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Is the Exchange Rate a Shock Absorber? The Case of Sweden.

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Abstract

This paper uses a structural vector autoregression representation of the Mundell-Flemming model to analyze the determinants of movements in Sweden's real exchange rate. It finds that, while (supply and demand) shocks account for over 60 percent of the forecast error variance, comparable to several Economic and Monetary Union (EMU) countries, demand shocks account for a higher fraction of these real shocks in Sweden than in those core countries. If real demand shocks result from controllable macroeconomic policies, the cost of relinquishing the exchange rate is no higher, and may be lower, for Sweden than for most core EMU countries.

JEL Classification Numbers: F30, F31

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Contents

SUMMARY

This paper examines the relationship between the real exchange rate and the business cycle in Sweden over the recent period of floating exchange rates to determine the extent to which movements in the real exchange rate have been driven by real as opposed to nominal shocks. This analysis provides an indication of the potential cost for Sweden of giving up the exchange rate as an instrument of macroeconomic policy, required for participating in Economic and Monetary union (EMU). Various types of macroeconomic shocks—demand, supply, and nominal—are identified using a structural vector autoregression approach that is based on the Mundell-Flemming model of the open economy. In this framework, the demand and nominal shocks are shocks to the goods and money markets, respectively, and the supply shock affects the level of capacity output.

The structural decomposition indicates that real shocks account for over 60 percent of the forecast error variance of the real exchanger ate, comparable to the percentage in a number of core EMU countries. Moreover, demand shocks account for a significantly higher fraction of real shocks in Sweden than in the other core EMU countries. To the extent that the control, the cost of relinquishing the exchange rate is no higher, and may be lower, for Sweden than for most of the core EMU countries.

I. INTRODUCTION

1. The final stages of European Monetary Unification (EMU) have motivated research into the pros and cons of adopting a common currency. The biggest change occurring under a currency union is the loss of the exchange rate as an instrument of macroeconomic adjustment. According to the literature, a single currency would reduce transactions and information costs but could prove costly in the face of asymmetric shocks or price rigidities (Mundell 1961). Moreover, the costs of a single currency would be smaller if labor and capital were sufficiently mobile and the trade regime was open (McKinnon 1963).

2. In evaluating the costs of EMU, one area of research has focused on the extent of asymmetries between national shocks. The idea behind this analysis is that the existence of asymmetries raises the cost of relinquishing the exchange rate as a shock absorber. Therefore to evaluate EMU appropriately it is important to understand the magnitude of asymmetric shocks across European economies. Bayoumi and Eichengreen (1992a and 1992b) develop this analysis and distinguish demand and supply shocks by assuming that demand shocks have no long-run effect on output whereas supply shocks have permanent effects. They correlate both types of shocks across European countries to identify the degree of asymmetry and find that the sub-group of countries Austria, France, Denmark, Netherlands and Belgium has the highest correlations with Germany whereas Sweden is in the middle rank of countries with Portugal, Italy and Finland. Bayoumi and Thomas (1995) conduct a similar analysis except that they restrict supply shocks to have no long-run effect on the real exchange rate under the assumption that countries produce similar goods. In their analysis, price responses to demand shocks were stronger for later entrants to the European Union than for initial members, on account of greater real exchange rate flexibility over most of the EMS period.

3. A number of authors have argued that a 2 variable VAR system of the type employed by Bayoumi and Eichengreen and Bayoumi and Thomas is unable to distinguish between real shocks and nominal shocks. This is important in the context of EMU because if shocks identified as demand shocks in the 2 variable VAR analysis are really nominal shocks, the cost of losing the exchange rate as an instrument of macroeconomic adjustment is overstated. To account for this drawback a 3 variable VAR system has been proposed to identify aggregate demand, aggregate supply and nominal shocks separately. Clarida and Gali (1994) provide an example of this analysis. In their set-up demand and nominal shocks are assumed only to have a temporary effect on relative output and the nominal shock is assumed only to have a temporary effect on the real exchange rate. A similar identification system proposed by Canzoneri et al. (1996) substitutes an assumption about government consumption for the assumption regarding the real exchange rate. In their analysis the nominal shock is only assumed to have a temporary effect on real government consumption.

4. Clarida and Gali (1994) analyze output and real exchange rate relationships between the U.S. and Japan, Germany, the UK and Canada and find that roughly 90 percent of output innovations can be attributed to real shocks and that roughly 60 percent of innovations to the real exchange rate can be attributed to real shocks. They infer from this that real shocks are important in explaining real exchange rate volatility; consistent with the findings of Campbell

and Clarida (1987) and Stockman (1988). Canzoneri at al. also find that supply and demand shocks account for almost all of the variation in relative output innovations between Germany and Austria, the Netherlands, France, Italy, Spain, and the UK but that nominal shocks account for most of the variation in the real exchange rate. In their view these European countries will not be adversely affected by the introduction of a common European monetary policy because their exchange rates have not behaved as shock absorbers since the break-up of the Bretton Woods system.

5. This paper considers the identification schemes of Clarida and Gali and Canzoneri et al. using Swedish data to discover whether output and real exchange rate innovations are driven by real or nominal shocks.[1] The paper finds that real shocks account for over 60 percent of the forecast error variance of the real exchange rate, comparable to the percentage in a number of core EMU countries. Moreover, demand shocks account for a significantly higher fraction of real shocks in Sweden compared to the other core EMU countries. To the extent that the demand shocks are related to macroeconomic policies that are under the control of the authorities, the cost of relinquishing the exchange rate is no higher if not lower for Sweden than for most of the core EMU countries. The paper is organized as follows. Section 2 provides the theoretical underpinnings for the identification schemes that are used, section 3 describes the data, section 4 discusses the econometric methodology, section 5 presents the regression results and section 6 concludes.

II. THEORETICAL CONSIDERATIONS

6. The Mundell-Flemming model (MF model in the rest of the paper) provides the theoretical foundation for restrictions used in this analysis to identify different kinds of shocks. The key assumptions of the MF model are (1) sticky prices and output adjustment and (2) national outputs that are imperfect substitutes in consumption. Shocks in the MF model can be categorized as aggregate supply shocks ϵ_s, aggregate demand shocks ϵ_d and nominal shocks ϵ_f. A positive supply shock creates an excess supply of home goods resulting in a depreciation of the real exchange rate. Over time output increases to a higher long-run level and the real exchange rate remains depreciated. A positive demand shock creates excess demand for home output resulting in an appreciation of the real exchange rate and a short-run increase in output. Over time output returns to its long-run level but the real exchange rate remains appreciated. A positive nominal shock lowers the home interest rate and leads to a depreciation of the real exchange rate and a short-run increase in output. Over time both output and the real exchange rate return to their initial levels.

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[1] Previous work using Swedish data has focused on the 2 variable decomposition of errors into permanent and temporary shocks. Using this framework, Bergman finds that over 90 percent of the error variance in output is the result of supply shocks whereas only 20 percent of the error variance of inflation is due to supply shocks.

7. To identify these different shocks, two approaches have generally been followed. Some researchers have constructed structural models of the economy and have simulated the models using various assumptions about the nature of supply and demand shocks. However, one difficulty with this approach is that classifying the residuals of a structural model into real demand and supply and nominal shocks is not straightforward. An alternative approach that has recently become popular is to impose a set of parsimonious statistical restrictions which embody the theoretical implications of a particular model. This alternative approach is adopted in this paper.

8. Following Clarida and Gali (1994) and Canzoneri et al. (1996) we estimate two three-variable VAR systems using Swedish data. The first system includes relative output, the real exchange rate and the relative price level and imposes the assumptions that real demand shocks and nominal shocks have no long-run effect on the level of output and nominal shocks have no long-run effect on the real exchange rate. The second system includes relative output, the real exchange rate and relative government expenditure on goods and services. In this system we assume that real demand shocks and nominal shocks have no long-run effect on the level of output and nominal shocks have no long-run effect on the real exchange rate and on government consumption.

9. These identifying restrictions differ in their identification of the nominal shock. The assumption that nominal shocks have no effect on the exchange rate allows us to distinguish the effects of nominal shocks on the exchange rate from demand shocks which are allowed to have a permanent effect. Assuming instead that nominal shocks have no effect on government consumption allows a distinction between nominal and real shocks provided that demand shocks have a permanent effect on government consumption. Before implementing the econometric models we shall first describe the variables used in the analysis and determine whether the systems should be estimated in log levels or log first differences.

III. DATA DESCRIPTION

10. In this analysis we are only interested in relative or asymmetric shocks because common shocks do not require any adjustment in the real exchange rate.[2] We therefore define the relative output and government consumption variables as the Swedish real GDP (government consumption) minus a trade weighted average of foreign output (government

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[2] There is now a sizeable literature which argues that it is necessary to consider the propagation of symmetric shocks in addition to the nature of asymmetric shocks before making a judgement on the net benefits of a common currency area. See for example the work of Rummell (1996). For Sweden, Thomas (1997) finds that the transmission of monetary policy actions is comparable to the UK, France and Germany and therefore the country would not be adversely affected by symmetric shocks in a common currency area.

consumption) levels valued at 1985 PPP exchange rates.[3] The real exchange rate is constructed using bilateral exchange rates vis-à-vis the foreign countries using the same trade weights. The relative price level is defined as the Swedish CPI minus a trade weighted average of foreign CPIs.

11. The next step is to determine the time series properties of the variables entering the VAR specifications. The top panel of Figure 1 shows that Swedish relative output fell almost continuously between the early 1980s and the early 1990s.[4] Since 1993 its level has stabilized. Moreover, the real exchange rate in the center panel indicates that periodic devaluations of the Swedish krona took place in the early 1980s and early 1990s to maintain competitiveness. The final panel shows the rise in Sweden's relative CPI over time which necessitated the repeated devaluations shown in the center panel.

12. It is clear therefore that with the possible exception of the real exchange rate, the variables have trended over time and therefore it is necessary to determine whether the variables are stationary around stochastic or deterministic trends. Table 1 presents a number of univariate stationarity tests for the data. The table indicates that the null hypothesis of a unit root for the relative output, government consumption and price variables and the real exchange rate can not be rejected against the alternative hypothesis of stationarity around a deterministic trend. Both the Augmented Dickey Fuller (ADF) and the Phillips-Perron test statistics are smaller than the 10 percent critical value for the variables. To confirm that the variables are first difference stationary, test statistics for the first differences of the variables were computed. In this case the test statistics are greater than their respective 10 percent critical values, confirming that the variables are first difference stationary.

IV. IMPLEMENTATION OF THE METHODOLOGY

13. The log of relative output, the log of the real exchange rate and the log of relative CPIs are the three variables in the first system. Using first differences we assume that the vector

$\Delta x_t = [\Delta y_t - \Delta y_t^*, \Delta RER_t, \Delta p_t - \Delta p_t^*]$ has a structural interpretation given by:

$$\Delta X_t = C(L)\epsilon_t$$

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[3] The foreign countries represent the 15 most important currencies in Swedish foreign trade and include Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Switzerland, United Kingdom, United States.

[4] The time period covered in this analysis spans 1979:1 to 1995:4 and was determined by the availability of data used to construct the trade weighted foreign GDP aggregate. Over most of this period the Swedish krona was pegged to the 15 most important currencies in Swedish foreign trade.

where L is the lag operator and $\epsilon_t = [\epsilon_s, \epsilon_d, \epsilon_f]$ is a vector of structural shocks; ϵ_s is the aggregate supply shock, ϵ_d is the aggregate demand shock and ϵ_f is the aggregate nominal shock. The errors are serially uncorrelated and have a variance covariance matrix normalized to the identity matrix.

The vector of structural shocks is not observed directly. The trick is to recover ϵ_t from an estimate of the moving-average representation:

$$\Delta X_t = A(L) u_t$$

where the first matrix in the polynomial A(L) is the identity matrix and the disturbance vector u_t has an estimated covariance matrix Σ.

Equations 1 and 2 imply a linear relationship between ϵ_t and u_t

$$u_t = C_0 \epsilon_t$$

It is necessary to identify the 3x3 matrix C_0 to be able to recover the vector of structural shocks ϵ_t from the estimated disturbance vector u_t. The symmetric matrix $\Sigma = C_0 C_0'$ imposes six of the nine restrictions that are required and therefore we only need three more identifying restrictions. Blanchard and Quah (1989) suggest that we can use economic theory to impose these restrictions. Economic theory has a number of implications regarding the long-run behavior of variables in response to shocks and therefore imposing these long-run restrictions allows us to properly identify the shocks.

The long-run representation of equation (1) can be written as

$$\begin{bmatrix} \Delta Y_t \\ \Delta RER_t \\ \Delta CPI_t \end{bmatrix} = \begin{bmatrix} C_{11}(1) & C_{12}(1) & C_{13}(1) \\ C_{21}(1) & C_{22}(1) & C_{23}(1) \\ C_{31}(1) & C_{32}(1) & C_{33}(1) \end{bmatrix} \begin{bmatrix} \epsilon_s \\ \epsilon_d \\ \epsilon_f \end{bmatrix}$$

where $C(1) = C_0 + C_1 + ...$ is the long-run effect of ϵ_t on ΔX_t.

Using Clarida and Gali's (1994) identifying assumptions, the long-run restrictions imposed on the model are $C_{12}=0$, $C_{13}=0$, and $C_{23}=0$. These restrictions make the matrix C(1) upper triangular and we can use this fact to recover C_0.

V. ESTIMATION RESULTS

14. This section presents results from the empirical implementation of the structural VAR analysis developed in the previous section. We examine the impulse responses of each of the variables to a unit positive innovation in each of the fundamental shocks using a variety of specifications and present variance decompositions of the forecast errors based on the VAR analysis.

15. The unrestricted VARs were estimated over the period 1979:1–1995:4 with six lags of each variable in each of the three equations. We performed a series of likelihood ratio tests for higher order lags but the null hypothesis that higher order lags in the VAR are insignificant could not be rejected at conventional levels of significance.

16. We initially conducted an analysis with a VAR system of relative outputs, relative CPIs and the real exchange rate. The impulse responses of the levels of the explanatory variables are presented in Figure 2. The top panel shows that supply shocks account for most of the changes in relative outputs and have permanent effects. Demand and nominal shocks have smaller impact effects on relative outputs and asymptote to zero. The center panel shows that supply shocks are not well identified in the real exchange rate equation because supply shocks lead to a long-run appreciation of the real exchange rate whereas we would expect the exchange rate to depreciate in the long-run in response to a positive supply shock. However, Clarida and Gali (1994) find a similar impulse response profile for the U.S. – Canadian real exchange rate and for the U.S. – Japan real exchange rate. Moreover, Bayoumi and Thomas (1995) make the identifying assumption that supply shocks have no long-run effect on the real exchange rate. In contrast, the demand shock is well specified in the model because it leads to a long-run appreciation of the real exchange rate. Nominal shocks lead to an initial depreciation of the exchange rate which is subsequently reversed as the exchange rate appreciates towards its trend level. The impulse responses of relative prices also conform to the MF model; demand and nominal shocks have permanent positive effects on the price level while supply shocks have a permanent negative effect.

17. Figure 3 presents impulse responses of the levels of an alternative system of explanatory variables with relative government consumption used in place of the relative price variable. The same long-run identification scheme is used as in the previous case. The impulse responses for the relative output variable and the real exchange rate are comparable to the previous case. However, the impulse responses for the relative government consumption variable give the implausible result that nominal shocks have strong and permanent effects on relative government consumption. This implication can be avoided by imposing that nominal shocks have no long-run effect on relative government consumption and allowing the impulse response of the real exchange rate to nominal shocks to be determined by the data (this is the assumption made in the analysis of Canzoneri et al. (1996)). The impulse responses from this formulation shown in Figure 4 indicate that nominal shocks have permanent effects on the real exchange rate which contradicts the basic Mundell-Flemming assumption. It appears therefore that the most satisfactory identifying scheme has relative outputs, relative prices and the real exchange rate as explanatory variables and imposes the restrictions that demand and nominal

shocks have only temporary effects on output and nominal shocks have only temporary effects on the real exchange rate. In the next section we limit our discussion to this specification.

18. Having discussed impulse responses for a number of alternative specifications, we now turn to the forecast error variance decompositions for the preferred model (Table 2). The table shows for each variable the fraction of the forecast error variance at different forecast horizons which can be attributed to each shock in the model. The variance decomposition for the first difference of relative output is presented in the first panel. The panel shows that supply shocks are the most important factor for variation in the forecast errors of relative output, contributing two-thirds of the variance in the first period and roughly half of the variance subsequently. The remainder of the variance is attributable to demand and nominal shocks in comparable quantities. Other studies also attribute most of the movements in relative outputs to supply shocks. Canzoneri et al. (1996) find that supply shocks account for two-thirds of the forecast error variance of relative outputs between Germany and Austria, the Netherlands, France, Italy, Spain and the UK. Prasad and Chadha (1996) document a similar result for the relative output of Japan versus the other G7 countries and Clarida and Gali (1994) document a similar result for the relative output of the United States with Japan, Germany, the UK and Canada.

19. Forecast error variance decompositions for changes in the real exchange rate are presented in the second panel of Table 3. In this case supply shocks play a very weak role in explaining movements in the real exchange rate, accounting for only 10 percent of the forecast error variance. Demand and nominal shocks are the main driving forces of this variable accounting for one half and one third of the forecast error variance respectively. The importance of demand shocks in accounting for real exchange rate movements is also found in the analysis of Clarida and Gali (1994) and leads them to conclude that real shocks have an important role in explaining real exchange rate volatility over the port-Bretton Woods period. In contrast, Canzoneri et al. (1996) find that real shocks account for only 25 percent of the forecast-error variance of the real exchange rates of the core EMU countries, with demand shocks accounting for less than 20 percent. Using this result they argue that the loss of the exchange rate as a shock absorber in the proposed EMU monetary framework will not be great for these countries. Finally, forecast error variance decompositions for relative inflation rates in the third panel of Table 3 show that demand, supply and nominal shocks account for roughly an equal portion of the forecast error variance.[5]

20. The previous comparison between Canzoneri et al.'s results for the core EMU countries and this paper's results for Sweden is not entirely appropriate because the two papers use different identifying assumptions. In order to make the comparison more robust,

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[5] It could be argued that the importance of real shocks have declined since Sweden targeted its exchange rate against the ECU in 1991. We therefore performed the analysis over the 1991-95 period using two lags of each explanatory variable. The results were comparable to those documented in this paper in that real shocks accounted for a large fraction of the forecast error variance of the real exchange rate.

forecast error variance decompositions were obtained for Austria, Belgium, France and the Netherlands using the preferred identifying assumptions reported in this paper. The forecast error decompostitions of the real exchange rate presented in Table 3 indicate that demand shocks account for roughly the same fraction of real exchange rate movements as in the analysis of Canzoneri et al.. However, supply shocks account for a significantly higher proportion. This suggests that the role of real shocks in influencing real exchange rate movements in the core EMU countries (with the exception of the Netherlands) is comparable to Sweden so that losing the exchange rate as a shock absorber is no less costly for the core EMU countries than for Sweden.[6]

21. Indeed, given that demand shocks account for a much greater fraction of the forecast errors in the real exchange rate equation for Sweden than for the other countries, Sweden has less to lose from joining EMU to the extent that the shocks are controllable policy shocks. In order to address this issue more explicitly we consider the historical decompoistion of real exchange rate shocks that are associated with demand impulses (Figure 5). The figure indicates that the demand impulses were negative throughout most of the 1980s and turned positive at the onset of the Swedish recession in 1990. In recent years the impulses have again turned negative. To consider the extent to which these demand impulses are related to fiscal policy we plot the change in the ratio of real government consumption to GDP on the same figure. It is apparent from the chart that negative demand impulses derived from the model are associated with reductions in the ratio of government expenditure to GDP.[7] It seems reasonable therefore to postulate that the Swedish authorities have some control over the demand impulses associated with movements in the real exchange rate which are identified in this paper.

22. The close association between the real exchange rate and the fiscal position identified above is a possible explanation for the emphasis in the Stability and Growth Pact of a fiscal deficit rule for each country. A related implication of the close relationship between both variables is that it is imperative for the Swedish authorities to have fiscal policy under control before entering EMU because otherwise it will be very difficult to maintain the conditions needed for adopting the single currency in Sweden.

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[6] To be fair, the degree of real exchange rate variability explained by real shocks overstates the potential loss of a single currency because it is only the nominal component of the real exchange rate that will no longer exist in EMU. It will still be possible for relative price differences across countries to moderate asymmetric shocks.

[7] A more complete fiscal policy impulse would be the change in the primary balance as a percentage of GDP. However, this data is only available on an annual basis. When we chart the annual average of the demand impulses derived in this paper with the change in the primary balance, the relationship is strongly negative.

VI. CONCLUSION

23. The results of this analysis suggest that real shocks play an important role in real exchange rate movements in Sweden. Real shocks account for over 60 percent of the forecast error variance of the real exchange rate in Sweden, comparable to the forecast error variance of the real exchange rates in a number of core EMU countries. At first glance this suggests that the cost of early EMU entry for Sweden could be considerable. However, a more in depth analysis reveals that demand shocks account for a significantly higher fraction of real shocks in Sweden compared to the other core EMU countries. Therefore, to the extent that real demand shocks are related to controlable macroeconomic policies in Sweden, the cost of relinquishing the exchange rate is no higher if not lower for Sweden than for most of the core EMU countries. Moreover, the relationship found in the paper between real exchange rate movements and changes in government expenditure suggests that it is imperative for the Swedish authorities to have fiscal policy under control before entering EMU because otherwise it will be very difficult to maintain the conditions needed for adopting the single currency in Sweden.

Table 1. Sweden: Unit Root Tests 1/

Variable	Phillips-Perron Z (τ) Test	Dickey-Fuller τ Test
p-p*	-0.7	-0.7
Δp -Δp*	-50.3 *	-2.9 *
reer	-7.4	-2.7
Δ reer	-50.3 *	-3.0 *
y-y*	-0.3	-0.3
Δy-Δy*	-100.1 *	-2.9 *
gc	0.7	0.6
Δ gc	-60.6 *	-4.2 *

1/ See text for data definitions. An asterisk denotes a variable or test statistic that is significant at the 10 percent level.

Table 2. Sweden: Forecast Error Variance Decompositions for Baseline Specification

(All variables in logarithmic first differences)

Variable:	Relative Output			Real Effective Exchange Rate			Relative CPI		
Shock:	Supply	Demand	Nominal	Supply	Demand	Nominal	Supply	Demand	Nominal
1	64.2	26.1	9.7	1.0	59.3	39.7	37.3	27.1	35.7
2	51.9	28.9	19.1	1.5	61.7	36.8	37.3	27.7	35.0
3	48.8	27.2	24.0	5.3	58.9	35.8	36.7	30.3	33.0
4	48.5	27.5	24.0	6.5	54.8	38.7	31.5	37.8	30.7
8	47.6	28.2	24.2	9.8	54.2	36.0	32.3	37.5	30.2
16	46.7	29.2	24.1	10.5	53.4	36.1	32.1	37.6	30.2
32	46.6	29.3	24.1	10.5	53.4	36.1	32.1	37.6	30.2
40	46.6	29.3	24.1	10.5	53.4	36.1	32.1	37.6	30.2

Notes: The forecast error variance decompositions are for the changes in each variable (i.e., first differences of log levels). These decompositions indicate the proportion of the variance of the k-period ahead forecast error that is attributable to each shock. The real effective exchange rate is computed using trade weights and CPIs for partner countries.

Table 3. Sweden: Forecast Error Variance Decompositions for Baseline Specification for Austria and Belgium

(All variables in logarithmic first differences)

Variable:	Real Effective Exchange Rate Austria			Real Effective Exchange Rate Belgium		
Shock:	Supply	Demand	Nominal	Supply	Demand	Nominal
1	32.4	36.8	30.9	38.8	27.2	34.0
2	35.9	34.2	30.0	42.8	27.2	30.0
3	35.4	33.8	30.8	42.3	27.9	29.8
4	36.1	33.3	30.6	39.9	28.3	31.9
8	30.3	28.2	41.5	34.6	31.2	34.2
16	29.5	27.7	42.9	12.9	33.4	29.9
32	29.1	27.4	43.5	33.3	30.3	36.5
40	29.1	27.4	43.5	33.3	30.3	36.5

Notes: The forecast error variance decompositions are for the changes in each variable (i.e., first differences of log levels). These decompositions indicate the proportion of the variance of the k-period ahead forecast error that is attributable to each shock. The real effective exchange rate is computed using trade weights and CPIs for partner countries.

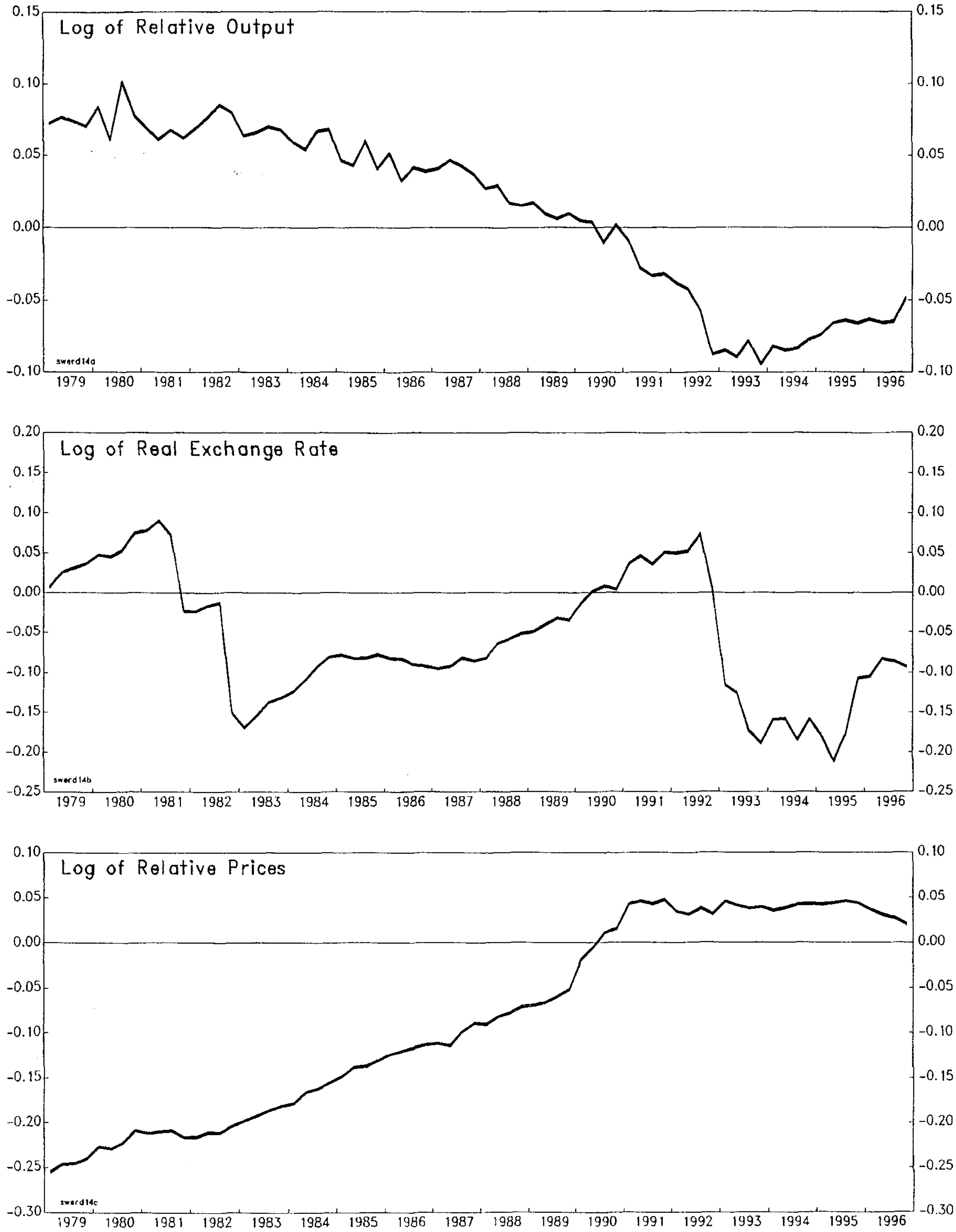
Table 4. Sweden: Forecast Error Variance Decompositions for Baseline Specification for France and the Netherlands

(all variables in logarithmic first differences)

Variable:	Real Effective Exchange Rate France			Real Effective Exchange Rate The Netherlands		
Shock:	Supply	Demand	Nominal	Supply	Demand	Nominal
1	59.4	1.8	38.8	1.7	8.7	89.6
2	57.9	3.0	39.2	1.6	11.5	86.9
3	47.0	13.1	39.9	2.3	12.8	85.0
4	47.4	13.4	39.1	10.2	11.9	77.8
8	43.7	17.5	38.8	12.1	14.6	73.3
16	43.0	17.9	39.1	13.4	17.4	69.2
32	42.9	18.1	39.0	13.7	17.4	69.0
40	42.9	18.1	39.0	13.7	17.4	68.9

Notes: The forecast error variance decompositions are for the changes in each variable (i.e., first differences of log levels). These decompositions indicate the proportion of the variance of the k-period ahead forecast error that is attributable to each shock. The real effective exchange rate is computed using trade weights and CPIs for partner countries.

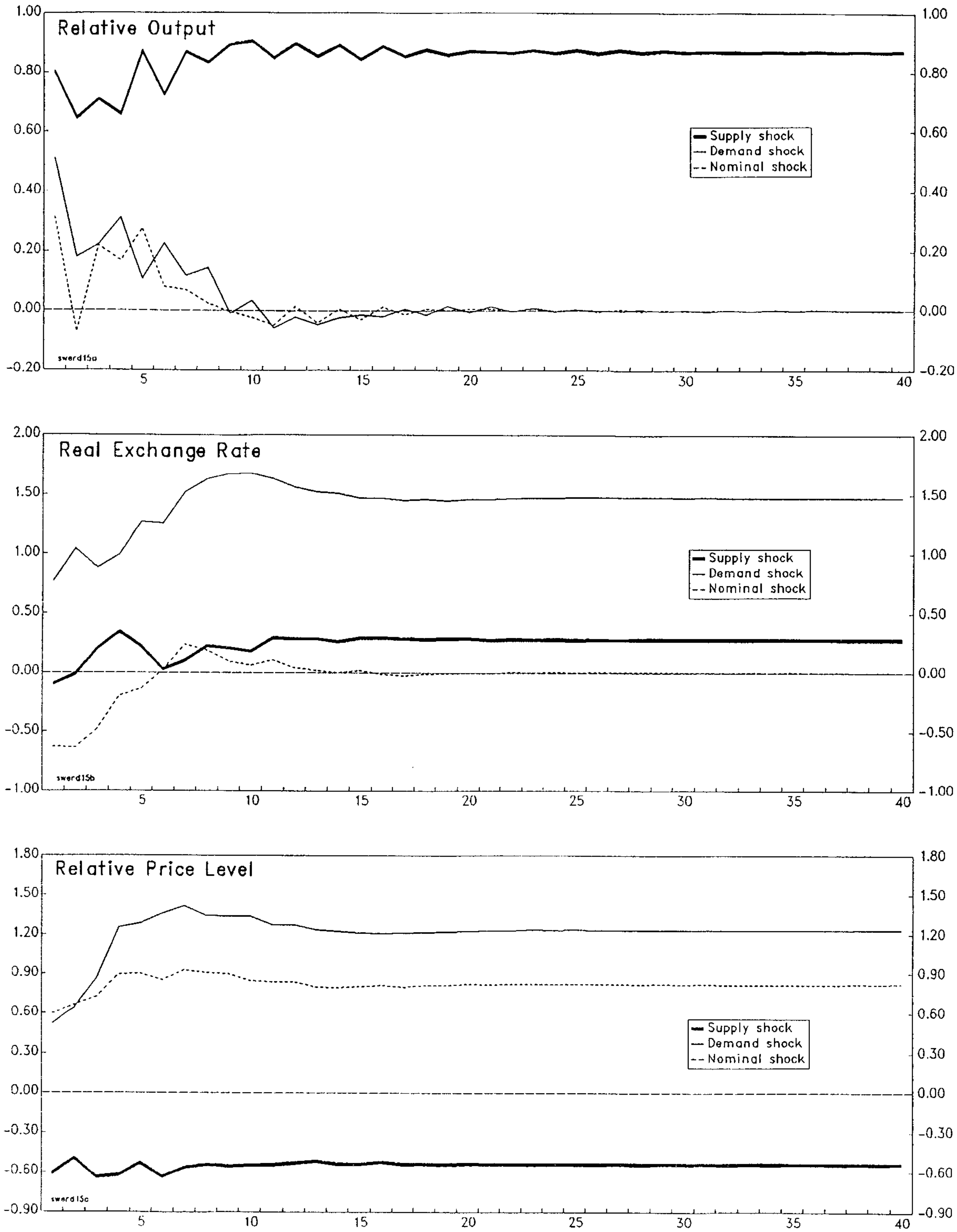
Chart 1. Sweden: Relative Output, Real Exchange Rate, and the Relative Price Level



Sources: Staff estimates.

Chart 2. Sweden: Impulse Responses Using Clarida and Gali's Identifying Restrictions

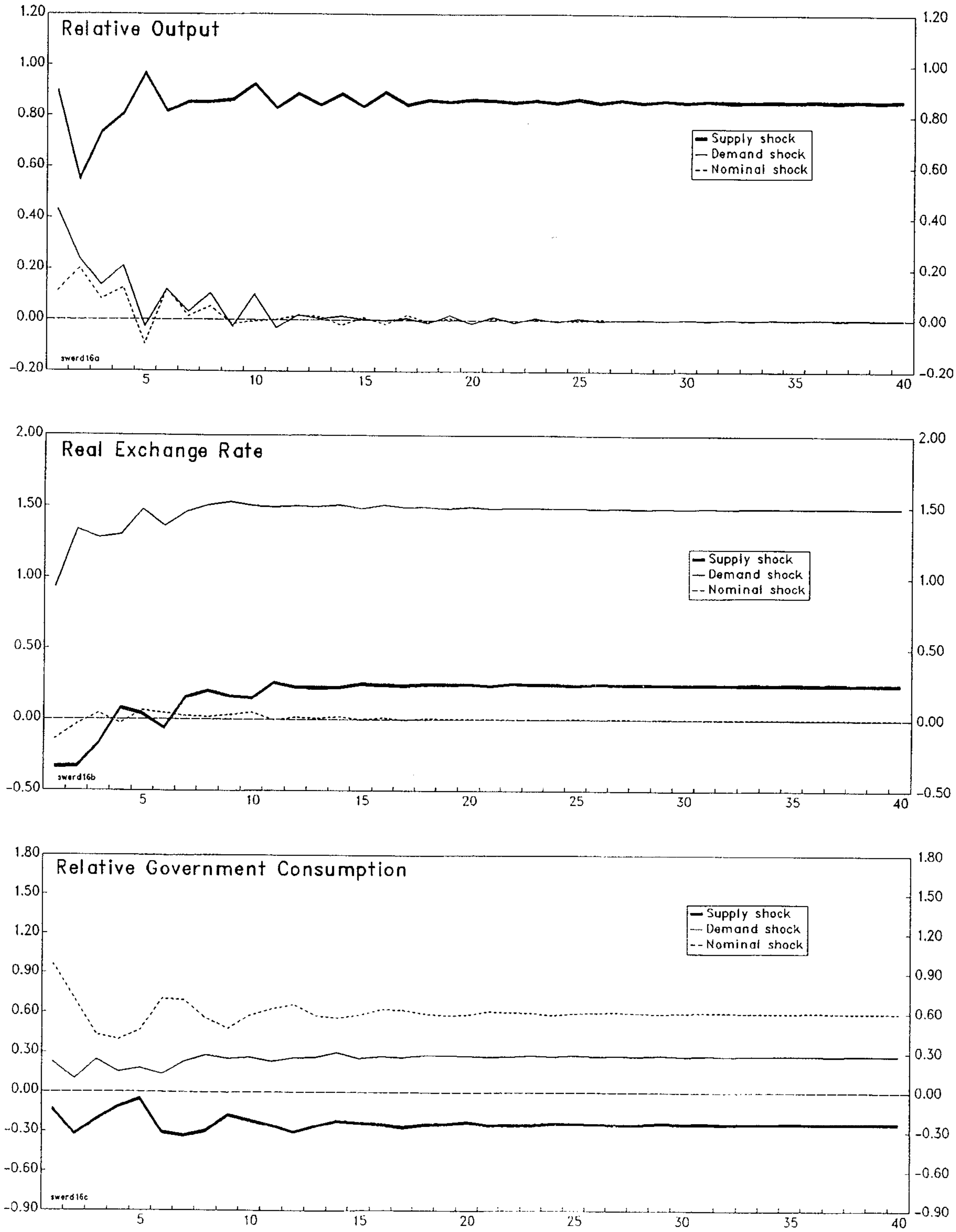
(Relative output, real exchange rate, and relative price level; in percent)



Sources: Staff estimates.

Chart 3. Sweden: Impulse Responses Using Clarida and Gali's Identifying Restrictions

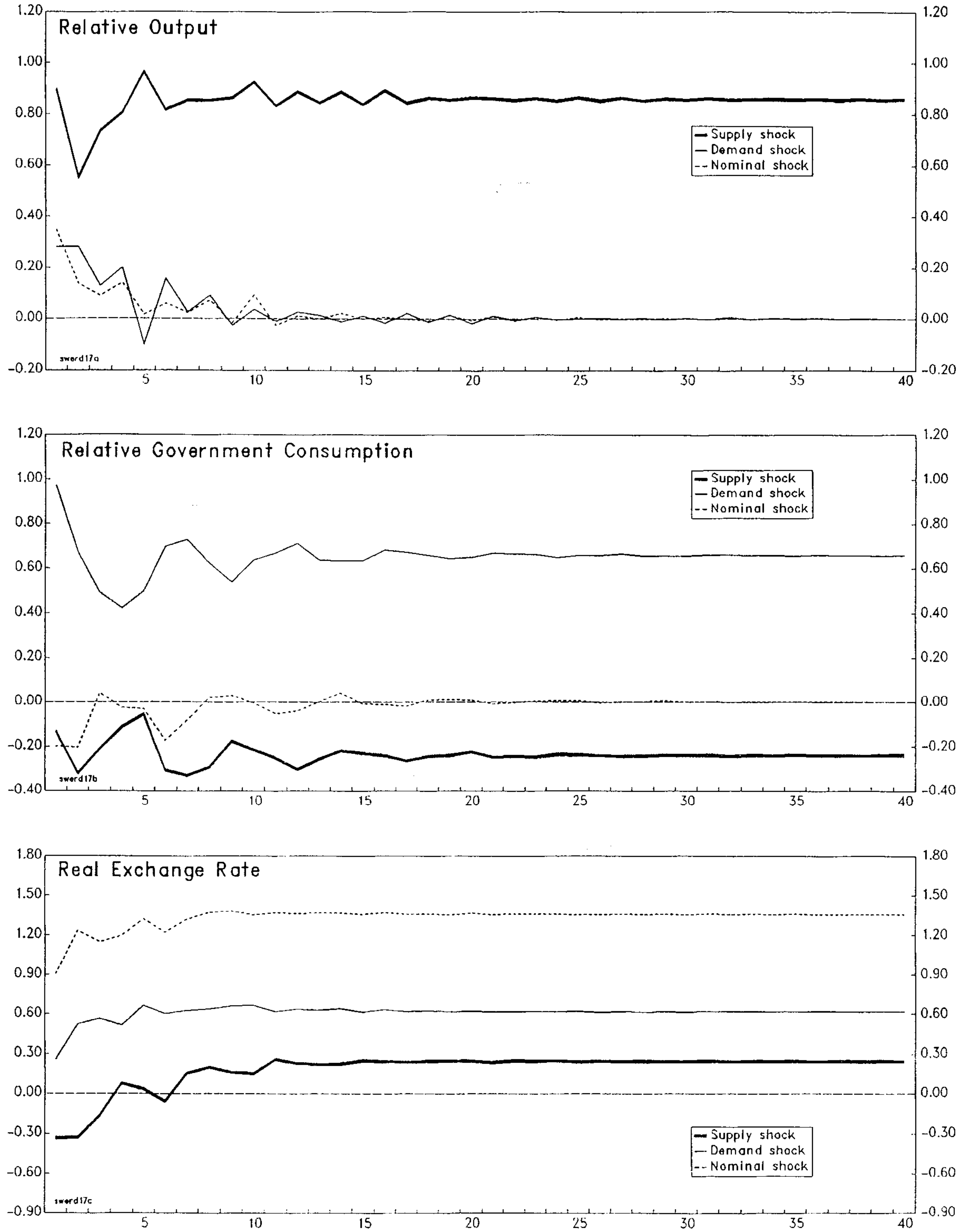
(Relative output, real exchange rate, and relative government consumption; in percent)



Sources: Staff estimates.

Chart 4. Sweden: Impulse Responses Using Canzoneri et al's Identifying Restrictions

(Relative output, relative government consumption, and real exchange rate; in percent)

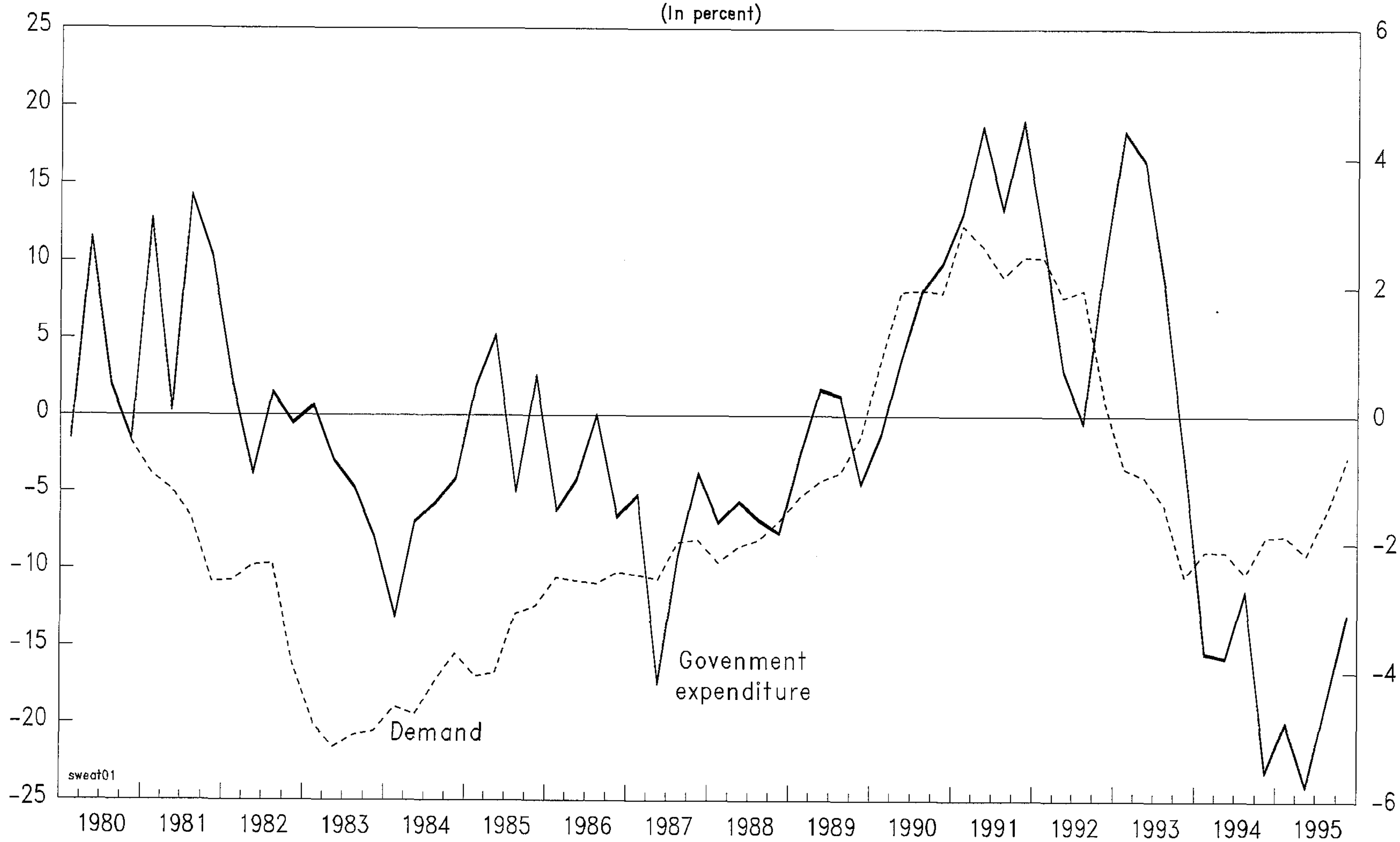


Sources: Staff estimates.

CHART 5
SWEDEN

DEMAND SHOCKS AND CHANGES IN GOVERNMENT EXPENDITURE

(In percent)



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