange rate.

The impulse responses in $ET1 \rightarrow ET3$ and $ET1 \rightarrow ET10$ are the same, except for the responses to the risk premium shock, monetary policy shock, and foreign interest rate shock, which lead to higher macroeconomic stabilization in $ET1 \rightarrow ET10$ than in $ET1 \rightarrow ET3$.

The impulse responses in both $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET3$ approach the impulse responses of $ET1$. They are placed between the impulse responses in $IT2$ and $ET1$. Hence, the nominal exchange rate, nominal interest rates and import prices are stabilized more in transitory $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET10$ than in independent $IT2$ and less than in independent $ET1$. On the other hand, the other variables are stabilized less in transitory $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET3$ than in $IT2$ and more than in $ET1$.

The comparison of $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET10$ reveals that $IT2 \rightarrow ET10$ is closer to $ET1$ than to $IT2$ relative to $IT2 \rightarrow ET3$. The reason for the stabilization of the nominal exchange rate in the transitory economies even before the regime change is the penalization of the monetary policy ($ET3$ or $ET10$) adopted after the regime change in case of exchange rate movements. Economic agents do not like potential abrupt changes in nominal interest rates causing jumps and distortions to the real economy (and to utility and profits), and prefer a smooth transition. If the economy is hit by a shock and the nominal interest rate is free to adjust, economic agents find it optimal to behave such that the resulting contemporaneous nominal exchange rate adjustment is considerable, followed by further adjustments in the nominal exchange rate. However, if they are informed by the monetary authority that the monetary policy rule the next period offsets the nominal exchange rate adjustments, they re-optimize their behavior and find the new nominal exchange rate trajectory that is optimal for utility and profit maximizing. The trajectory of the nominal exchange rate is consistent with the trajectories of the other variables. Thus, if further adjustments of the nominal exchange rate are not allowed, a strong contemporaneous adjustment of the nominal exchange rate would be followed by a jump in nominal exchange rate stability. This would be accompanied by jumps in the nominal interest rate, real interest rate, and real economy which agents do not find optimal. Therefore, agents smooth the trajectories and allow for lower nominal exchange rate adjustment and higher adjustment of the other variables.

It turns out that even though the monetary policy rule is the same for 20 periods (8 periods), the announcement of the future change in monetary policy makes economic agents behave differently, which results in different impulse responses. Thus, the current behavior of economic agents depends not only on the current monetary policy rule, but also on the future monetary policy rule.

4.2 Macroeconomic Stability

In this section, we compare the variances in the independent economies $IT2$ and $ET1$ and the conditional (on time) variances (or standard errors) in the transitory economies $IT2 \rightarrow ET3$, $IT2 \rightarrow ET10$, $ET1 \rightarrow ET3$, and $ET1 \rightarrow ET10$.

Table 4.1 shows the standard errors in the independent economies. As expected, inflation is stabilized better in $IT2$ than $ET1$, while the nominal exchange rate, Δe, is stabilized better in $ET1$ than $IT2$.

Table 4.1: Comparison of std. errors – in percentage points

Variable	IT2	ET1
CPI inflation	0.9	1.6
Δe	2.1	0.6
Imported inflation	0.6	1.2
Real Exchange rate	2.2	2.1
Output	2.6	2.6
Consumption	1.6	1.5
Domestic inflation	1.1	1.8
Terms of Trade	2.8	2.8
Nominal int. rate	1.0	1.0
Marginal costs	2.6	3.0
LOP gap	0.8	0.6

The conditional variances (and standard errors) depend on the number of periods after the announcement of the regime change. Therefore, we compute the conditional variance of the considered variables using the second order approximation. To do this, we evaluate the information shocks and we compute the conditional variances for the announced regime change with transition period lengths of 20 and 8 periods, respectively.

Figures G.1 and G.2 display the conditional standard errors for transitory economies that change their monetary policy rule to $ET3$ after 20 and 8 periods, respectively, and figures G.3 and G.4 display the conditional standard errors for transitory economies that change their rule to ET10 after 20 and 8 periods, respectively. As described in the previous section, the standard error of the change in the nominal exchange rate in transitory inflation targeting economies $IT2 \rightarrow ET3$ and $IT2 \rightarrow ET10$ decreases (and decreases more in $IT2 \rightarrow ET10$ than in $IT2 \rightarrow ET3$). The standard error of the other variables (except for the LOP gap) increases. The volatility of inflation increases from 0.9 p.p (see Table 1) in the independent IT economy to 1.5 p.p in the transitory IT economy (see Figures G.3 and G.4).

Regarding transitory exchange rate targeting, it turns out that the standard errors do not change that much between the independent and transitory exchange rate targeting economies for inflation, the exchange rate, marginal costs, and the LOP gap, while for the rest of the variables transitory exchange rate targeting exhibits higher volatility than independent exchange rate targeting.

4.3 Welfare

In this section we compare the independent and transitory economies based on welfare. As in Santacreu (2005), for the purpose of monetary policy comparison we define the loss function of the monetary authority in the following form:

$$L_t = \lambda Var(\pi_t) + (1-\lambda)Var(y_t) + \frac{\lambda}{4}(i_t),$$

where $\lambda \in < 0, 1 >$ is the weight on inflation stabilization. The results of the loss function computation are plotted in tables H.1–K.1.

Further, following Gali and Monacelli (2005) we define an alternative loss function in the following form:

$$L_t = \frac{1}{\tau} Var(\pi_t) + (1+\phi) Var(y_t),$$

where $\tau = (1-\theta)(1-\beta\theta)/\theta$ and ϕ are parameters of the underlying model. The result of the calculation is shown in figures H.1–K.1 for various transitory regimes and times of monetary policy rule change.

Finally, as the last criterion we use terms of trade variance comparison. In this case, we compare the $ET1$ regime against the $IT2$ regime. The use of this criterion is based on the arguments of Gali and Monacelli (2005). Figures H.2–K.2 show the result of this comparison for various transitory regimes and times of monetary policy rule change. It can be seen that the $IT2$ regime is preferable to the $ET1$ regime with respect to the terms of trade, given our particular calibration.

We can observe that the loss in the transitory economies is higher than that in the independent economies, and that the loss increases with the approaching change in the monetary policy rule. If monetary policy targets the exchange rate in the unilateral peg economy with a weight of 10 on nominal exchange rate stabilization, the loss in the transitory inflation targeting economy is closer to the loss in the exchange rate targeting economy than if the weight is 3. This result is consistent across the alternative measures.

5. Conclusions

In this paper, we analyze the effects of an anticipated future change in monetary policy regime. We investigate the behavior of small open inflation targeting and exchange rate targeting economies after the announcement of the future monetary policy rule change. The economies are considering entering a monetary union in the future. Thus, the monetary policy rule after the regime change targets the change in the exchange rate (to imitate monetary union entry). We study two alternatives, differing in the extent of nominal exchange rate stabilization. As soon as the monetary authority announces the future regime change, the independent economy becomes transitory. After the regime change, the economy is referred to as a unilateral peg.

The goal of our paper is to investigate the changes between the independent and transitory economies (inflation and exchange rate targeting economies) due to future alternative changes in the monetary policy rule. Impulse responses are provided. We also compare macroeconomic stability and welfare between the independent and transitory economies. Thus, we study macroeconomic stability and welfare within the economy (either independent and transitory inflation targeting, or independent and transitory exchange rate targeting) rather than across economies (inflation targeting and exchange rate targeting).

We show that the announcement of the future regime change affects the impulse responses and variances of the variables before the regime change. It turns out that even though the monetary policy rule is the same until the future regime change occurs, the announcement of the future change in the monetary policy regime makes economic agents behave differently, which results in different impulse responses.

The variance of the nominal exchange rate in the transitory inflation targeting economy decreases, while the variance of the other variables (except for the LOP gap) increases. Regarding transitory exchange rate targeting, it turns out that the variances do not change that much between the independent and transitory exchange rate targeting economies for inflation, the exchange rate, marginal costs, and the LOP gap, while for the rest of the variables transitory exchange rate targeting exhibits higher volatility than independent exchange rate targeting. Thus, the transitory economies exhibit higher volatility of variables, except for the nominal exchange rate.

As long as the domestic and foreign business cycles are not synchronized, as assumed, the welfare in the unilateral peg economy is lower than in the independent economies (the loss is higher). However, if the economies are on the transition to the new regime with a fixed exchange rate, welfare starts to deteriorate right after the announcement of the future regime change even though current monetary policy is unchanged until the regime change. Thus, the loss in the transitory economies is higher than that in the independent economies, and the loss increases with the approaching change in the monetary policy rule. This effect is larger for the transitory inflation targeting economy than for the transitory exchange rate targeting economy. A transitory inflation targeting economy with stricter exchange rate targeting after the regime change exhibits a loss that is closer to the loss under exchange rate targeting than a transitory inflation targeting economy with a less strict alternative of future anticipated exchange rate targeting.

The announcement of the future regime change triggers an immediate change in the behavior of households and firms, which translates to different responses of the variables before and after the announcement. As a result, the variances and welfare change. The behavior of economic agents over the transitory period depends not only on the current monetary policy rule in the transitory period, but also on the future anticipated monetary policy rule. As soon as future exchange rate targeting is announced, the difference in macroeconomic volatility and impulse responses between the inflation and exchange rate targeting economies is lower, due to the common future monetary policy regime.

The model predicts that the more aggressive the future anticipated exchange rate targeting, the closer the behavior of agents in the transitory inflation and exchange rate targeting economies. The resulting inflation path induces nominal interest rate behavior that leads to a more stable nominal exchange rate. In the exchange rate targeting economy, policy interest rates – stabilizing the nominal exchange rate – determine inflation. In the transitory inflation targeting economy, economic agents make inflation behave such that the resulting policy interest rates stabilize the nominal exchange rate. This is why the inflation targeting economy after the regime change announcement (the transitory inflation targeting economy) starts to exhibit behavior that is closer to the exchange rate targeting economy. The nominal exchange rate is in the transitory inflation targeting economy stabilized at the cost of higher inflation volatility. Thus, the behavior of the inflation and exchange rate targeting economies converges after the announcement of the future regime change.

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A. Calibration summary

Table A.1: Model parameters

Coefficient	Description	Value
β	Discount factor	0.99
σ	Inverse elasticity of substitution	1.20
φ	Inverse elasticity of labor supply	1.50
θ_H	Calvo pricing - domestic	0.50
θ_F	Calvo pricing - foreign	0.50
α	Degree of openness	0.30
η	Elasticity of F-H substitution	1.50
h	Degree of habit formation	0.50
δ	Degree of price indexation	0.50
ρ_i	Interest rate smoothing	0.70
ρ_π	Response to inflation	2.00 or 0
ρ_y	Response to output gap	0.00
ρ_e	Response to ex. rate change	0.00 or 1
ω_{11}	Foreign VAR	0.70
ω_{12}	Foreign VAR	0.00
ω_{13}	Foreign VAR	0.00
ω_{21}	Foreign VAR	0.00
ω_{22}	Foreign VAR	0.70
ω_{23}	Foreign VAR	0.00
ω_{31}	Foreign VAR	0.00
ω_{32}	Foreign VAR	0.00
ω_{33}	Foreign VAR	0.70
ρ_a	Technology - VAR(1)	0.70
ρ_s	Ex. rate risk - VAR(1)	0.70
ρ_g	Taste shock - VAR(1)	0.70
stderr ε^π	Foreign shock variance	1.00
stderr ε^y	Foreign shock variance	1.00
stderr ε^i	Foreign shock variance	0.10
stderr ε^a	Domestic shock variance	2.00
stderr ε^m	Domestic shock variance	0.10
stderr ε^g	Domestic shock variance	1.00
stderr ε^s	Domestic shock variance	0.10

B. IRF: No regime change - $IT2$ vs $ET1$

Figure B.1: No change - $IT2$ (solid), $ET1$ (dashed) - response to technology shock ε^a

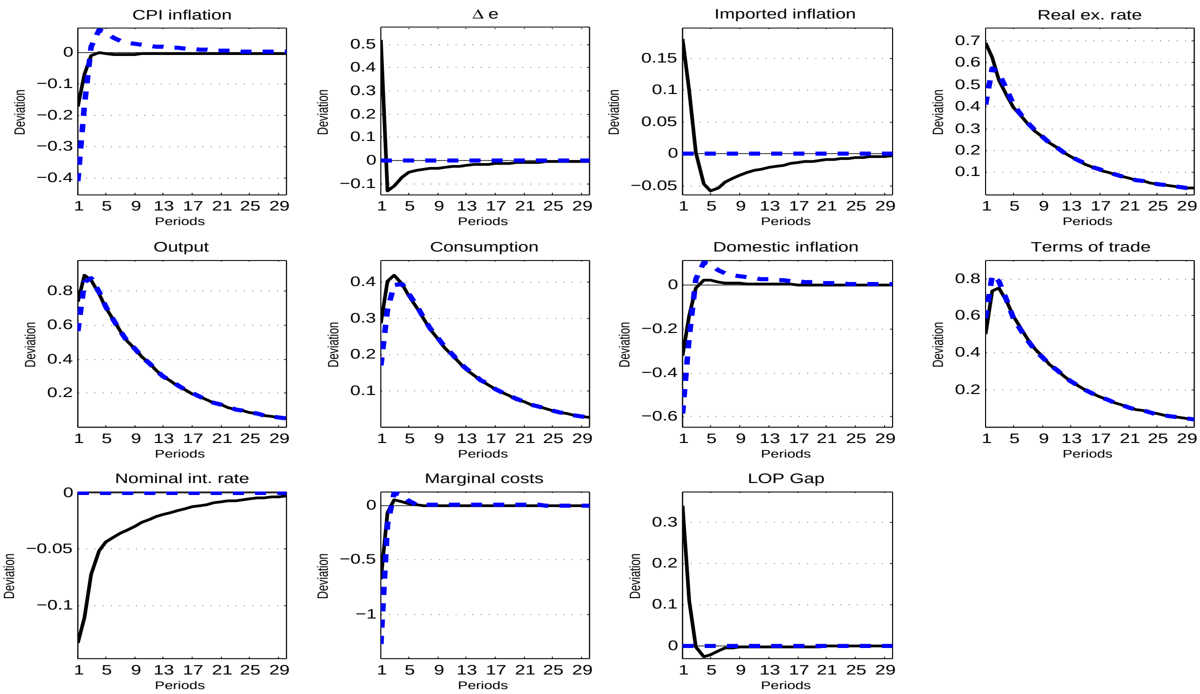


Figure B.2: No change - $IT2$ (solid), $ET1$ (dashed) - response to preference shock ε^g

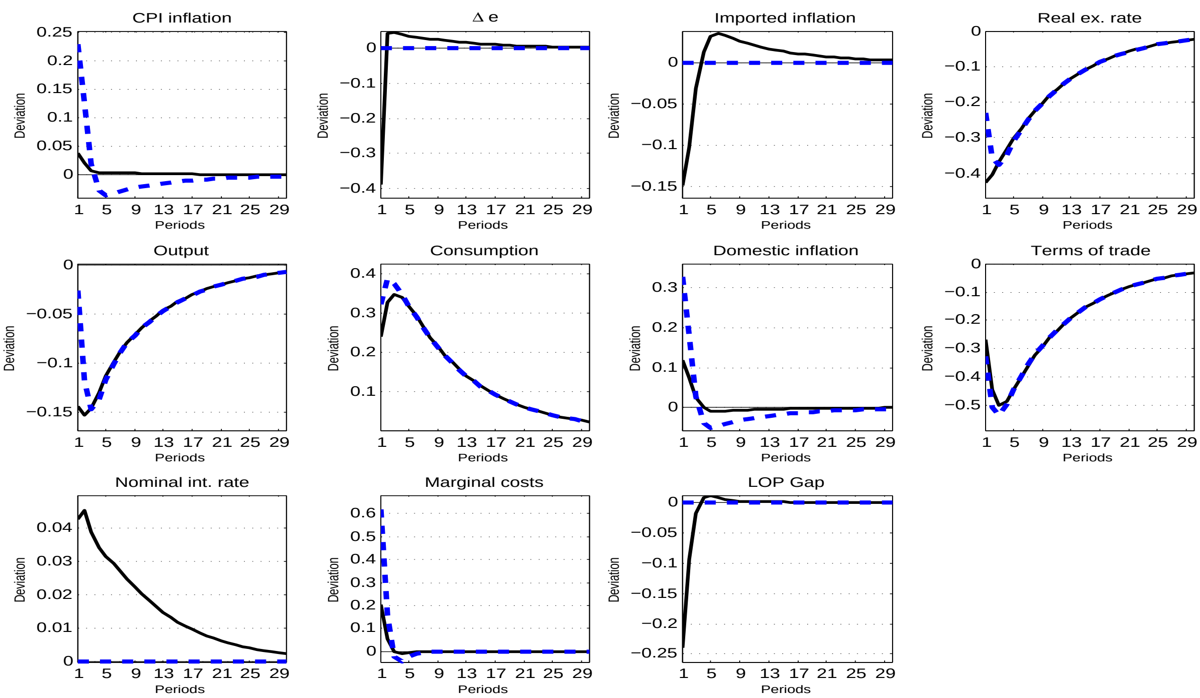


Figure B.3: No change - $IT2$ (solid), $ET1$ (dashed) - response to risk prem. shock ε^s

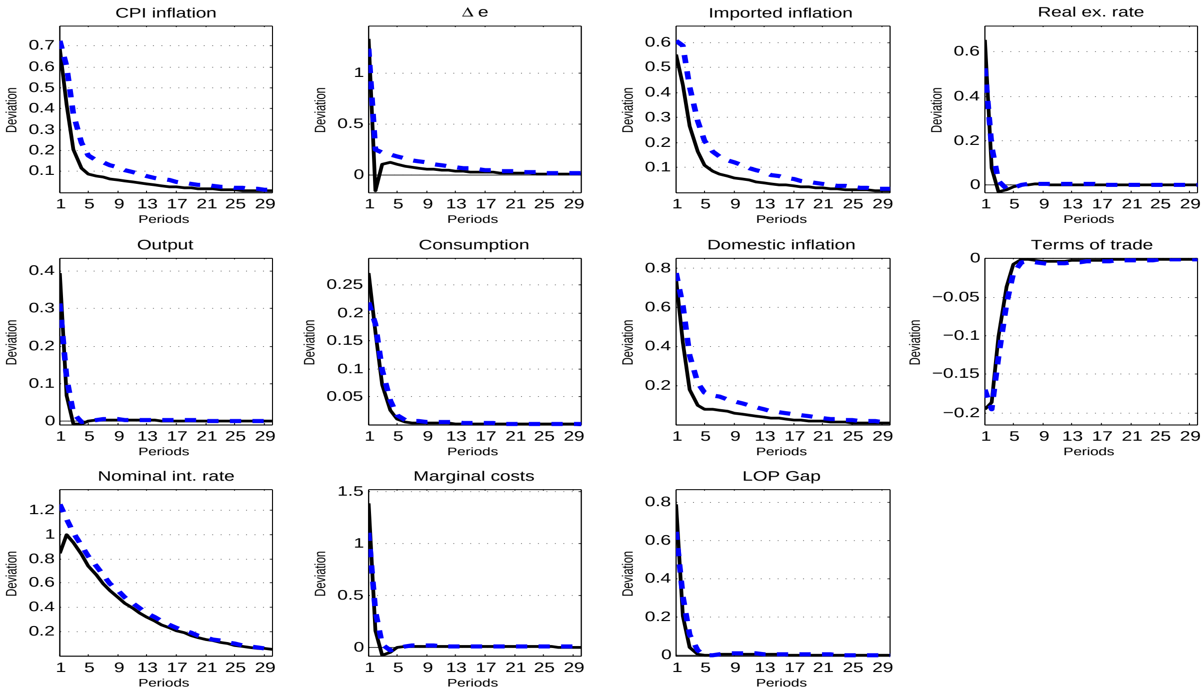


Figure B.4: No change - $IT2$ (solid), $ET1$ (dashed) - response to policy shock ε^m

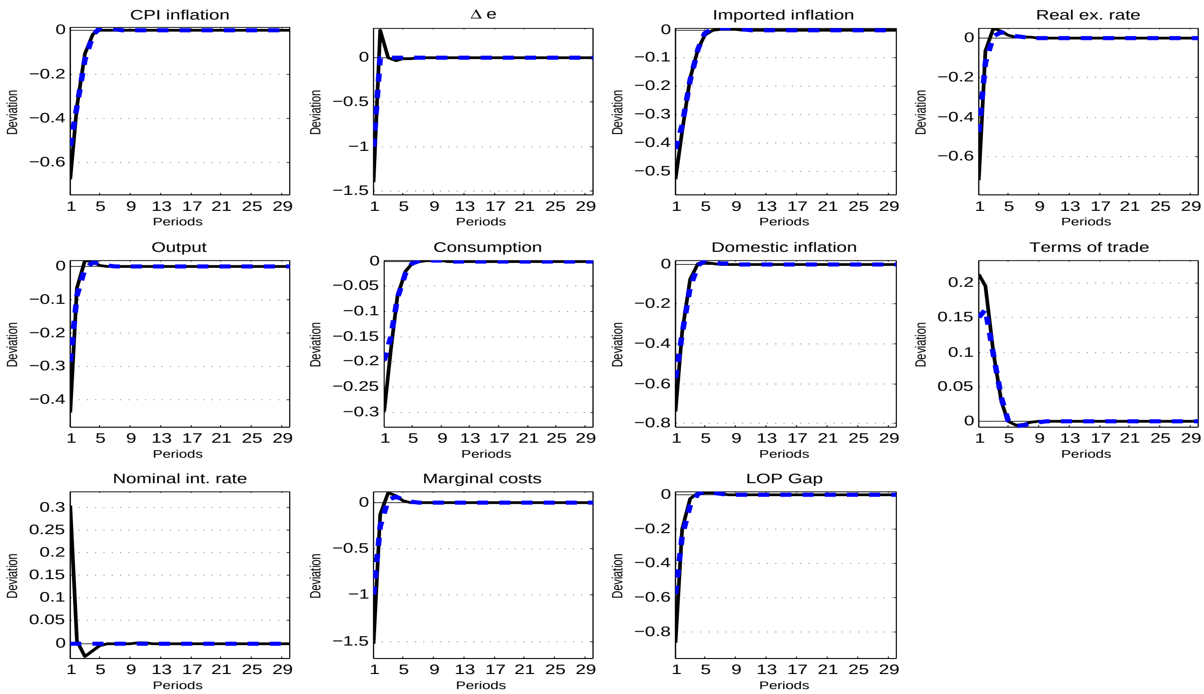


Figure B.5: No change - $IT2$ (solid), $ET1$ (dashed) - response to foreign inflation ε^{π}

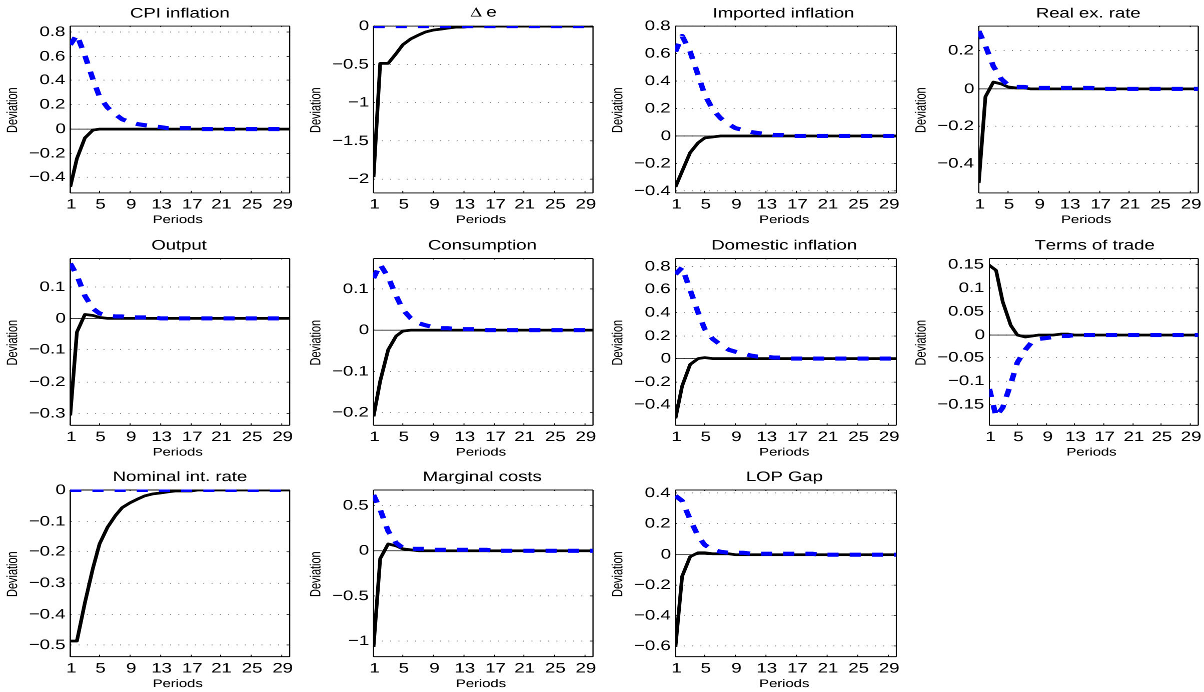


Figure B.6: No change - $IT2$ (solid), $ET1$ (dashed) - response to foreign output ε^{y}

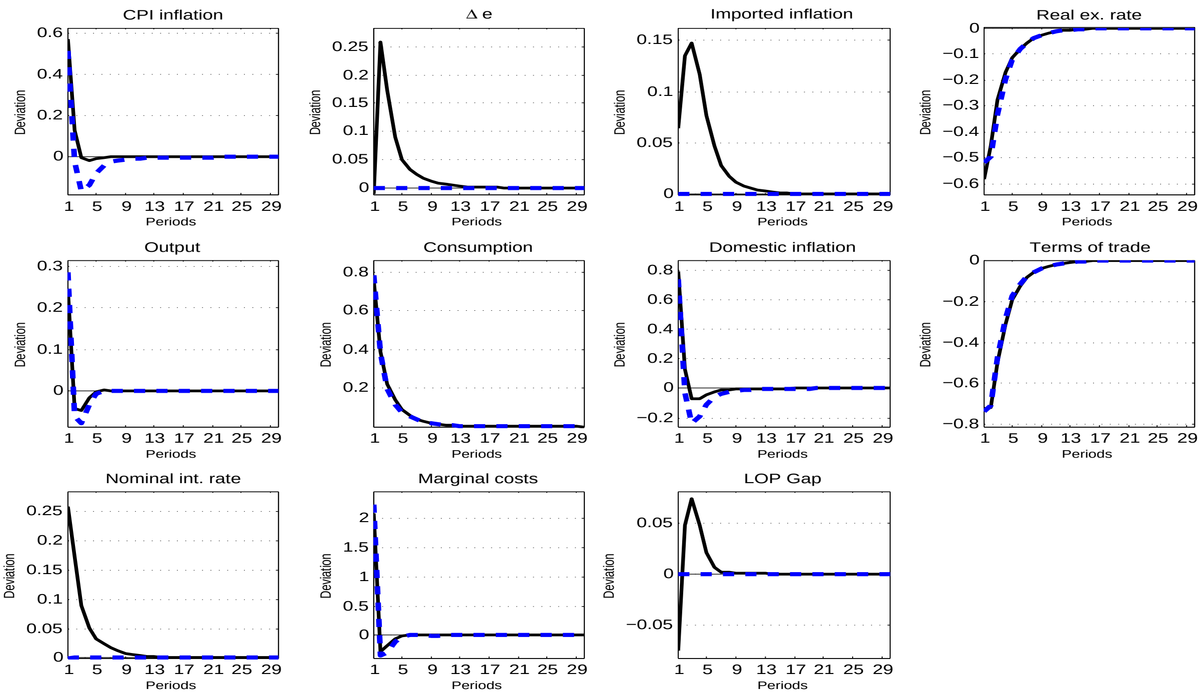
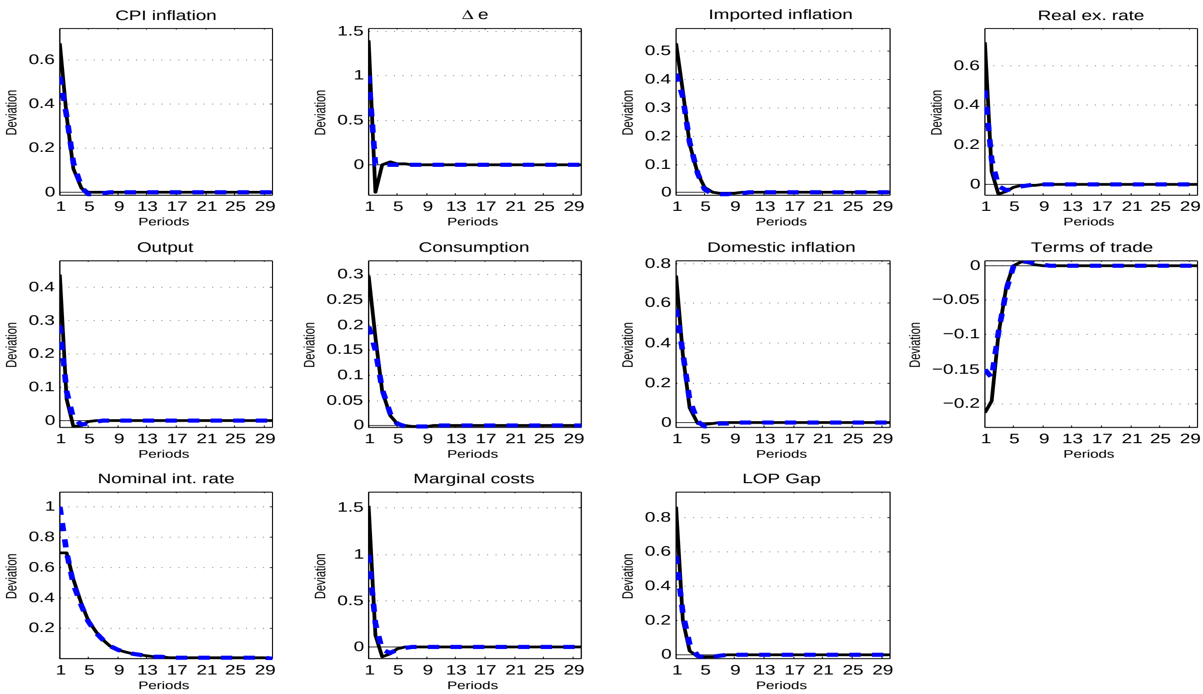


Figure B.7: No change - $IT2$ (solid), $ET1$ (dashed) - response to foreign int. rate ε^{i}



C. IRF: Regime change in 20 periods - for $IT2$

Figure C.1: $IT2 \rightarrow ET3$ **(solid)**, $IT2 \rightarrow ET10$ ***(dashed) - resp.to technology shock*** ε^a

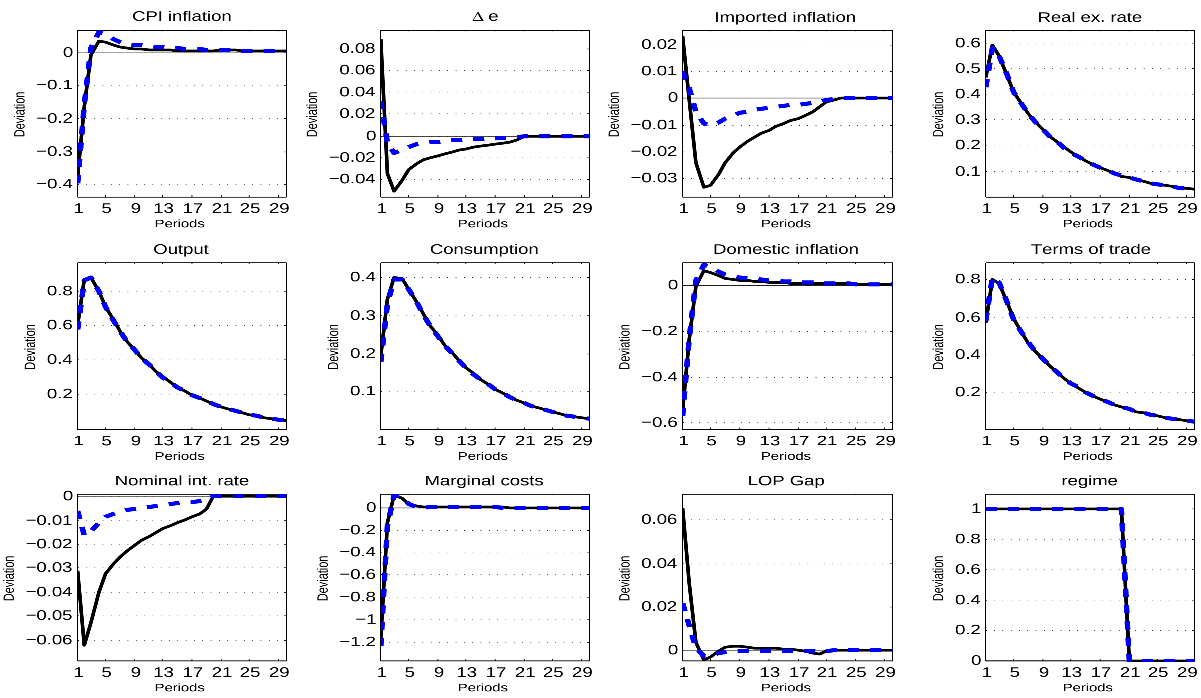


Figure C.2: $IT2 \rightarrow ET3$ **(solid)**, $IT2 \rightarrow ET10$ ***(dashed) - resp.to preference shock*** ε^g

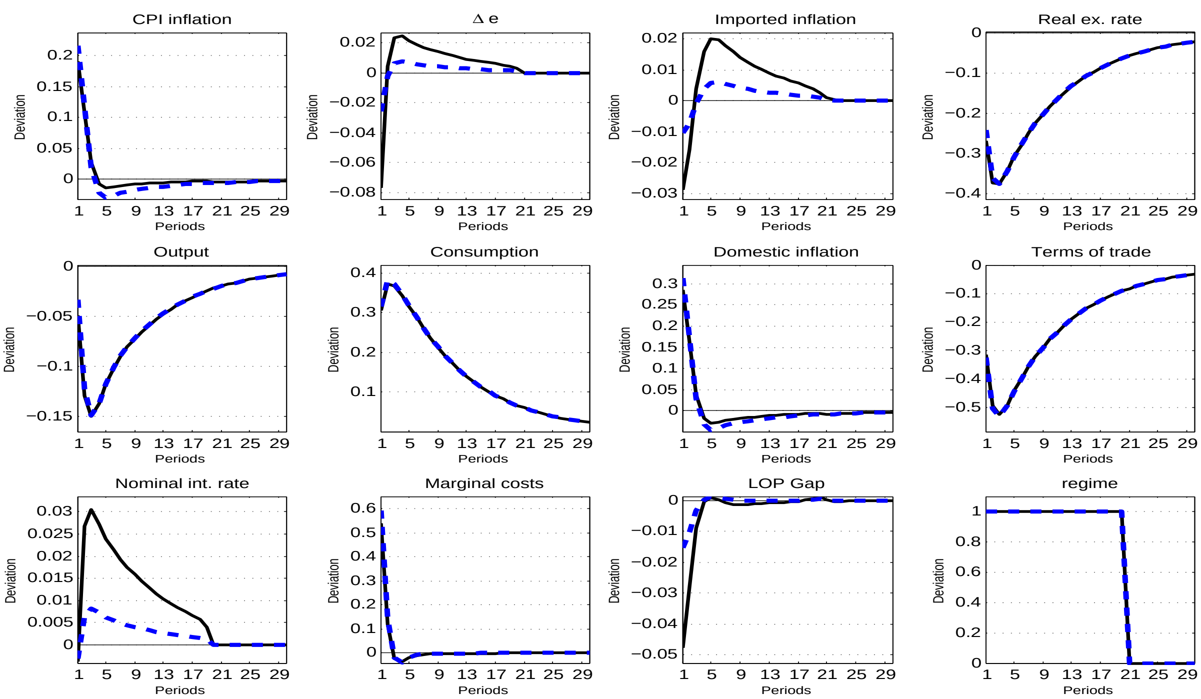


Figure C.3: $IT2 \rightarrow ET3$ **(solid),** $IT2 \rightarrow ET10$ ***(dashed) - resp.to risk prem. shock*** ε^s

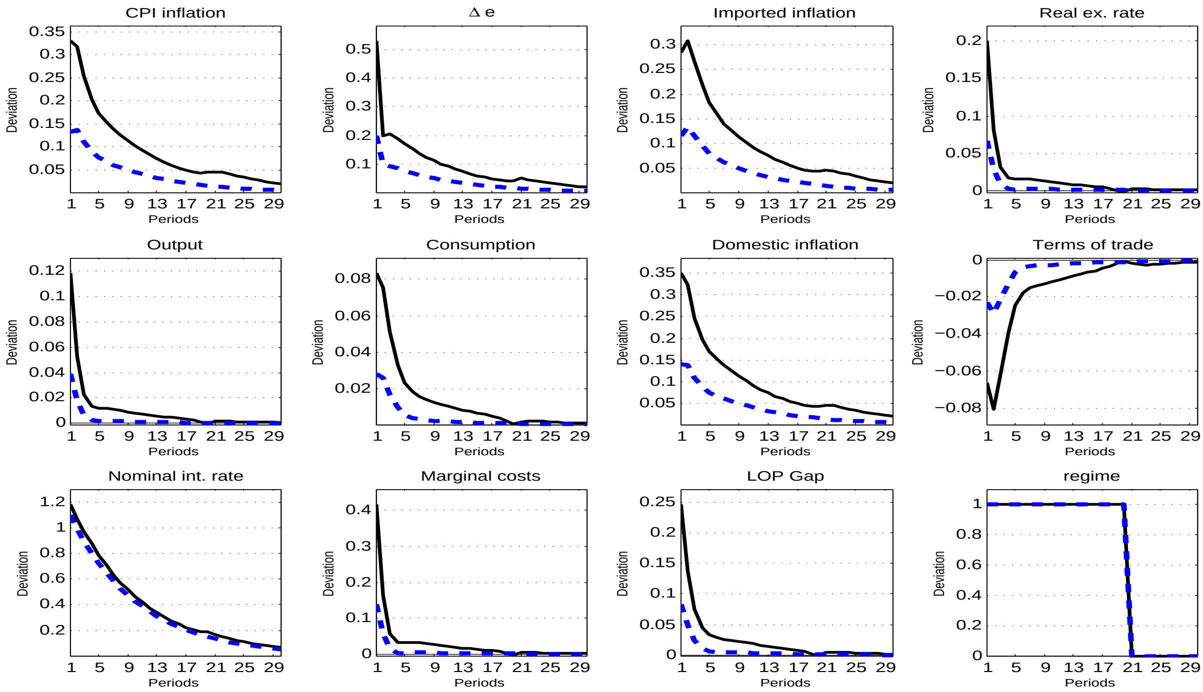


Figure C.4: $IT2 \rightarrow ET3$ **(solid),** $IT2 \rightarrow ET10$ ***(dashed) - resp.to policy shock*** ε^m

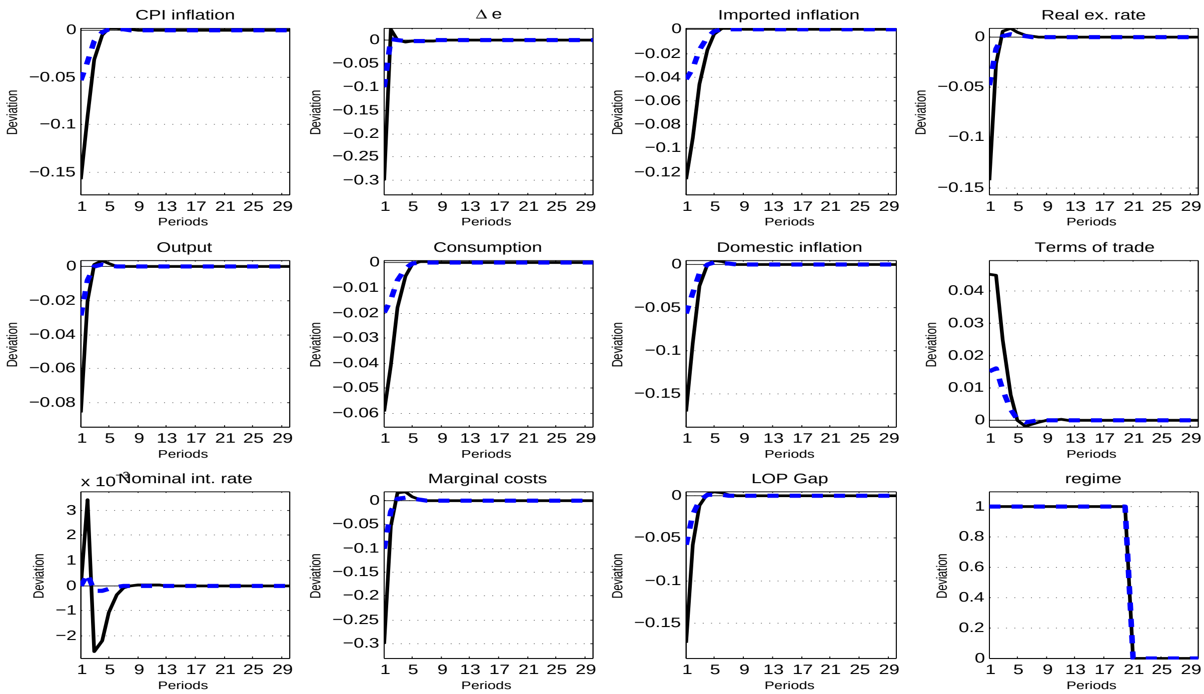


Figure C.5: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to foreign inflation*** ε^{π}

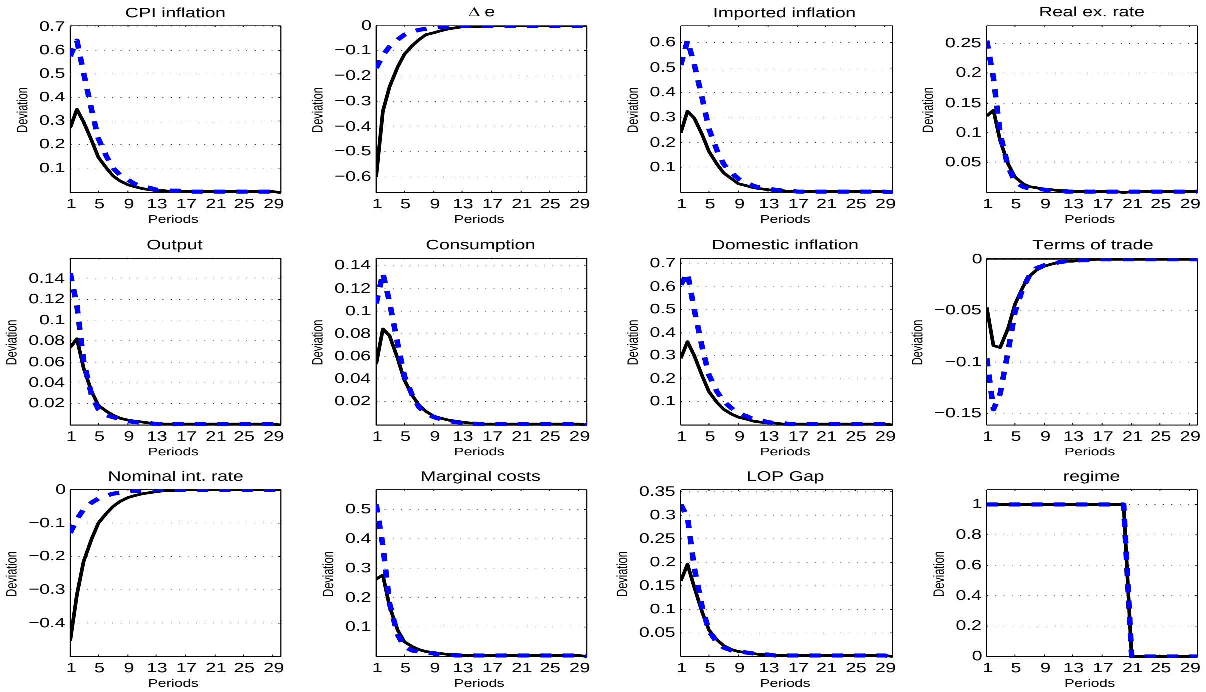


Figure C.6: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to foreign output*** ε^{y}

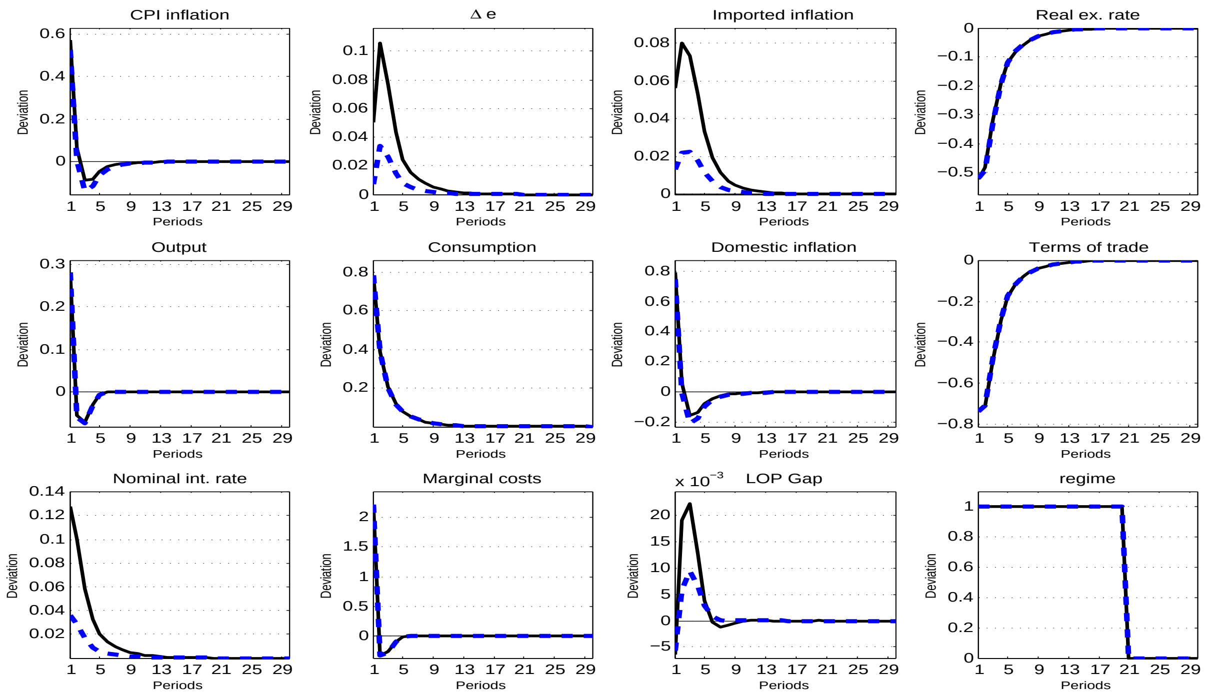
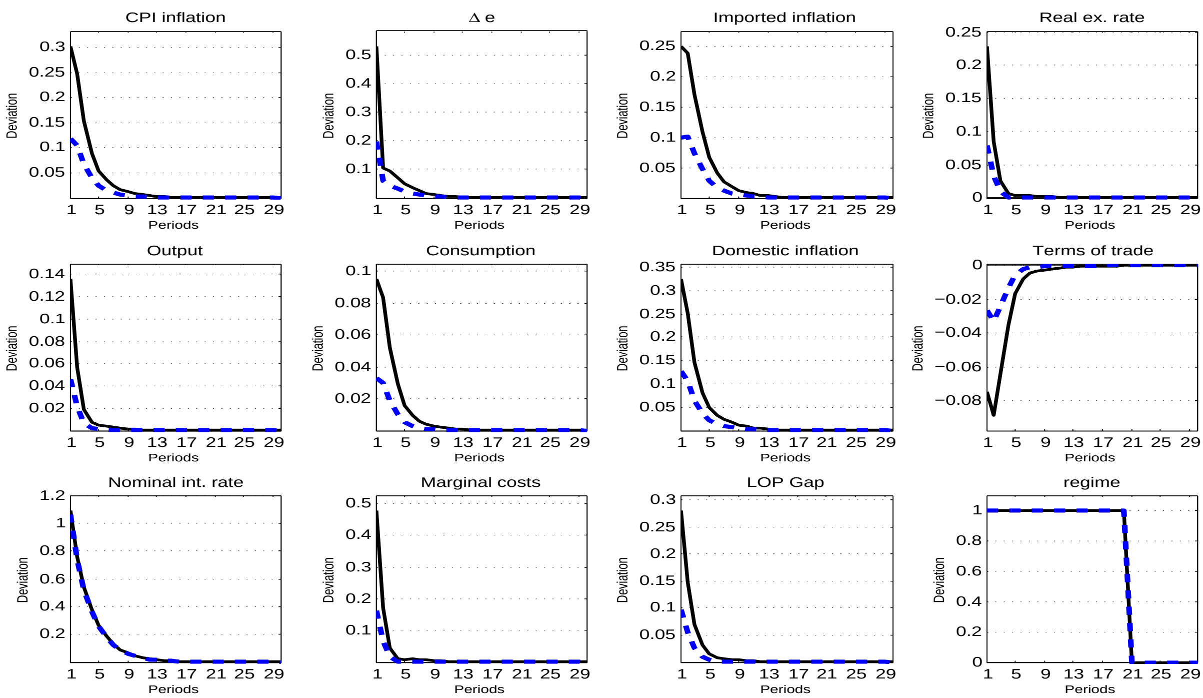


Figure C.7: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to foreign int. rate*** ε^i



D. IRF: Regime change in 8 periods - for $IT2$

Figure D.1: *$IT2 \rightarrow ET3$ (solid), $IT2 \rightarrow ET10$ (dashed) - resp.to technology shock ε^a*

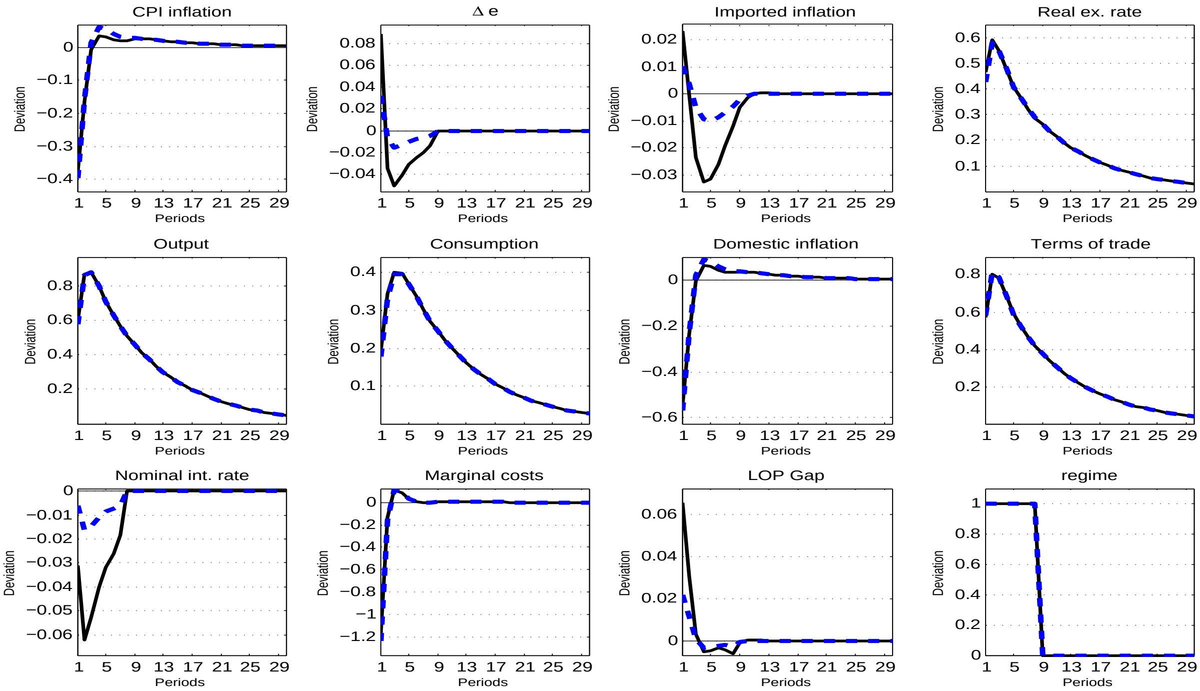


Figure D.2: *$IT2 \rightarrow ET3$ (solid), $IT2 \rightarrow ET10$ (dashed) - resp.to preference shock ε^g*

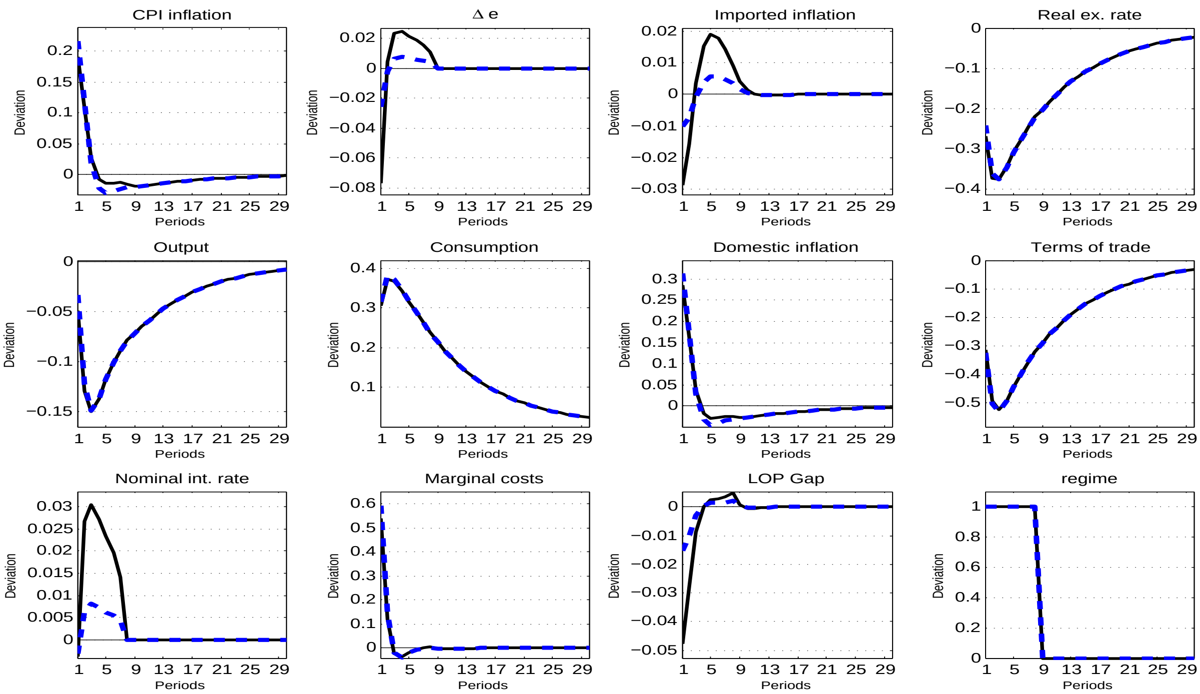


Figure D.3: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to risk prem. shock*** ε^s

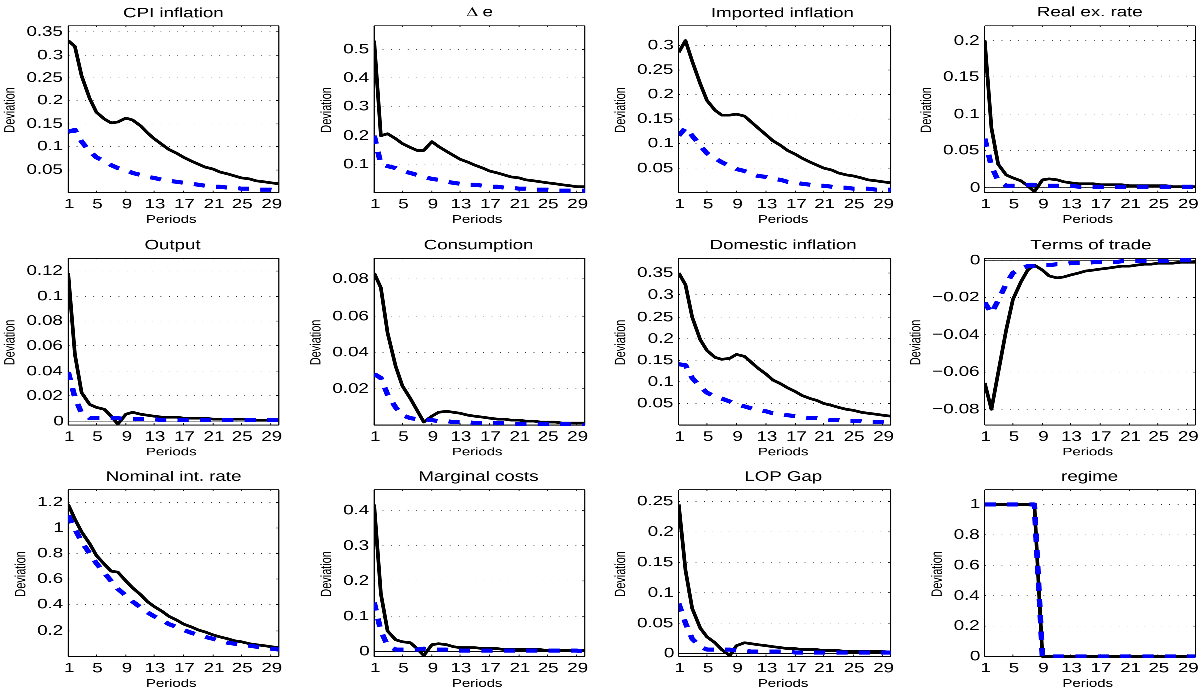


Figure D.4: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to policy shock*** ε^m

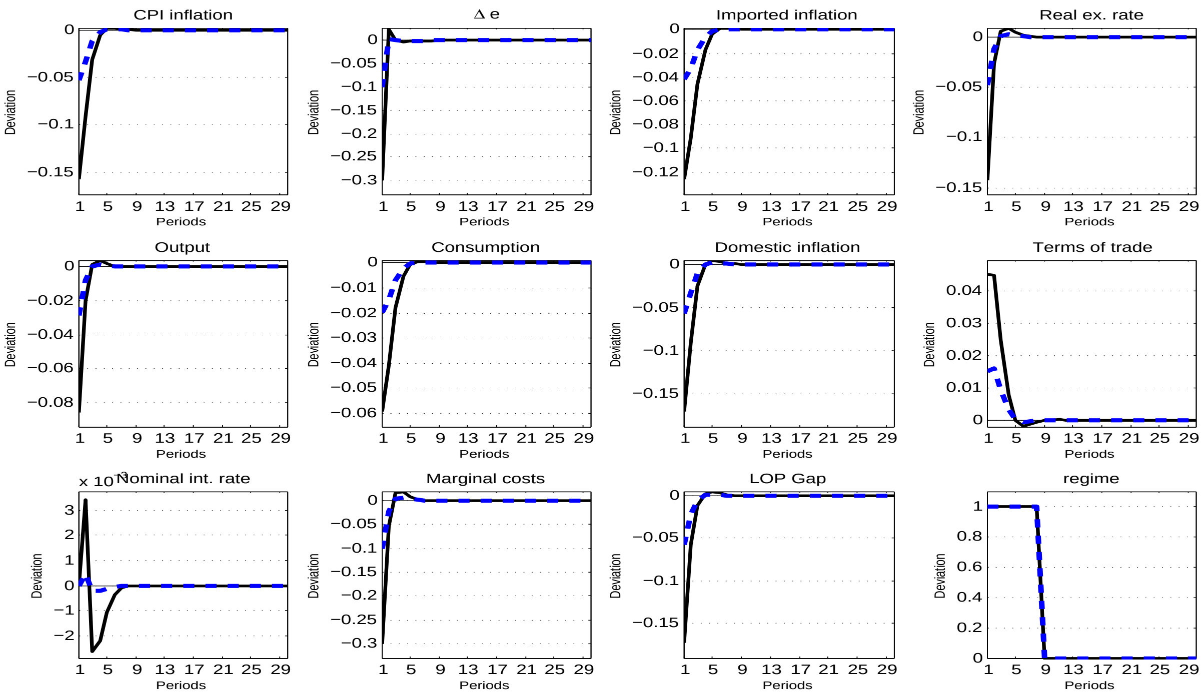


Figure D.5: $IT2 \rightarrow ET3$ **(*solid*),** $IT2 \rightarrow ET10$ **(*dashed*) - *resp.to foreign inflation*** ε^{π}

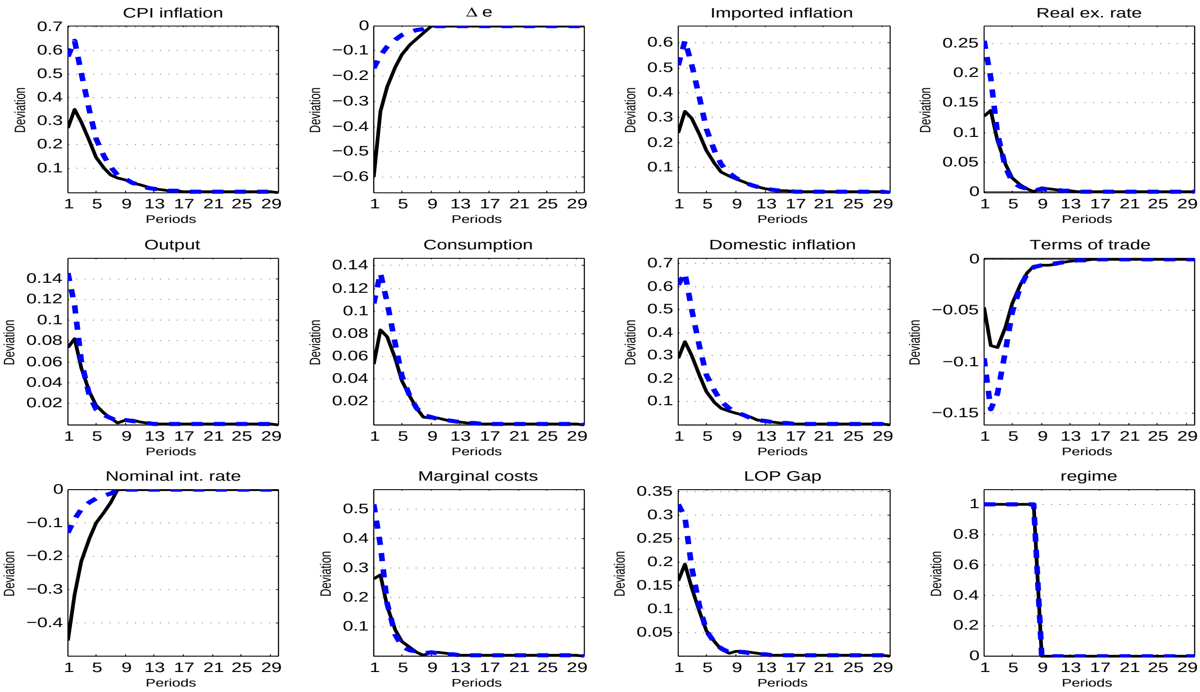


Figure D.6: $IT2 \rightarrow ET3$ **(*solid*),** $IT2 \rightarrow ET10$ **(*dashed*) - *resp.to foreign output*** ε^{y}

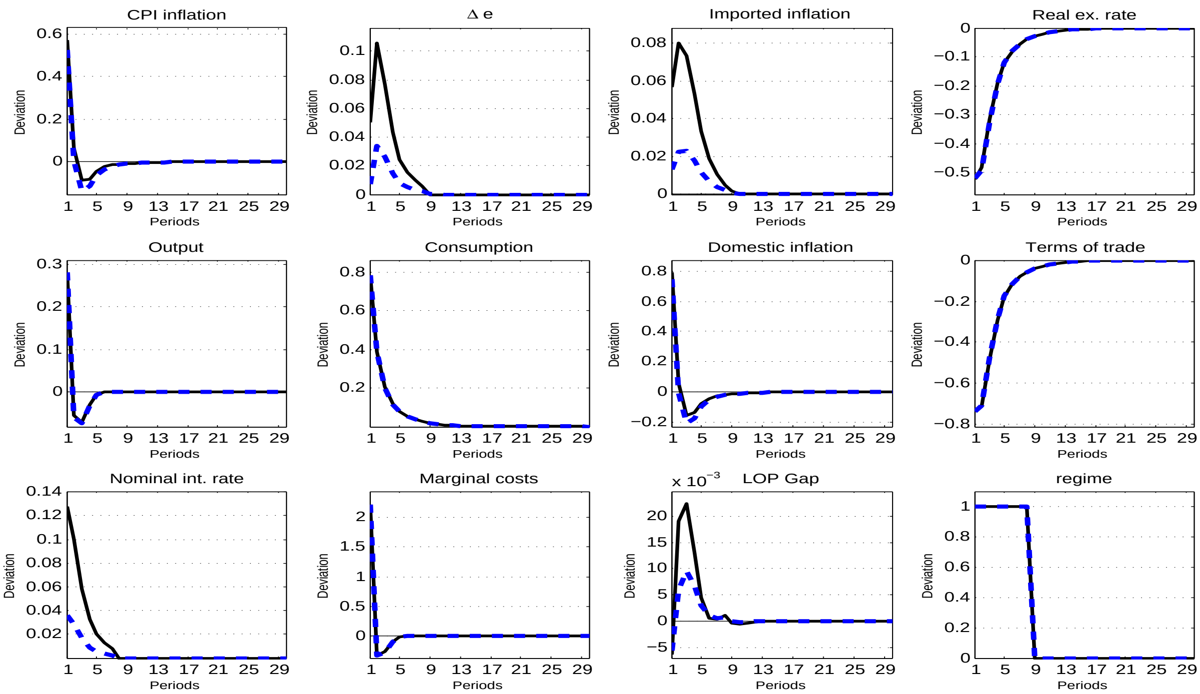
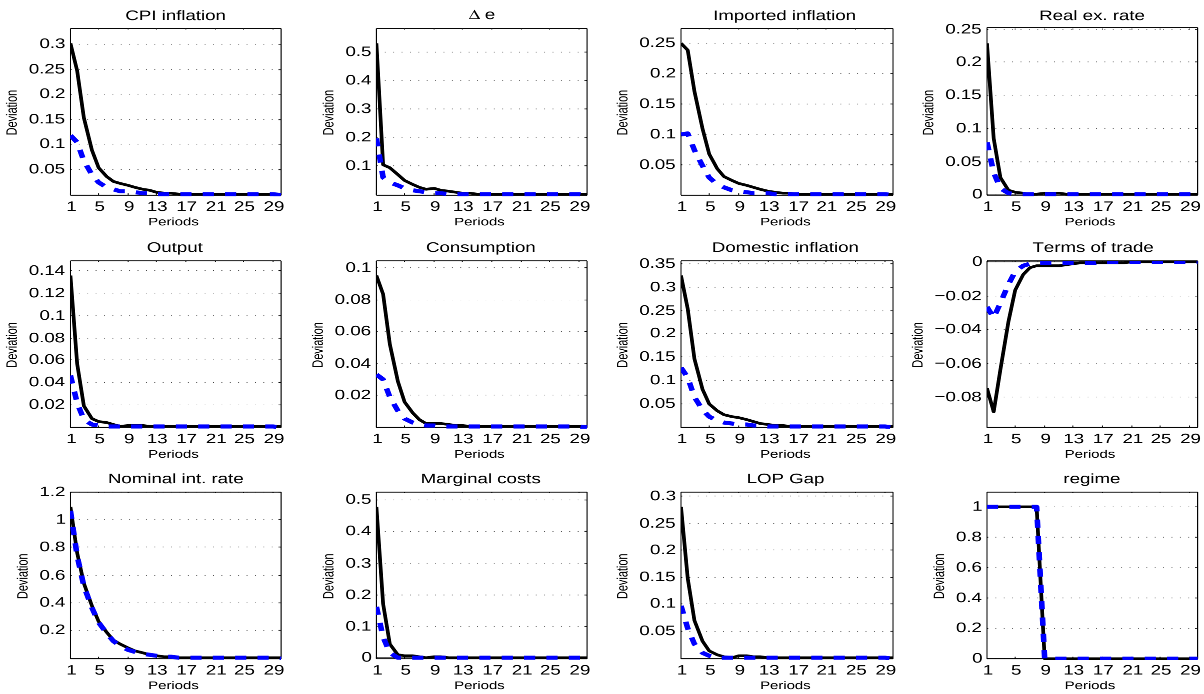


Figure D.7: $IT2 \rightarrow ET3$ ***(solid),*** $IT2 \rightarrow ET10$ ***(dashed) - resp.to foreign int. rate*** ε^{i}



E. IRF: Regime change in 20 periods - for $ET1$

Figure E.1: ET1 $\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to technolog. shock*** ε^a

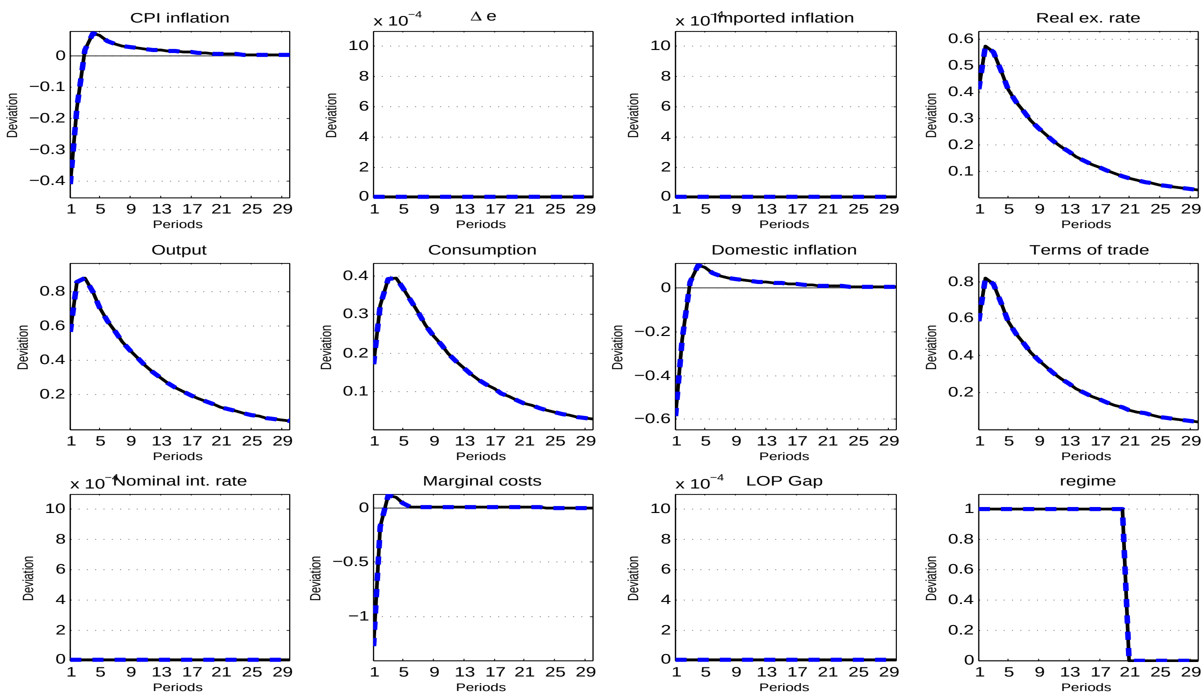


Figure E.2: ET1 $\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to preference shock*** ε^g

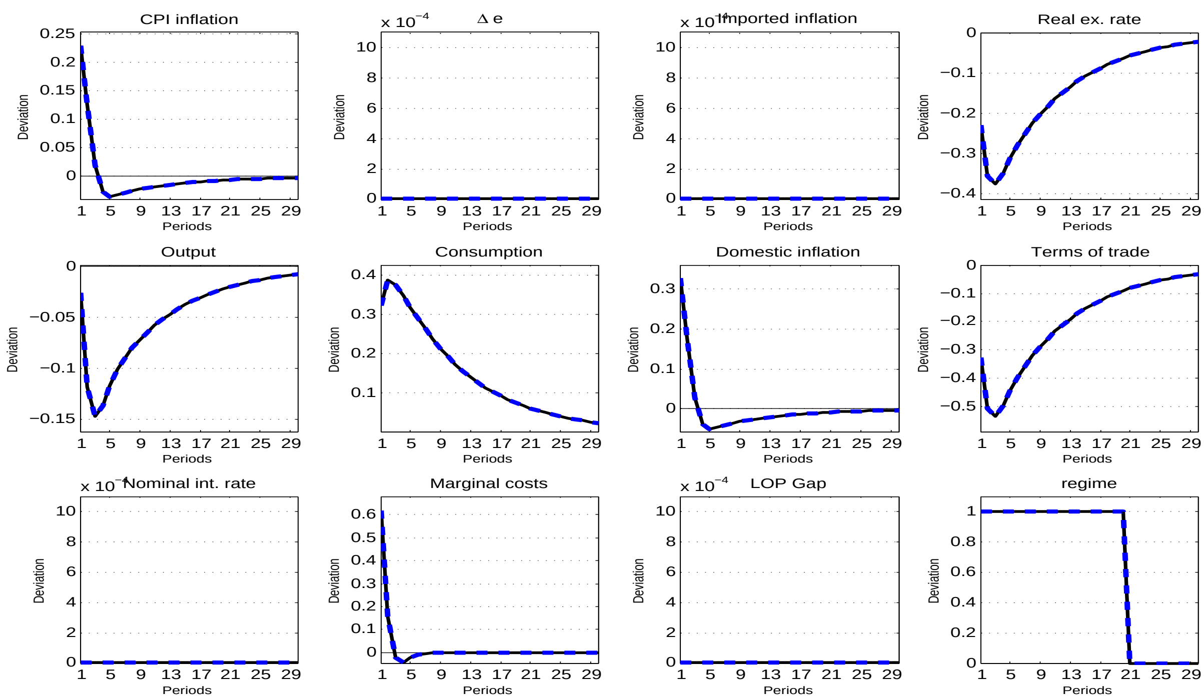


Figure E.3: ET1$\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to risk prem. shock*** ε^s

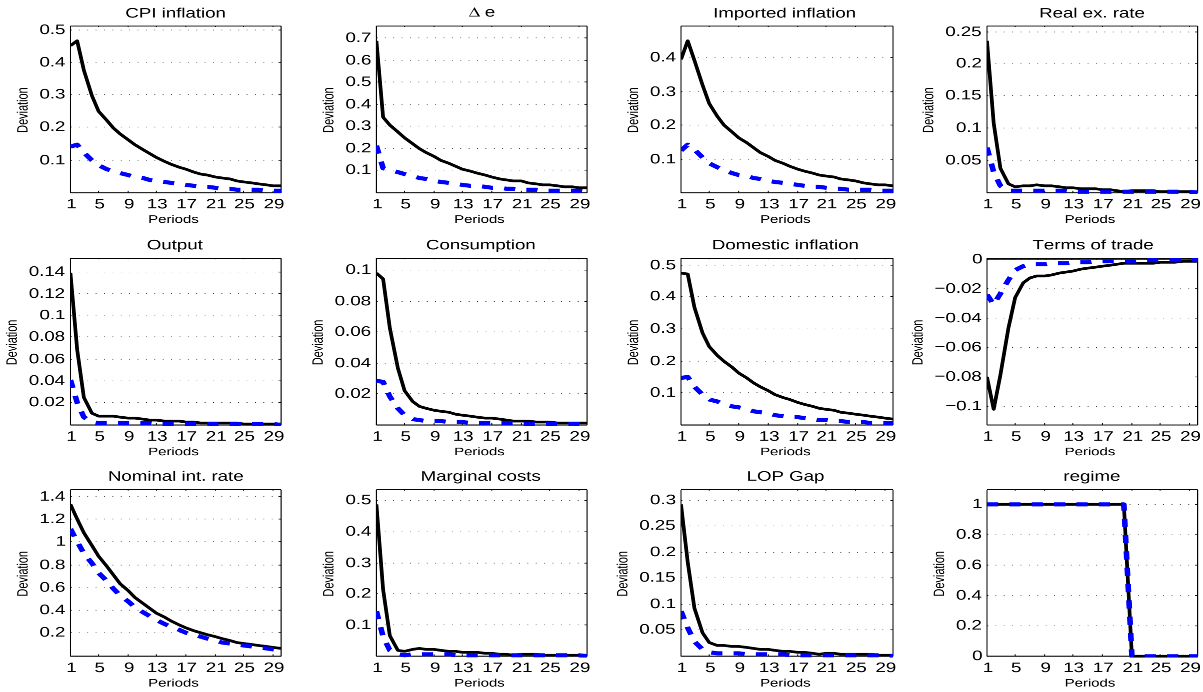


Figure E.4: ET1$\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to policy shock*** ε^m

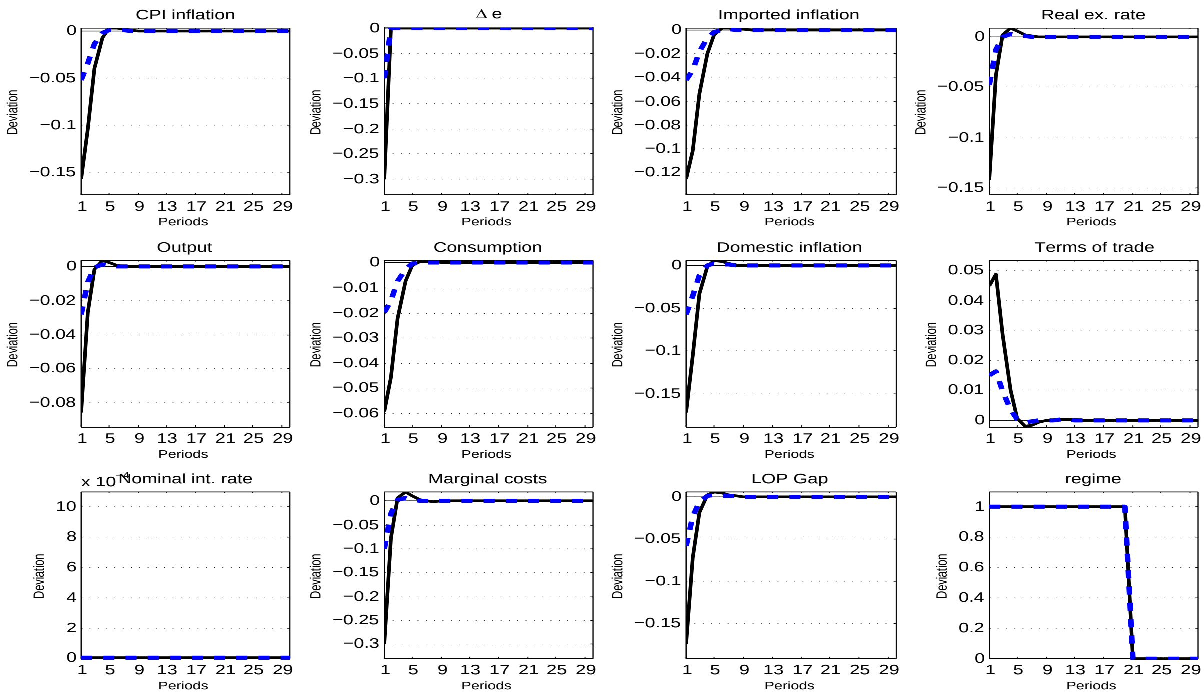


Figure E.5: ET1$\rightarrow ET3$ **(solid),** $ET1 \rightarrow ET10$ **(dashed) - resp.to foreign inflation** ε^{π}

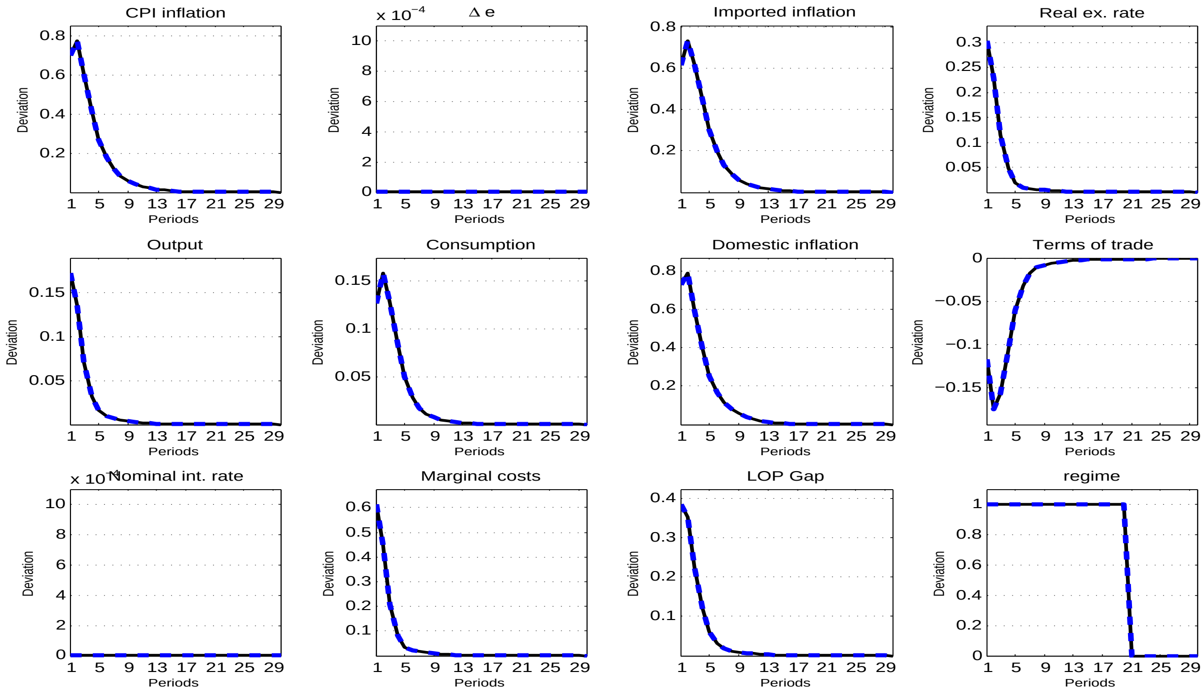


Figure E.6: ET1$\rightarrow ET3$ **(solid),** $ET1 \rightarrow ET10$ **(dashed) - resp.to foreign output** ε^{y}

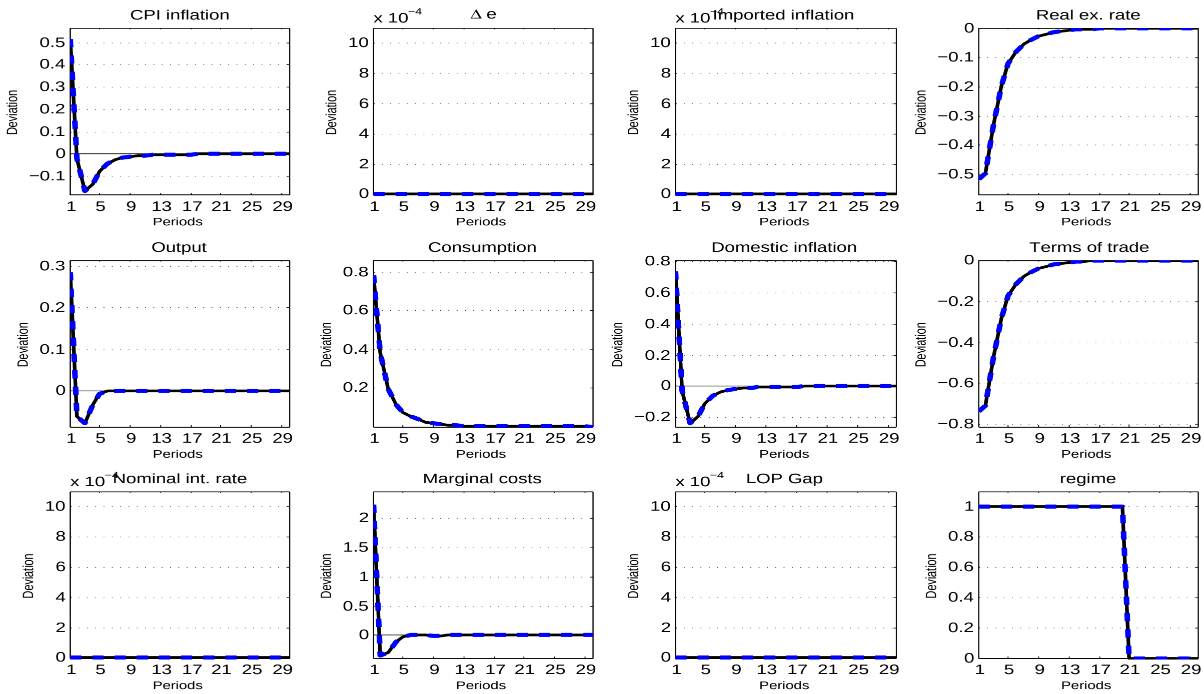
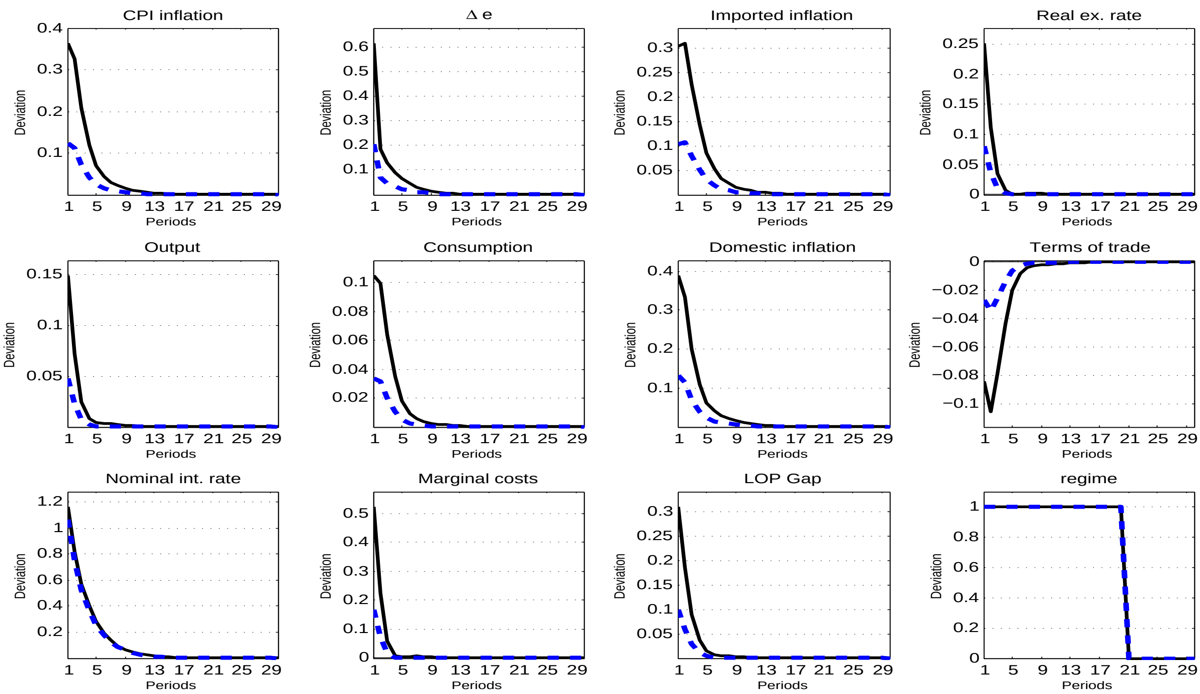


Figure E.7: ET1$\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to foreign int. rate*** ε^i



F. IRF: Regime change in 8 periods - for $ET1$

Figure F.1: ET1 $\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to technolog. shock*** ε^a

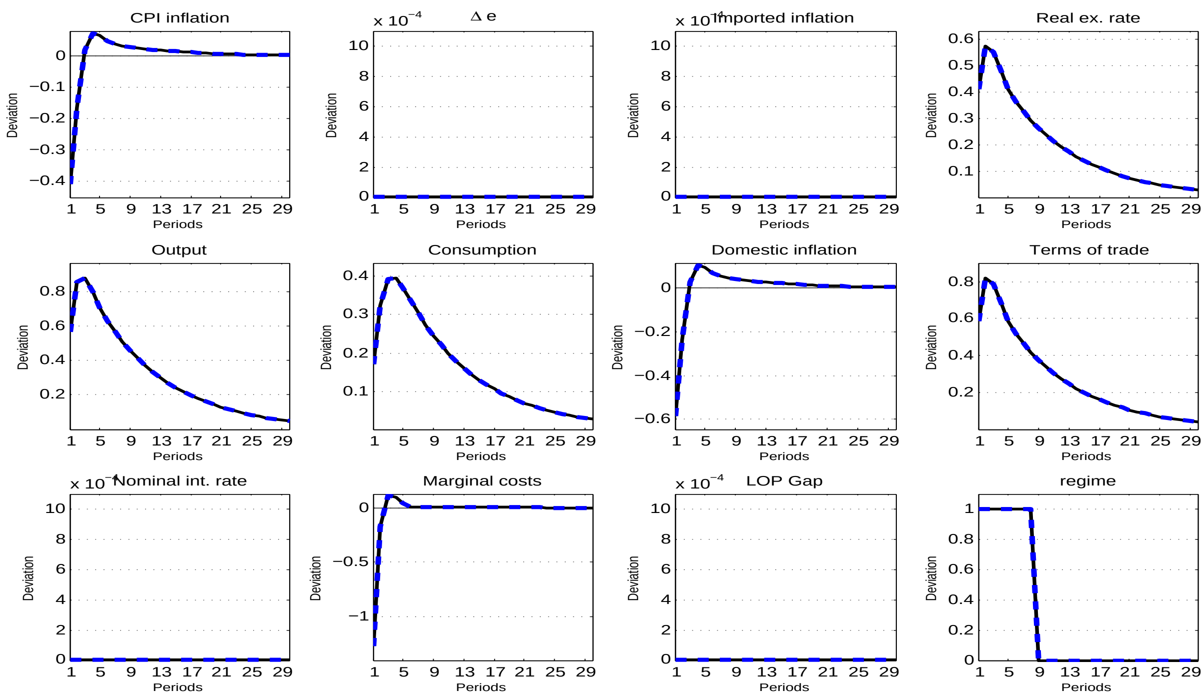


Figure F.2: ET1 $\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to preference shock*** ε^g

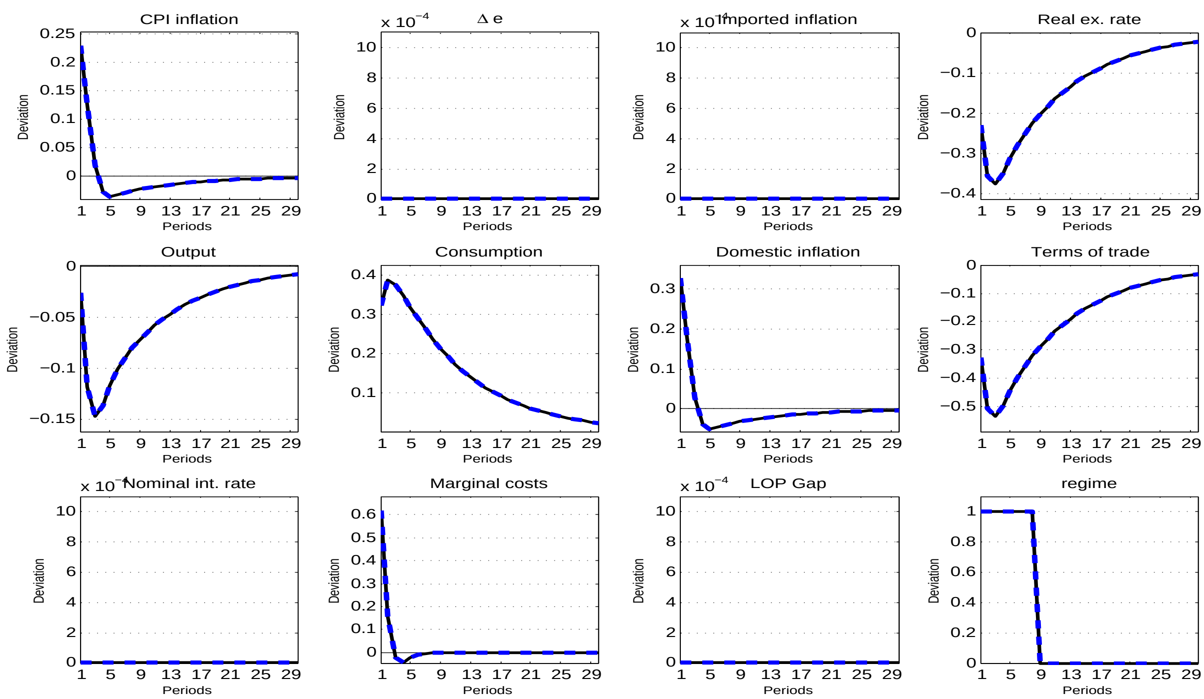


Figure F.3: ET1→ $ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to risk prem. shock*** ε^s

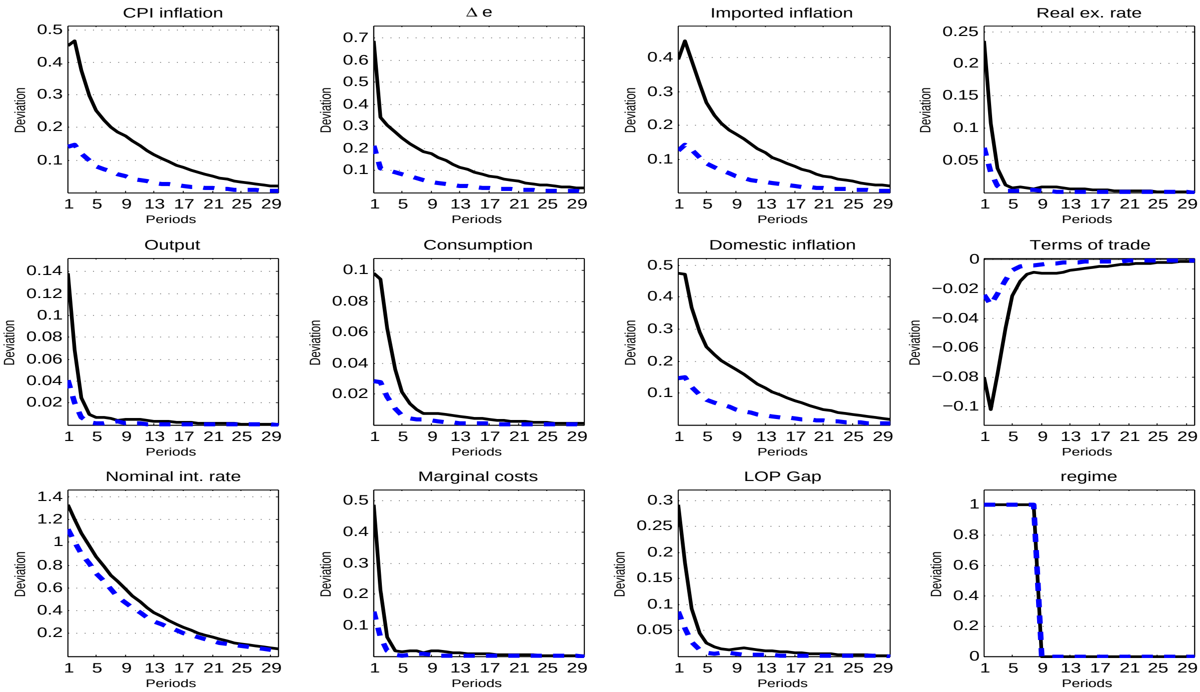


Figure F.4: ET1→ $ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to policy shock*** ε^m

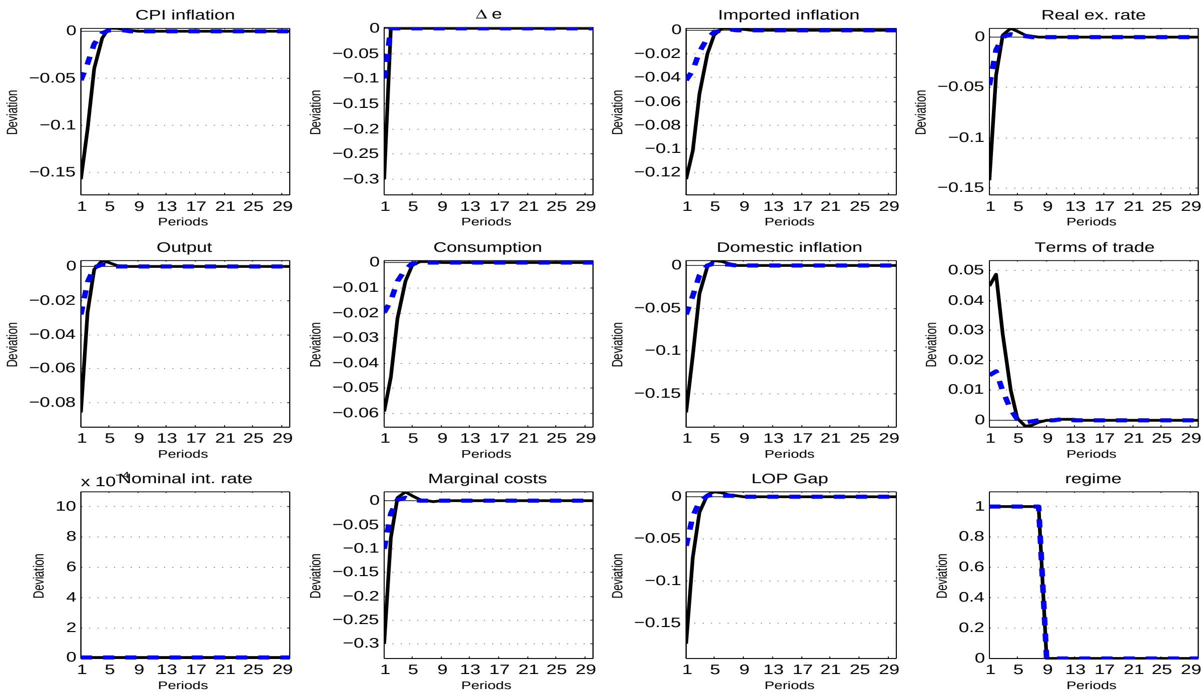


Figure F.5: ET1$\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to foreign inflation*** ε^{π}

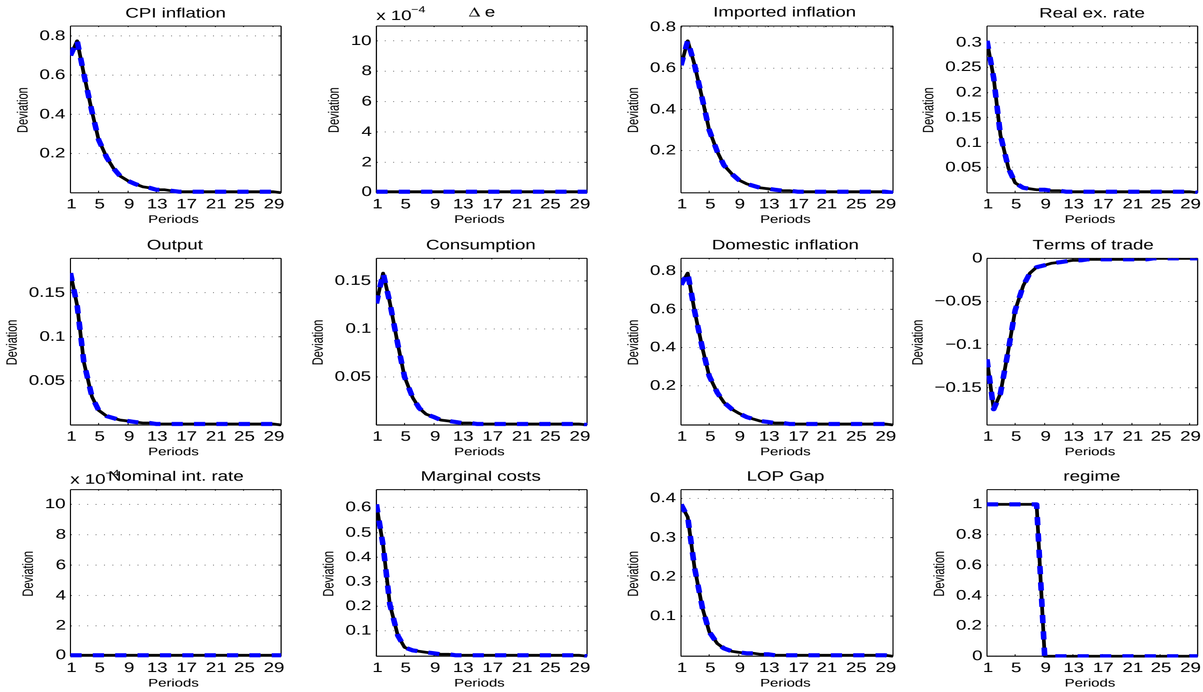


Figure F.6: ET1$\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to foreign output*** ε^{y}

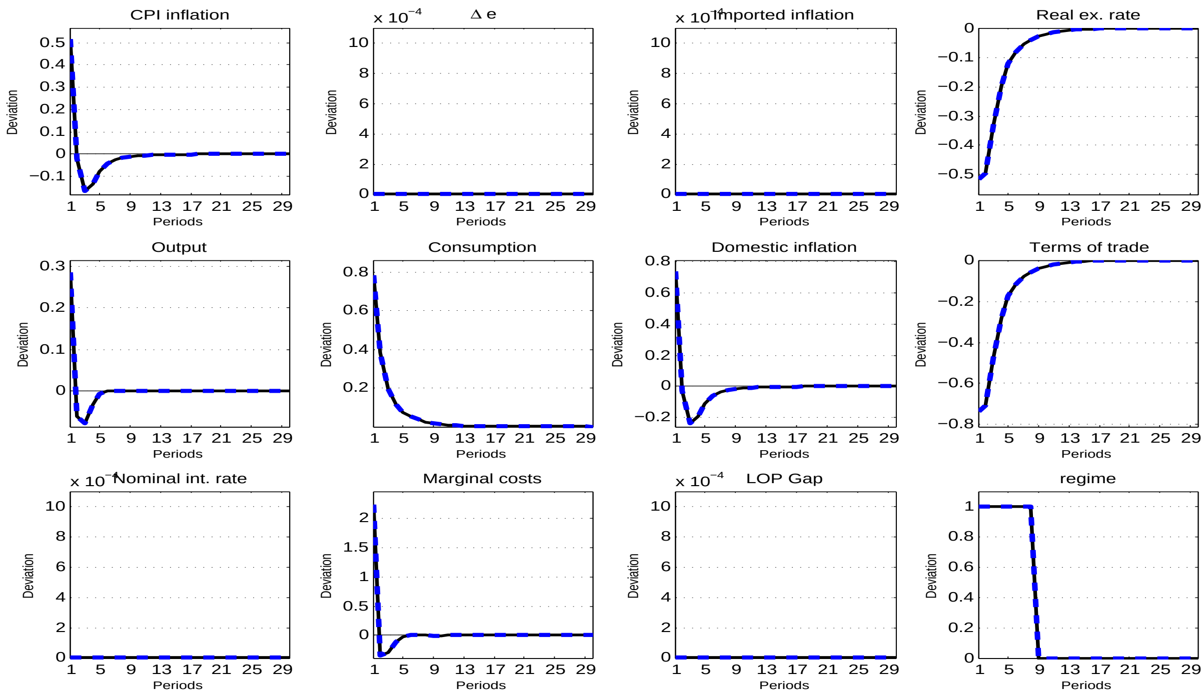
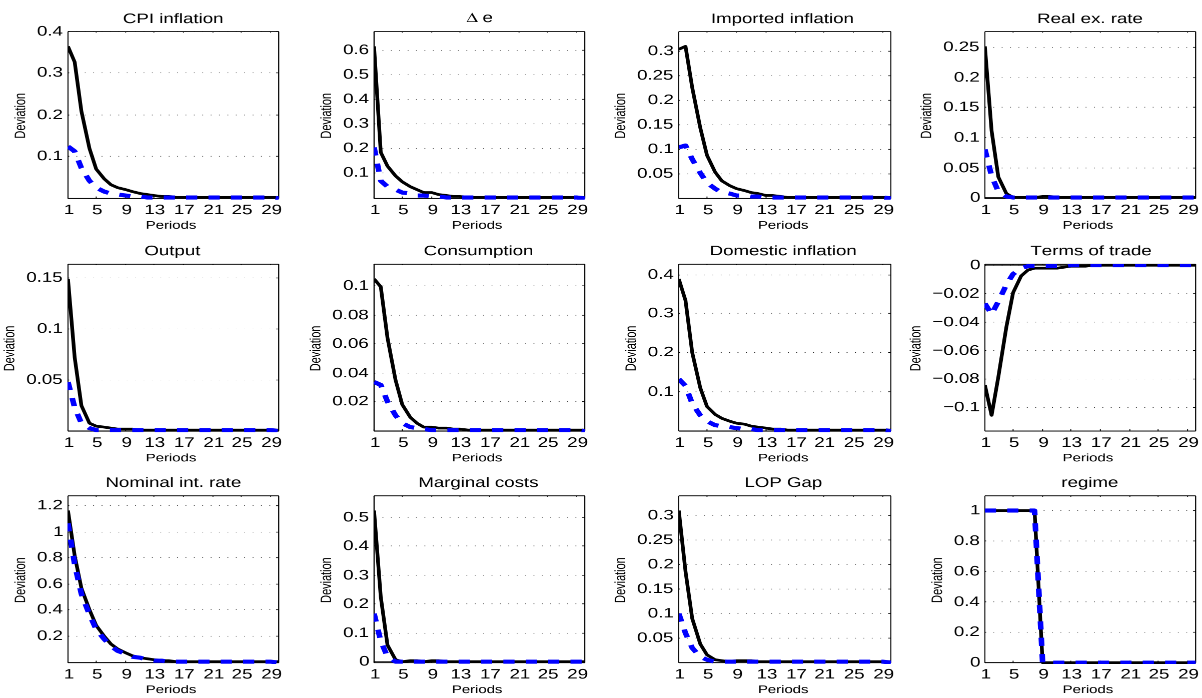


Figure F.7: ET1 $\rightarrow ET3$ ***(solid),*** $ET1 \rightarrow ET10$ ***(dashed) - resp.to foreign int. rate*** ε^{i}



G. Std.err: Regime change in 8 and 20 periods

Figure G.1: Std.errors: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 20 periods)***

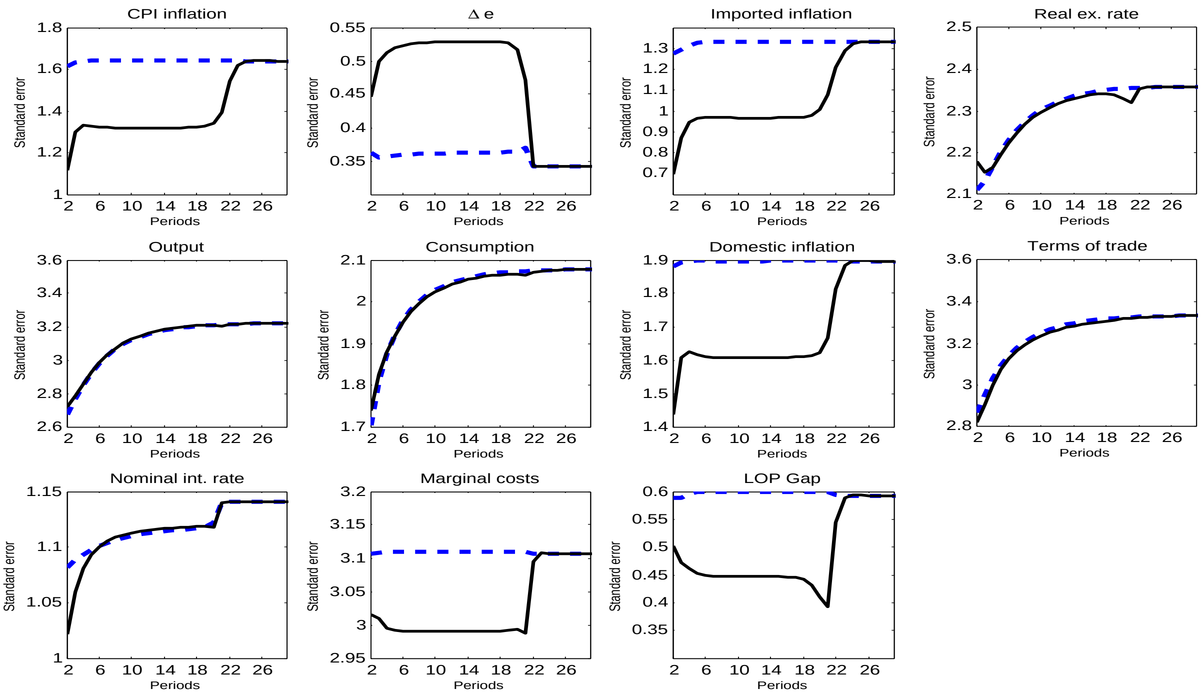


Figure G.2: Std.errors: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 8 periods)***

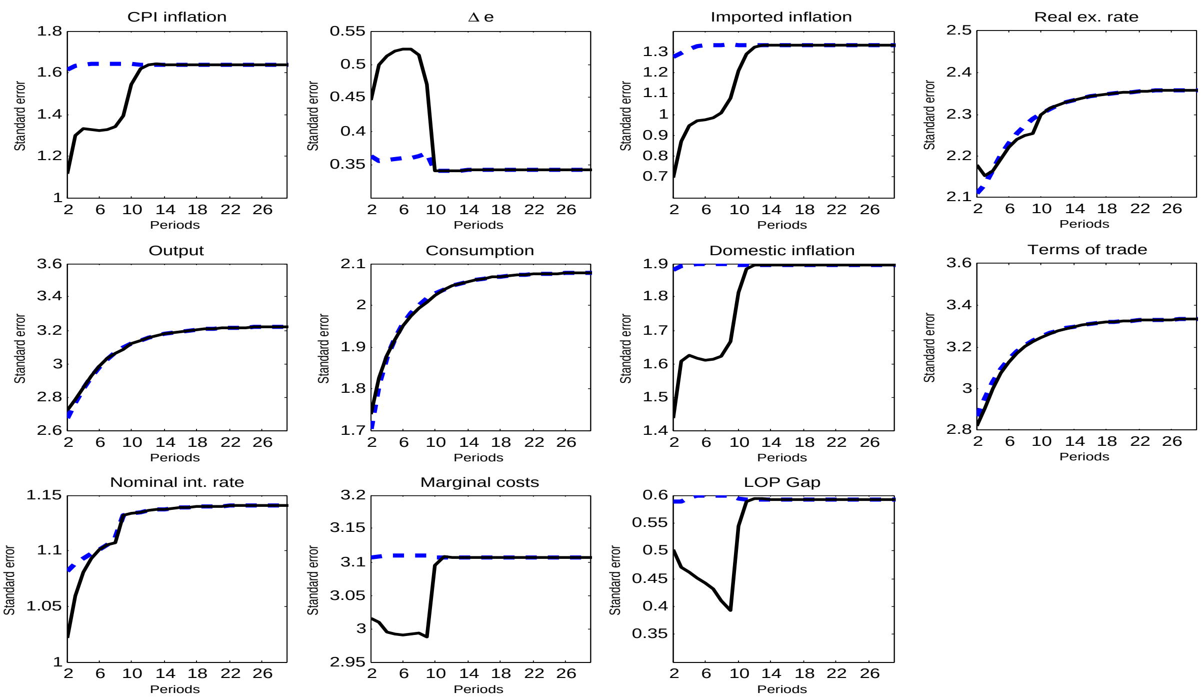


Figure G.3: Std.errors: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow ET10$ ***(after 20 periods)***

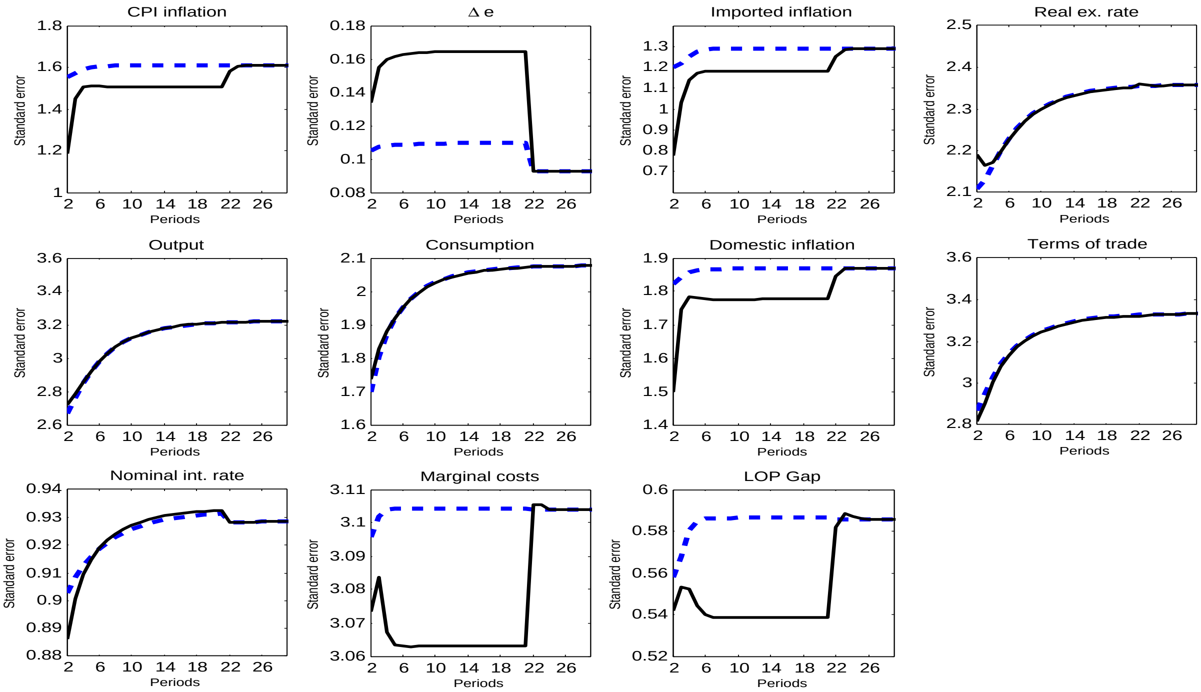
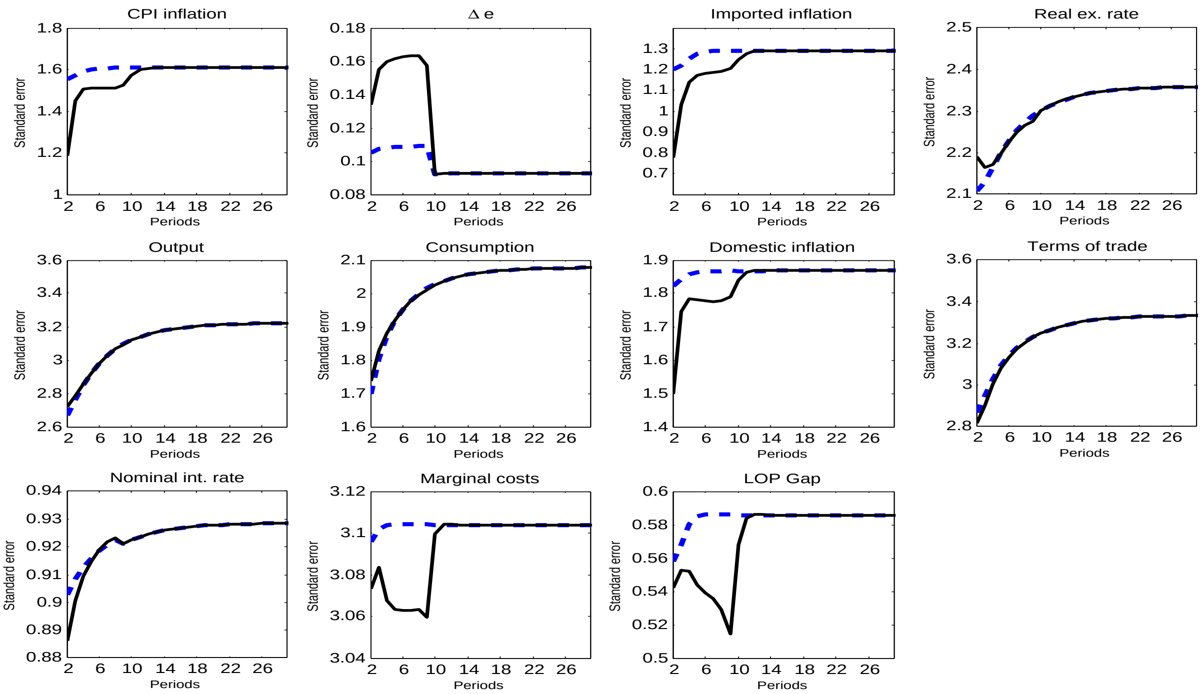


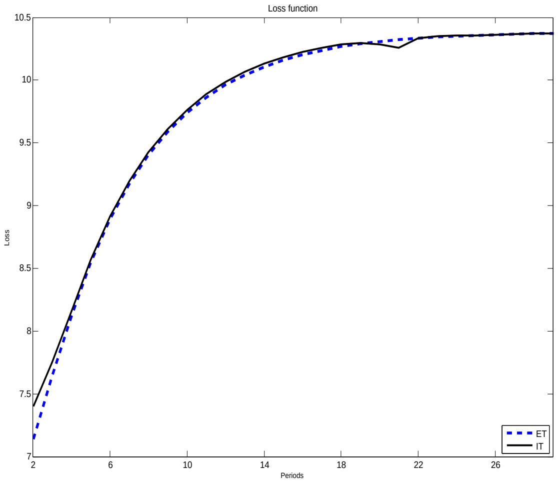
Figure G.4: Std.errors: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow ET10$ ***(after 8 periods)***



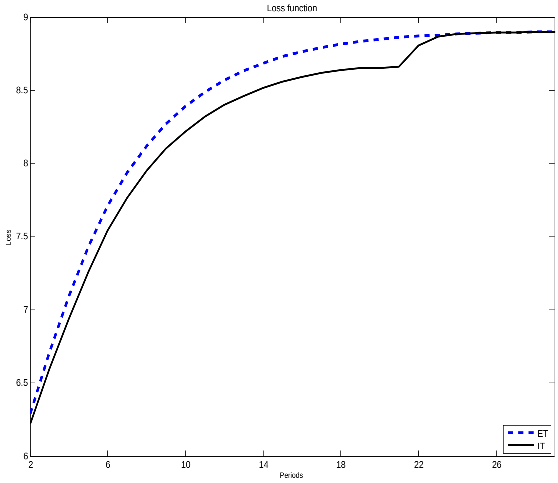
H. Loss functions: Change to $ET3$ in 20 periods

Table H.1: Loss1: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 20 periods)***

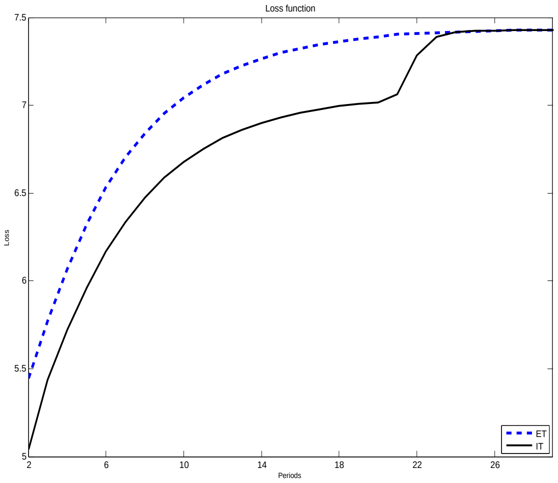
$\lambda = 0.0$



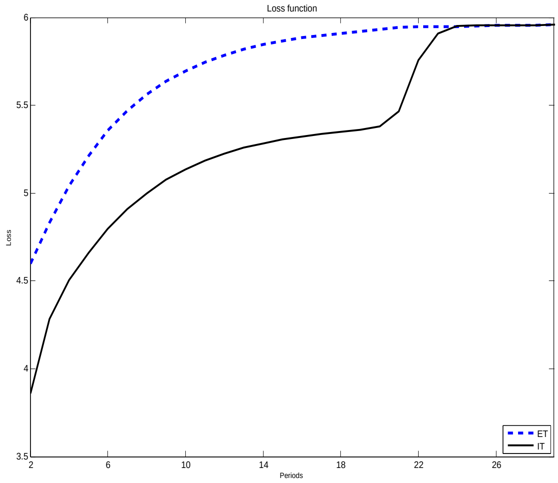
$\lambda = 0.2$



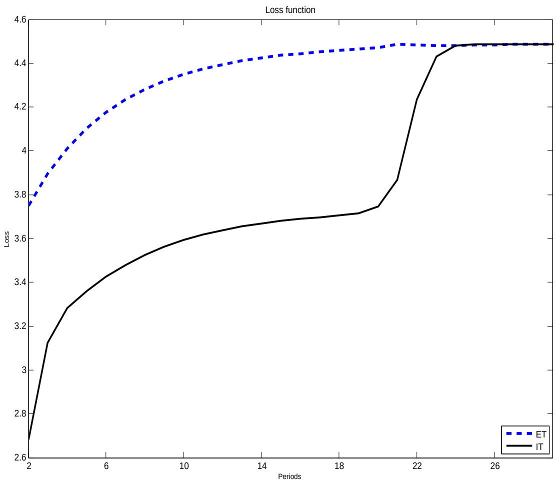
$\lambda = 0.4$



$\lambda = 0.6$



$\lambda = 0.8$



$\lambda = 1.0$

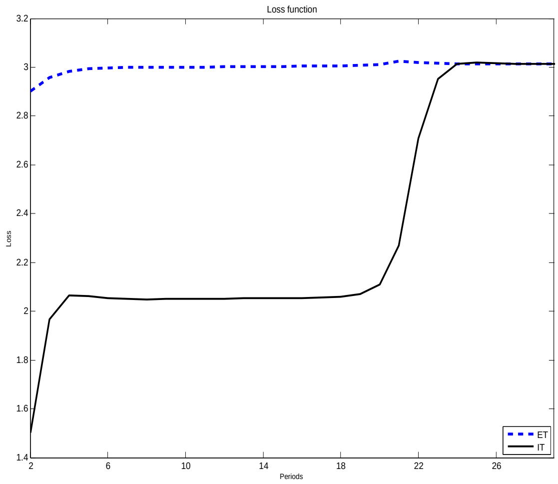


Figure H.1: Loss2: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 20 periods)***

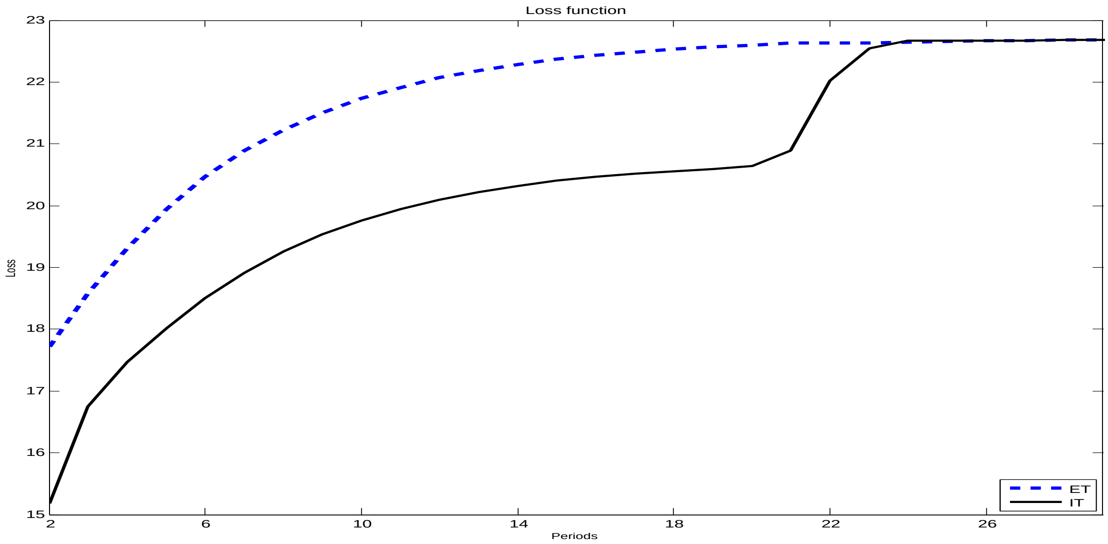
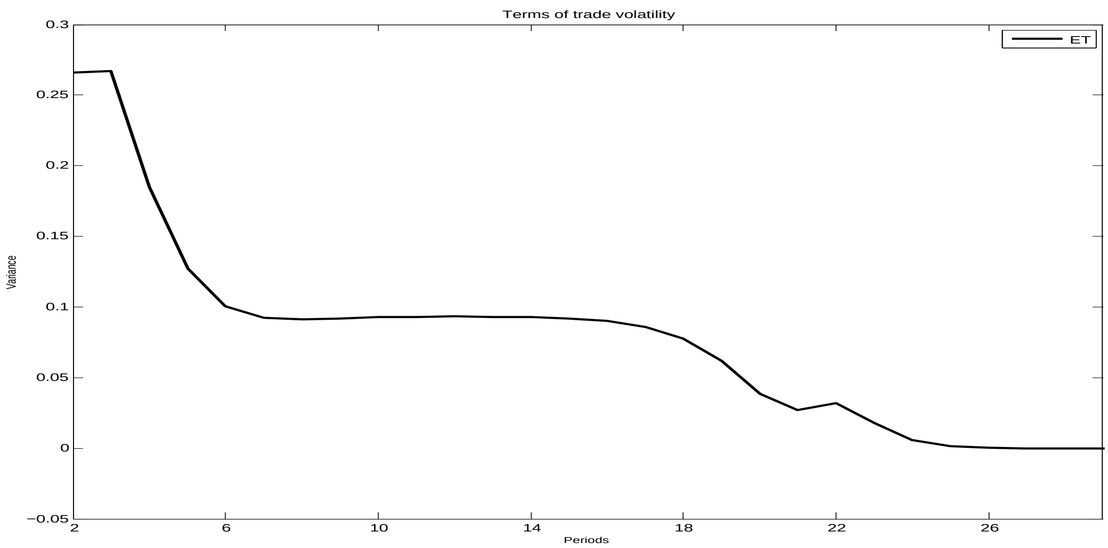


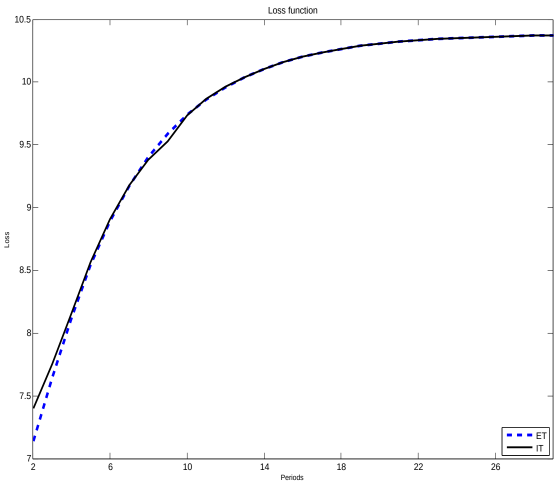
Figure H.2: Terms of trade variance: Difference from IT



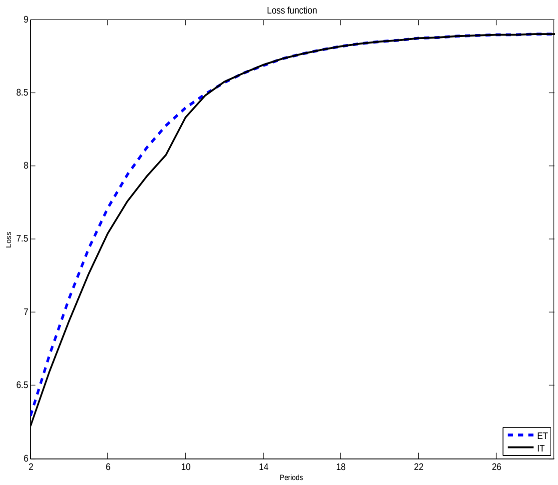
I. Loss functions: Change to $ET3$ after 8 periods

Table I.1: Loss1: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 8 periods)***

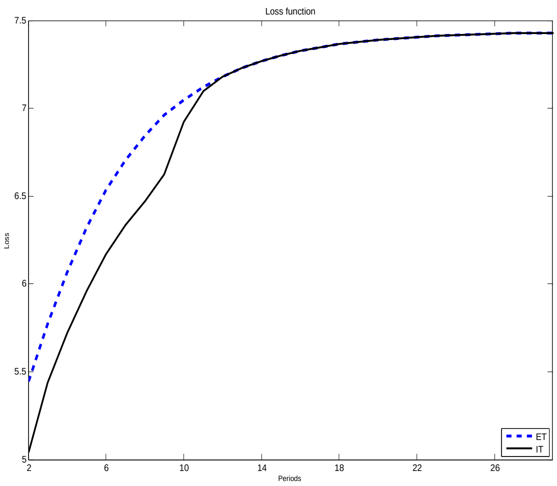
$\lambda = 0.0$



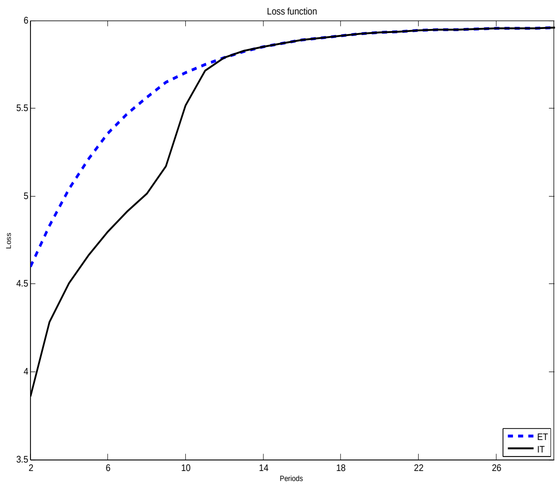
$\lambda = 0.2$



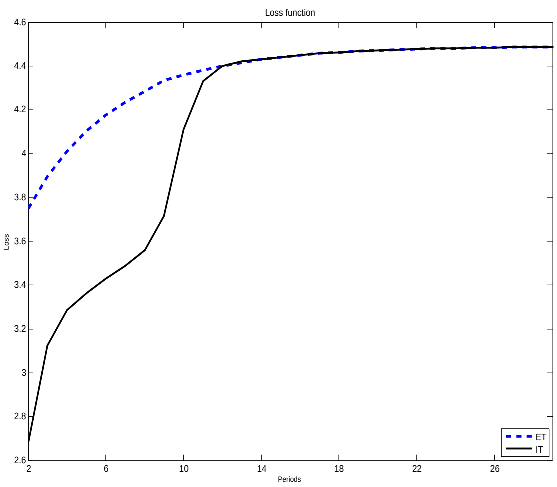
$\lambda = 0.4$



$\lambda = 0.6$



$\lambda = 0.8$



$\lambda = 1.0$

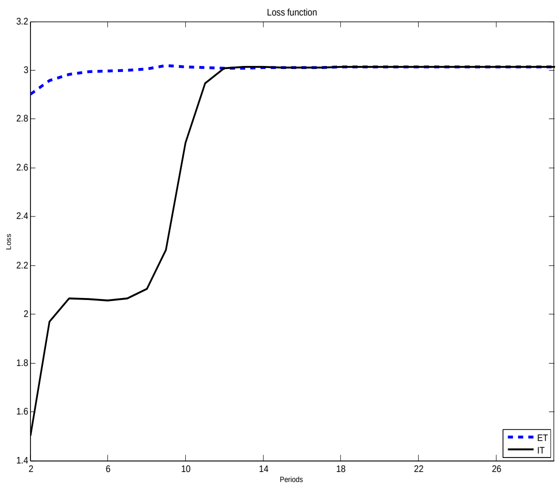


Figure I.1: Loss2: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$ $ET3$ ***(after 8 periods)***

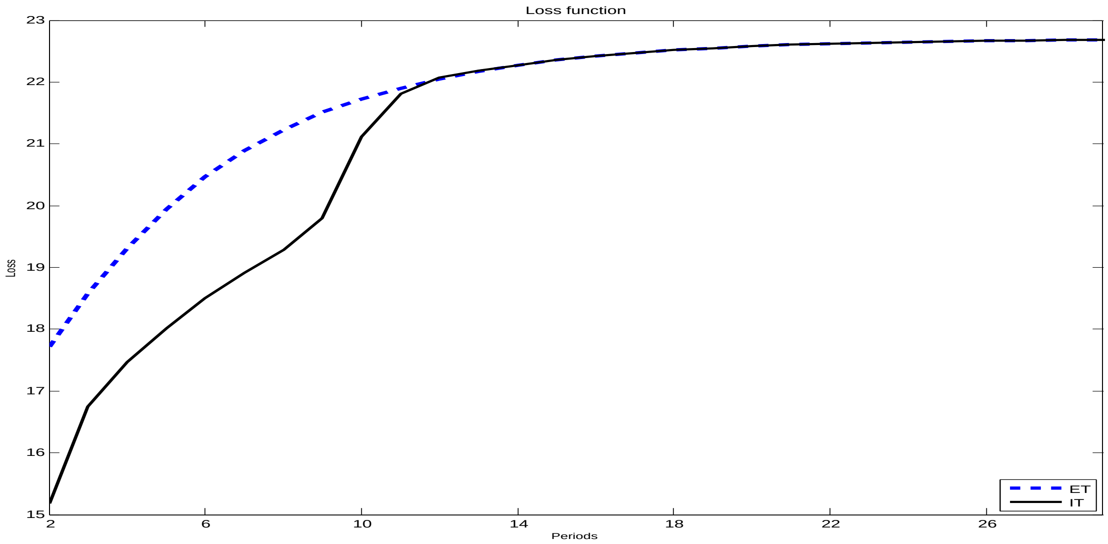
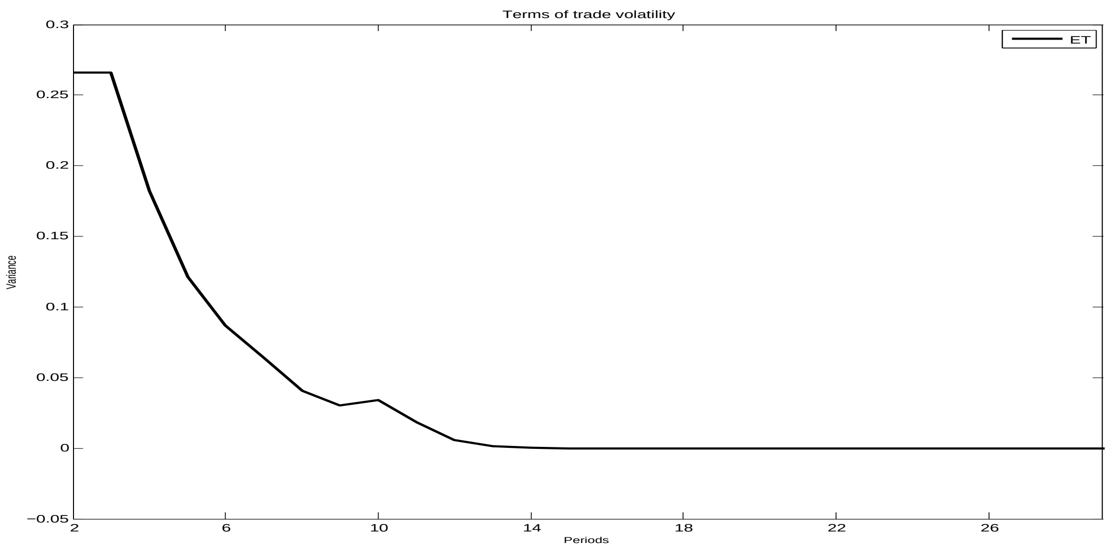


Figure I.2: Terms of trade variance: Difference from IT



J. Loss functions: Change to $ET10$ after 20 periods

Table J.1: Loss1: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow$$ET10$ ***(after 20 periods)***

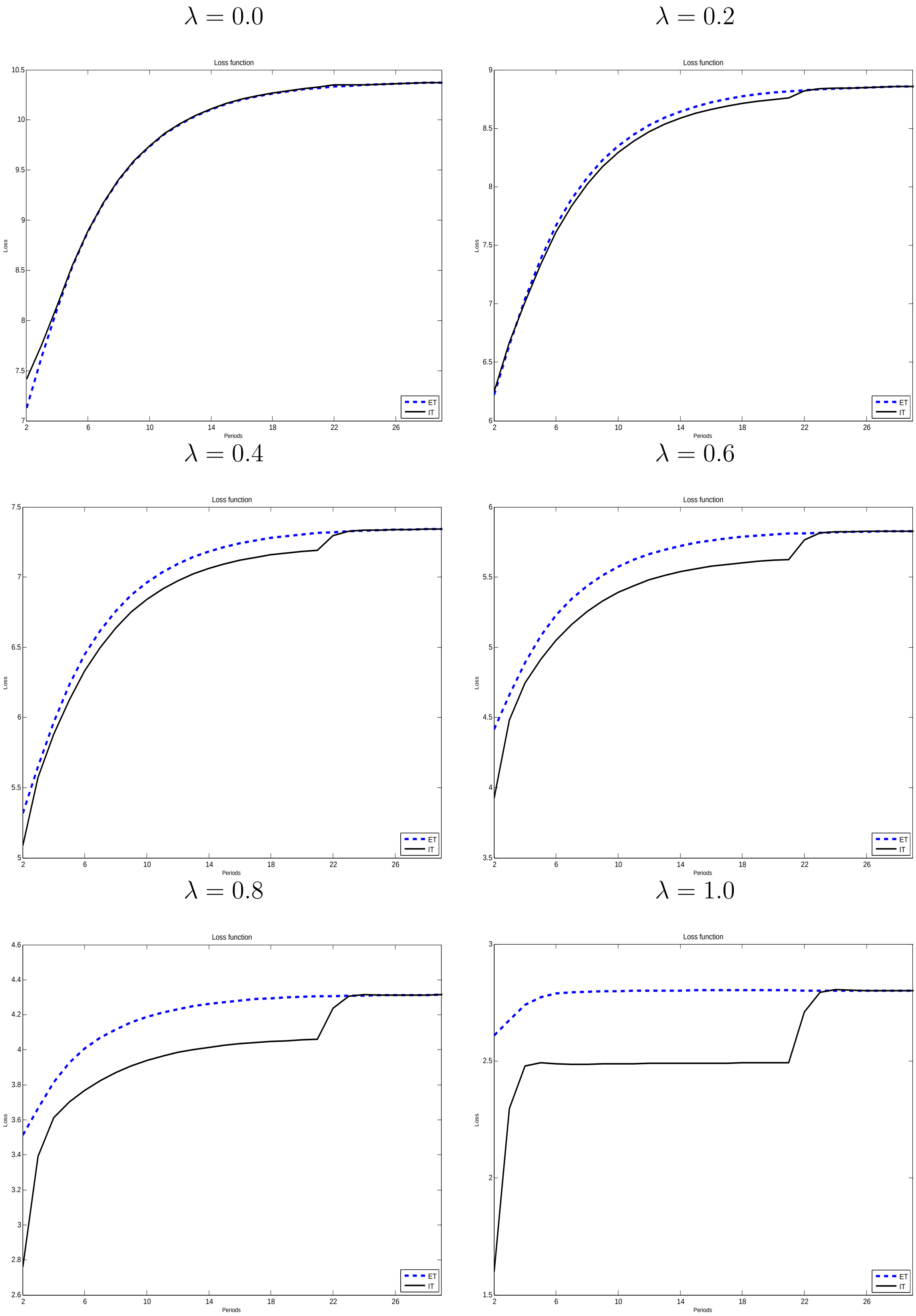


Figure J.1: Loss2: $IT2$ ***(solid),*** $ET1$ ***(dashed)***$\rightarrow ET10$ ***(after 20 periods)***

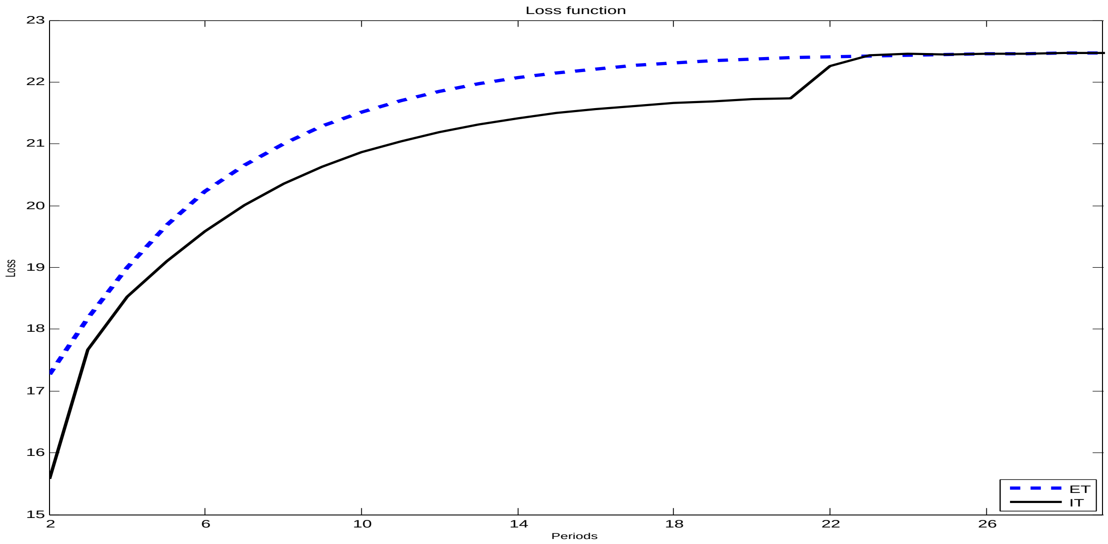
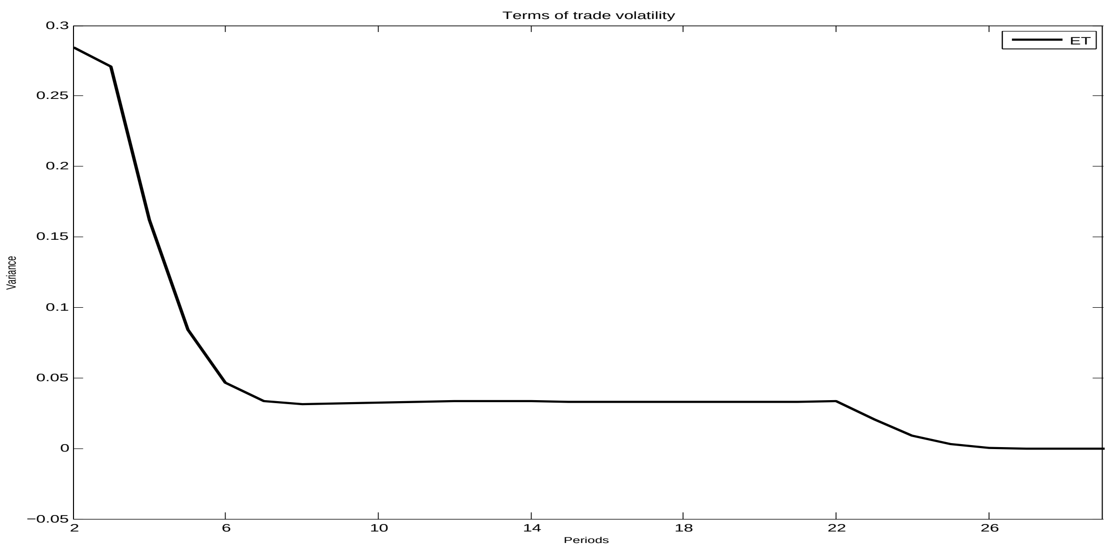


Figure J.2: Terms of trade variance: Difference from IT



K. Loss functions: Change to $ET10$ after 8 periods

Table K.1: Loss1: $IT2$ ***(solid),*** $ET1$ ***(dashed)→***$ET10$ ***(after 8 periods)***

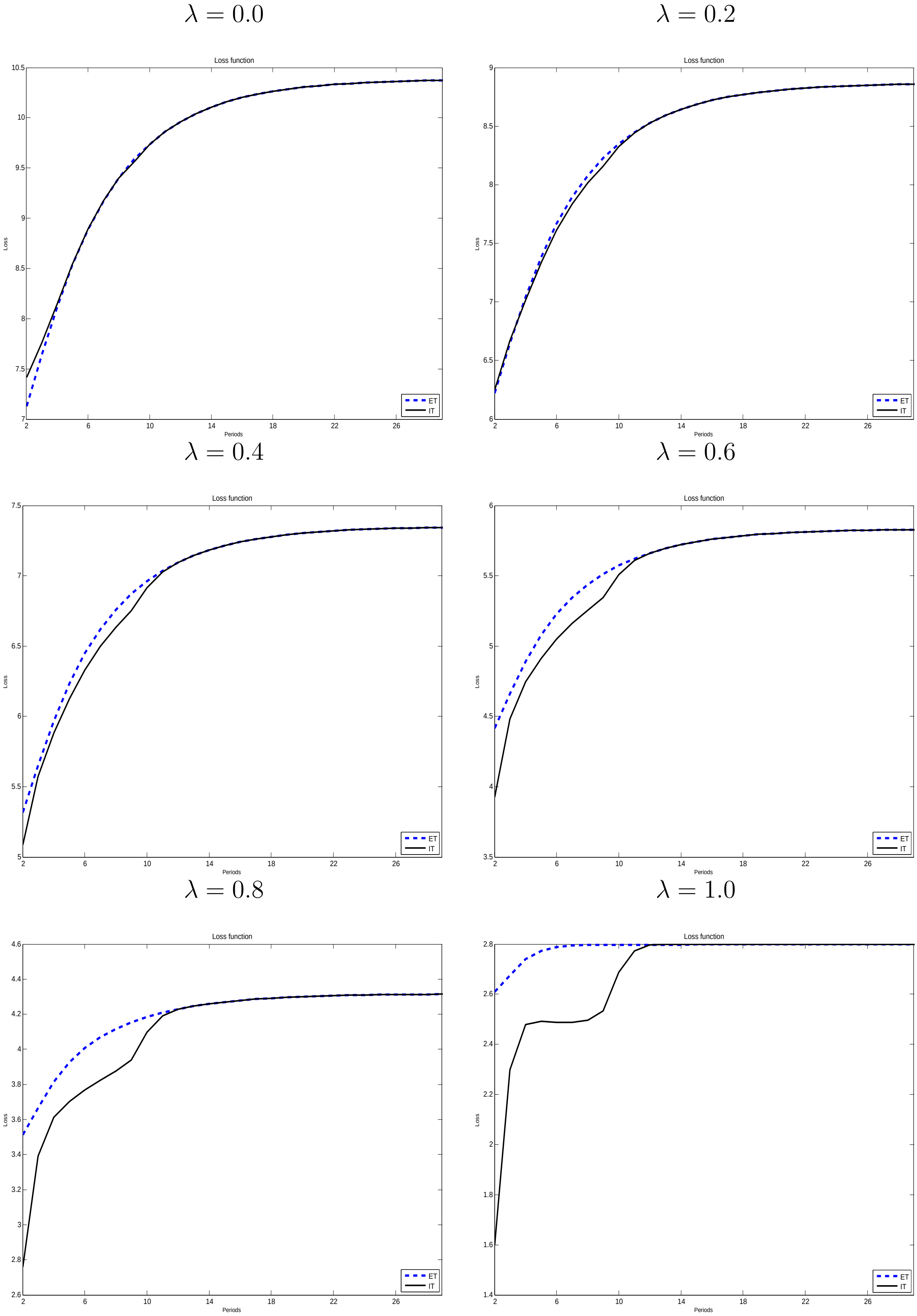


Figure K.1: Loss2:* $IT2$ *(solid),* $ET1$ *(dashed)*$\rightarrow ET10$ *(after 8 periods)

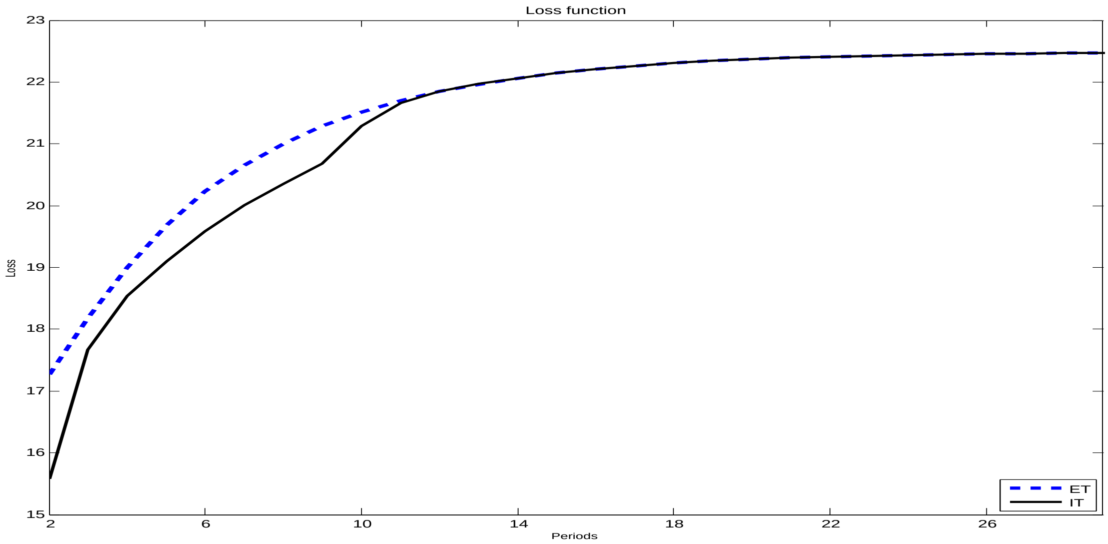
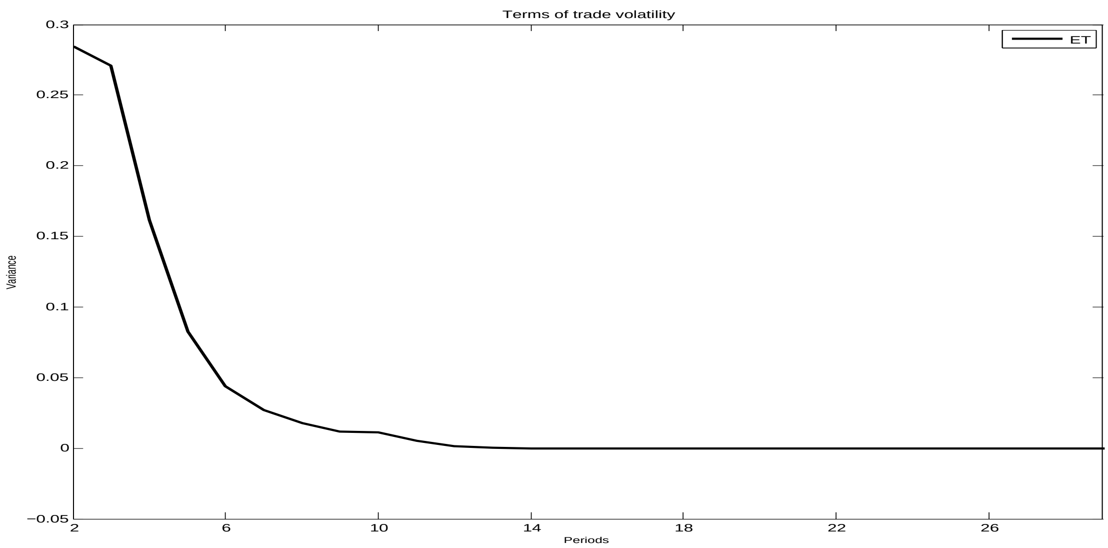


Figure K.2: Terms of trade variance: Difference from IT



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