

Johansson, Martin; Jönsson, Kristian

Working Paper

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Working Paper, No. 2003:3

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Suggested Citation: Johansson, Martin; Jönsson, Kristian (2003) : Public debt and the effects of government expenditure on private consumption - A Kalman filter analysis of the Swedish experience 1970-1997, Working Paper, No. 2003:3, Lund University, School of Economics and Management, Department of Economics, Lund

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Public debt and the effects of government expenditure on private consumption - A Kalman filter analysis of the Swedish experience 1970-1997.*

Martin W Johansson[†] and Kristian Jönsson[‡]

April 3, 2003

Abstract

Recently, it has been suggested that the effect of government expenditure on private consumption is dependent on the level of public debt. More specifically, a higher public debt implies a less Keynesian response in private consumption. In this paper we investigate if this theory is supported by Swedish data 1970-1997 by estimating a consumption function allowing for time-varying parameters. Our main finding is that the effect of government expenditure has become less Keynesian over time. This coincides with a large increase in public debt, lending support to the theoretical predictions.

JEL Classification: E62; E21; E12

Keywords: Government expenditure; private consumption; time-varying parameters.

*The authors would like to thank Michael Bergman, David Edgerton and Klas Fregert for comments on an earlier draft. We would also like to extend our gratitude to seminar participants at the National Institute of Economic Research (NIER), Stockholm.

[†]Department of Economics, Lund University, P.O. Box 7082, S-220 07 Lund, Sweden. Tel: +46(0)462227911, fax: +46(0)462224118. Email: Martin.Johansson@nek.lu.se

[‡]Corresponding author: Department of Economics, Lund University, P.O. Box 7082, S-220 07 Lund, Sweden. Tel: +46(0)462224970, fax: +46(0)462224118. Email: Kristian.Jonsson@nek.lu.se

1 Introduction

Within the field of macroeconomics, the subject of economic policy effects is a research area that draw much attention to itself. This has also been the case historically. The Great Depression during the 1930s put focus on the potential benefit of an active economic policy. Keynes (1936) argued that a deficit-financed increase in public spending could spur private consumption and thus help the economy rise from a slump. Although the Keynesian consensus was by and large broken during the 1970s, demand stimulating policies to meet business cycle fluctuations, have continued to occupy a central role in the economic policy debate.

Coinciding with the demise of the Keynesian hegemony during the later half of the post-war period, the level of public debt in the OECD countries had increased. In many countries the level of public debt was eventually deemed unsustainable, which prompted the implementation of fiscal consolidation plans across the OECD. During the 1990s the motive for stabilizing the public debt was further strengthened by the Growth and Stability Pact, which puts caps on the level of public debt in the countries participating in the European Monetary Union (EMU).

In a seminal work concerning the fiscal contractions in Ireland and Denmark during the 1980s, Giavazzi and Pagano (1990) noted that the response in private consumption to cuts in government expenditure contradicted the standard Keynesian view - instead of *decreasing* private consumption, cutting government expenditure *increased* private consumption. This reversed response has been termed 'expansionary fiscal contractions' or 'The German view on fiscal contractions'¹. Subsequent research, see for example Giavazzi and Pagano (1996), Afonso (2001) and Hjelm (2002), has confirmed that the effects of fiscal policy on private consumption are indeed ambiguous. A common theme in this literature is that Keynesian effects are turned into non-Keynesian² effects during periods of fiscal stress.

Following the observation that government expenditure contractions can be expansionary on private consumption, several explanations for this phenomenon have been proposed. Blanchard (1990) and Sutherland (1997) present models where the effects of fiscal policy depend on the level of public debt. At moderate levels of public debt the effects of fiscal policy are Keynesian. As the debt increases, these effects are reversed and fiscal policy becomes non-Keynesian. The driving mechanism behind this result is that a decrease in government expenditure increases private consumption through the households' expectations of lower future tax-burdens.

¹See Barry and Devereux (1995) for a discussion of these definitions.

²Non-Keynesian effects means that the net effect of fiscal policy on private consumption is either in line with the predictions of the neoclassical model of consumption or that there is no effect at all of fiscal policy on private consumption. Sometimes a distinction is made between non-Keynesian and anti-Keynesian effects of fiscal policy (see Giavazzi and Pagano (1990, 1996) and Bhattacharya (1999) for use of this term). In this paper we only refer to Keynesian and non-Keynesian effects.

In this paper we investigate whether the Swedish experience is consistent with the theoretical predictions in Sutherland (1997). We investigate if the effect of government expenditure varies over time by estimating a consumption function that includes government spending and allows for time-varying parameters. We then compare the changes in government expenditure effects with the level of public debt. Our main results are in line with the predictions of the theoretical model. As the level of public debt increases in Sweden, the effect of government expenditure on private consumption becomes less Keynesian.

In Section 2 we discuss the theoretical background and introduce the empirical model. Section 3 describes the econometric methodology. In Section 4 we present our data and the empirical findings. Section 5 concludes.

2 Theoretical background

In this section we present the theoretical model underpinning our paper. We use the solution to the model, derived by Sutherland (1997), to illustrate the effects of fiscal policy under different assumptions regarding the level of the public debt. We also formulate our empirical model from the solution to the theoretical model.

2.1 Private consumption and government debt

The theoretical model in which the agents act is an overlapping generations (OLG) model, similar to the OLG models used by Blanchard (1985, 1990) and Blanchard and Fisher (1989). The agents in the model are assumed to maximize the present value of utility stemming from consumption. This maximization is performed under a budget restriction. However, the agents don't face complete certainty. At every instance in time there is a probability that an individual dies. This introduces an element of uncertainty, which is taken into account in the optimization problem. The objective function and the budget constraint of the agents are given in (1) and (2) below.

$$\int_t^\infty u(c(\tau))e^{-(r+\theta)(\tau-t)}d\tau \tag{1}$$

$$dA(t) = [y(t) - c(t) + (r + \theta)A(t)]dt + H(t) \tag{2}$$

In (1) $u(\cdot)$ is the instantaneous utility function, which is assumed to be quadratic, and $c(t)$ is the consumption at time t . In the budget constraint, (2), $y(t)$ is income, $A(t)$ is bond holdings, r is the subjective discount rate (which is equal to the interest rate), θ is the probability of death facing the individuals and $H(t)$ is a net transfer from the government. The probability of death is assumed to be a Poisson death rate. Hence, the probability alters the effective discount rate in the objective function (1). But the

probability also affects the budget constraint. In the model, the agents buy insurance against the uncertainty regarding time of death. At every instant of time the agents receive the premium, $\theta A(t)$, from the insurance company. In return the agents turn over their remaining wealth to the insurance company at the time of death. This is why the proceeds from current bond holdings are $(r + \theta)A(t)$ rather than $rA(t)$. Finally, it is important to note that the transfer recieved from the government, $H(t)$, is of lump-sum character and that it can be both positive and negative. This transfer represents fiscal policy in the theoreical model.

To close the model some assumption about the fiscal policy variable, $H(t)$, has to be made. Sutherland (1997) assumes that the transfer payments are the only activities that the government engages in. Hence, the transfer payment is equal to the fiscal deficit. Furthermore, it is assumed that the fiscal deficit develops stochastically as in (3).

$$H(t) = \sigma dW(t) \quad (3)$$

In (3) σ is a scaling parameter and $W(t)$ is a standard Wiener process. The specific process for the fiscal deficits implies that fiscal policy is stochastic and that the deficits are independent over time. But this assumption also implies that public debt, wich is equal to the cumulative fiscal deficits, evolves as a random walk. If the government is to meet its budget constraint, and not accumulate infinite debt or infinite wealth, debt adjustments has to be performed. In Sutherland's (1997) model, the government must perform fiscal adjustments at an upper and a lower threshold of public debt. If a fiscal adjustment is performed at the upper threshold, it is denoted a fiscal contraction. The fiscal contraction is necessary to make sure that the government doesn't accumulate an infinite debt. Similarly, fiscal actions taken at the lower theshold is denoted fiscal expansions. The fiscal expansions ensure that the governemnt doesn't accumulate an infinite wealth. The fiscal adjustments are achieved through a lump-sum tax, denoted T , which can be either negative or positive.

The agents' optimization problem can now be solved. Sutherland (1997) derives the solution to the maximization problem faced by the agents under the assumptions given above. The optimal consumption path is given by (4).

$$c(t) = y + (r + \theta) \left[A(t) - E_t \int_t^\infty \delta(\tau) T e^{-(r+\theta)(\tau-t)} d\tau \right] \quad (4)$$

In (4), y denotes income. This variable now lacks a time argument, which indicates that income is assumed to be constant. In the solution to the maximization problem, (4), $\delta(t)$ is an indicator function that takes the value $-1/dt$ ($+1/dt$) during fiscal expansions (contractions) and T is, as mentioned above, a lump-sum tax that is imposed on the consumers in periods of expansions and contractions. The important part of the consumption expression is the second term within the square brackets in (4). This term corresponds to the present value of expected future expansions and contractions. Denote

this expectation $F^e(B)$ as in (5).

$$F^e(B) = E_t \int_t^\infty \delta(\tau) T e^{-(r+\theta)(\tau-t)} d\tau \quad (5)$$

The expectation in (5) is a function of public debt, B , since the government perform fiscal expansions and contractions at certain levels of public debt. As seen in (5) above, public debt doesn't enter explicitly in the expression. However, the fiscal expansions and contractions have to be made at certain debt thresholds as mentioned above. This implies that a higher debt will affect the time at which the indicator function, $\delta(\tau)$, takes the value $-1/dt$ or $+1/dt$. If an expansion or a contraction, indicated by the $\delta(\tau)$, is expected to occur in the near future they will not be discounted as much as if they were to occur in a more distant future. As a consequence, the expectation in (5) becomes larger when the current debt is high, i.e. close to the upper threshold, and smaller when the current debt is low, i.e. closer to the lower threshold.

Using stochastic calculus, Sutherland (1997) derives a second order differential equation in $F^e(B)$ from which an explicit solution to the expectation can be obtained. The differential equation is given in (6).

$$(r + \theta)F^e(B) = rB \frac{dF^e(B)}{dB} + \frac{\sigma^2}{2} \frac{d^2 F^e(B)}{dB^2} \quad (6)$$

To determine a unique solution to $F^e(B)$, we need parameter values for r , θ and σ together with two boundary conditions. To illustrate how public debt alters fiscal policy effects, we equip the solution in (6) with parameter values and boundary conditions. We assign values to the parameter vector such that $(r, \theta, \sigma) = (0.1, 0.4, 0.2)^3$. Furthermore, we adopt the condition that the expectation of future taxation is equal to zero if current public debt is equal to zero. This leaves one restriction to be determined. For ease of exposition we make the normalization that $F^e(1) = 1$.

In the upper left panel of Figure 1 we supply the numerical solution to the differential equation under the stated parameters and conditions⁴. As one would expect from the model, there is a change in the expectation of future taxation when we change B . Furthermore, this change is non-linear. This is because the agents expect that a fiscal action will occur within a nearer future when the debt level is closer to any of the thresholds. In the model the fiscal deficit is equal to the change in public debt. Hence, to analyze the effects of fiscal policy on private consumption we are interested in the derivative of $F^e(B)$, that is we want to study $\frac{dF^e(B)}{dB}$. In the upper right panel of Figure 1 we plot $\frac{dF^e(B)}{dB}$. It is obvious from this plot that the expectational effects of a budget deficit is non-linear as

³These parameter values are completely arbitrary and we use these values just to obtain a numerical solution to the stated problem. This implies that the size of the variable B cannot be given any empirical meaning.

⁴We used the Symbolic toolbox in Matlab 5.3 to find the numerical solution to the differential equation.

well. However, this plot does not convey the effects of fiscal policy on private consumption. To study the response in private consumption following a fiscal policy change we have to construct the quantity $(r + \theta) \left(1 - \frac{dF^e(B)}{dB}\right)$. The reason for this formulation is that a fiscal deficit takes the form of a lump-sum transfer to the households. Hence the marginal change in life-time wealth, following an increased budget deficit, is unity. On the other hand there is the change in the expectations of future taxation which is $\frac{dF^e(B)}{dB}$. The expected change in net present wealth is the difference between these two terms. Finally, the marginal propensity to consume is $(r + \theta)$ which is multiplied by the expected change in net present wealth. The quantity $(r + \theta) \left(1 - \frac{dF^e(B)}{dB}\right)$ is plotted in the lower left panel of Figure 1. As seen in this figure there exists an interval, approximately $(-0.61, 0.61)$, over which the effects of a fiscal deficit is expansionary on private consumption. But there also exist two intervals, approximately $(-\infty, -0.61)$ and $(0.61, \infty)$, where the effects of a fiscal deficit is contractionary and thus the effect of a fiscal deficit depends on the level of public debt. At debt levels which are small in absolute value we observe fiscal policy effects that are in line with those of the Keynesian theory. However as the debt level becomes larger in absolute value the net effects of fiscal policy changes and we observe a non-Keynesian effect on private consumption of fiscal policy⁵.

2.2 The consumption function

Using the theoretical formulation in the previous section we formulate a consumption function that explicitly investigates the effect of government expenditure. In order to single out the effects of government expenditure we incorporate the taxation revenues of the government into the income measure. The remaining part of the fiscal budget, government expenditure, is incorporated as an explanatory variable in our consumption function. Hence, a *ceteris paribus* increase in government expenditure will translate into an increase in the fiscal deficit in Section 2.1. Our empirical model of consumption, C_t , is presented in (7) where Y_t and G_t are disposable income and government expenditure respectively. This is the same specification as used in Graham (1993) and Ho (2001).

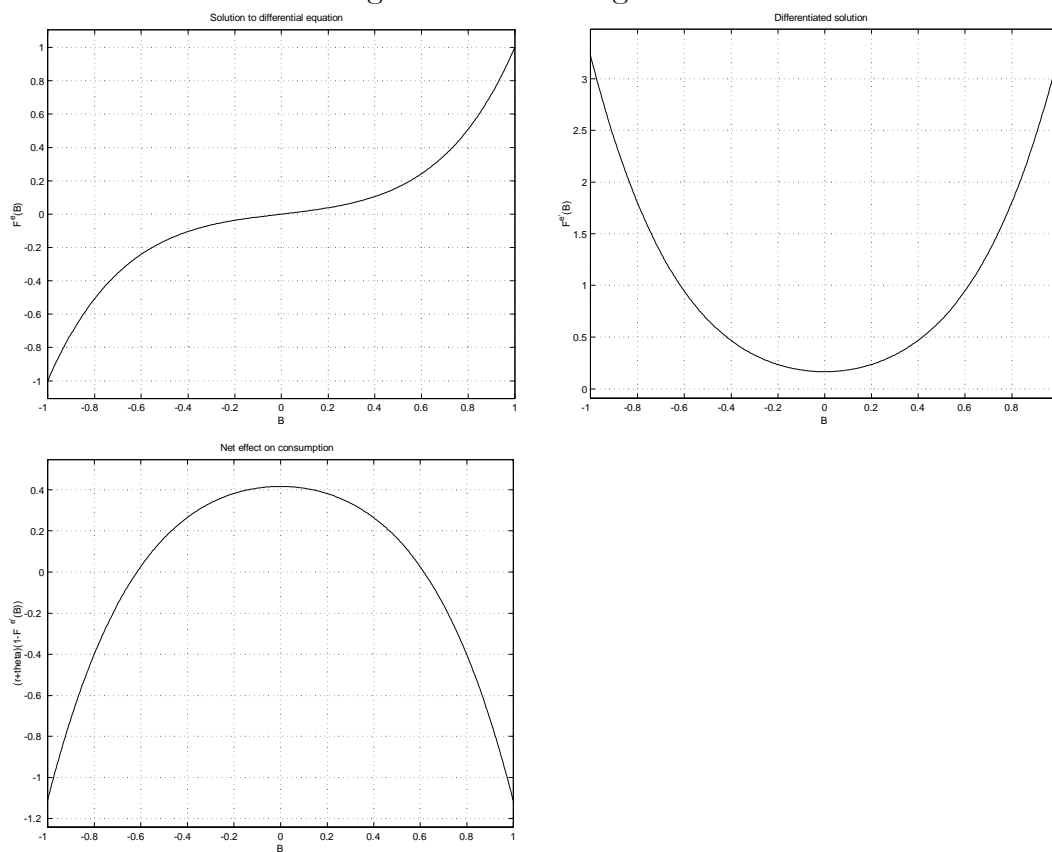
$$\Delta C_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 \Delta G_t + e_t \quad (7)$$

3 The econometric methodology

In this section we will give a brief introduction to the time-varying parameter framework and the methodology used to estimate a regression with time-varying parameters.

⁵By 'Keynesian effects' we refer to the sign with which government expenditure enters the consumption function, not the transmission mechanism.

Figure 1: Effects of government debt.



3.1 The state-space framework⁶

Our point of departure is the state-space representation of a linear regression with time-varying parameters, written as

$$y_t = x_t\beta_t + \epsilon_t \quad \epsilon_t \sim N(0, \sigma_\epsilon^2) \quad (8)$$

$$\beta_t = \beta_{t-1} + v_t \quad v_t \sim N(0, Q) \quad (9)$$

where x_t is $1 \times p$ vector with p independent variables and β_t is $p \times 1$ vector with parameters. β_t follows a random walk with disturbances, v_t , that are normally distributed with zero mean and covariance matrix Q .

Translating (7) into the state-space representation gives $y_t = \Delta C_t$ and $x_t = [1 \quad \Delta Y_t \quad \Delta G_t]$. $\beta'_t = [\beta_{0t} \quad \beta_{1t} \quad \beta_{2t}]$ denotes the time-varying marginal effects of x_t .

Briefly put the state-space representation is made up of two equations. The first equation, (8), is called the measurement equation and relates the dependent variable, y_t , to the observed variables, x_t . The second equation, (9), is called the transition equation and controls the evolvement of the (unobserved) state variables, β_t . The state variables show the time-varying impact that changes in the independent variables have on the dependent variable. This will be the focal point of our study. To estimate the state variables it is standard practice to apply the Kalman filter which is an algorithm that in a convenient way updates the likelihood function as new observations are added to the information set. The Kalman filter is composed of two parts, the prediction phase and the updating phase. In what follows we will use the notation of Kim and Nelson (1999) and denote the expected value of, say, β at time t given the information set available at $t-1$ as $\beta_{t|t-1}$. The prediction phase consists of calculating $\beta_{t|t-1}$ and then $y_{t|t-1}$. As we add one observation the true value of y_t becomes available. We can now compare our estimate, $y_{t|t-1}$, with the realized value, y_t , and obtain the forecast error, $n_{t|t-1}$, and its variance, $f_{t|t-1}$. Armed with this new information we update our estimates of state variables, $\beta_{t|t}$ and $P_{t|t}$. Our updated estimates can be seen as a weighted average of our forecast error and prior estimates⁷. Equations (10)-(13) and (14)-(15) make up the prediction phase and the updating phase respectively.

⁶The reader interested in a more thorough introduction to state-space models and Kalman filtering is referred to Hamilton (1994a,b) and Kim and Nelson (1999).

⁷The derivation of the updating scheme can be found in Hamilton (1994b) and Kim and Nelson (1999).

$$\beta_{t|t-1} = \beta_{t-1|t-1} \quad (10)$$

$$P_{t|t-1} = P_{t-1|t-1} + Q \quad (11)$$

$$n_{t|t-1} = y_t - x_t \beta_{t|t-1} \quad (12)$$

$$f_{t|t-1} = x_t P_{t|t-1} x_t' + \sigma_\epsilon^2 \quad (13)$$

$$\beta_{t|t} = \beta_{t|t-1} + P_{t|t-1} x_t' f_{t|t-1}^{-1} n_{t|t-1} \quad (14)$$

$$P_{t|t} = P_{t|t-1} - P_{t|t-1} x_t' f_{t|t-1}^{-1} x_t P_{t|t-1} \quad (15)$$

Given an initial value for the state vector and its covariance matrix, equations (10)-(15) can be iterated for $t = 1, \dots, T$. Assuming normality on behalf of the state vector disturbances, v_t , and the measurement equation disturbance, ϵ_t , the log likelihood function can be written as:

$$l = -0.5 \sum_{t=1}^T \left[\ln(2\pi f_{t|t-1}) + \frac{n_t^2}{f_{t|t-1}} \right] \quad (16)$$

Maximizing (16) produces (amongst other things) a set of $\beta_{t|t}$ and $P_{t|t}$ for all t , which are called the filtered estimates. It is important to note that each filtered estimate is conditioned on the information set from the current period. However in economics we are often interested in parameter estimates conditioned on the information set from the *whole* sample. To obtain these so called smoothed estimates we note that the only instance when the filtered estimates are conditioned on the whole sample is when $t = T$. Using this fact we can plug in $\beta_{T|T}$ and $P_{T|T}$ into a smoothing algorithm, consisting of equation (17)-(18), and iterate these equations backwards in time until $t = 1$ to obtain $\beta_{t|T}$ and $P_{t|T}$.

$$\beta_{t|T} = \beta_{t|t} + P_{t|t} P_{t+1|t}^{-1} (\beta_{t+1|T} - \beta_{t+1|t}) \quad (17)$$

$$P_{t|T} = P_{t|t} + P_{t|t} P_{t+1|t}^{-1} (P_{t+1|T} - P_{t+1|t}) P_{t+1|t}^{-1} P_{t|t} \quad (18)$$

3.2 Maximization issues⁸

Maximizing (16) is usually done with a derivative-based optimizer such as Gauss-Newton. In practice this can be rather tricky as the likelihood surface is likely to be multimodal and hence the optimizer risks getting bogged down in a local optimum⁹. To circumvent this difficulty we apply the Simulated Annealing (SA) algorithm which is global optimizer

⁸A review of the Simulated Annealing algorithm is given by Goffe et al. (1994).

⁹See Cramer (1985) for a more general discussion on the limitations of derivative based optimizers.

from the Markov Chain Monte Carlo (MCMC) family¹⁰. The SA algorithm has many advantages compared to the standard derivative based local optimizers. First, and most importantly, it is a global optimizer. Secondly it is easy to impose restrictions on the parameters. Thirdly, since it is not derivative-based, the algorithm is very stable and does not fail due to any ill-conditioned Hessian. Its only drawback is that it can be very time consuming, but with the continuous advances in the performance of a standard PC this is becoming less of a problem. To calculate the covariance matrix of the parameter estimates one simply inverts the negated numerical Hessian conditioned on the data and the estimated parameters from the SA algorithm.

4 Estimation

4.1 The data

To estimate our model we use quarterly data for Sweden for the period 1970:1-1997:4. Our series are private total consumption (C_t), disposable labor income (Y_t) and government expenditures (G_t)¹¹. The series are measured per capita and fixed 1991-prices and seasonally adjusted using the X11 filter in Eviews 3.1. Since transfers received by households is an item in both disposable income and government expenditure, we adjust the income series by subtracting transfers from household disposable income.

Table 1: Unit root tests^a

| Variable | Level | First difference |
|----------|-------|------------------|
| C | -1.72 | -4.40 |
| Y | -2.05 | -6.29 |
| G | -1.60 | -5.65 |

Notes: ^aWe use a linear trend and an intercept together with four lagged first differences in our unit root tests. The 10% critical value is -3.13, see MacKinnon (1991).

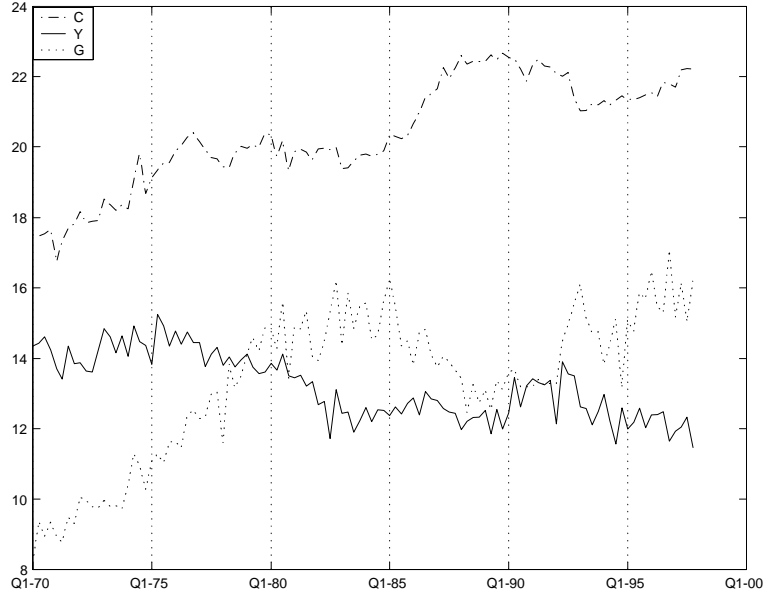
The data series for consumption, (adjusted) income and government expenditure are plotted in Figure 2. In Table 1 we present the unit root tests, augmented Dickey-Fuller (ADF) tests, for the series. As seen in Table 1, we cannot reject the null of a unit root when we test the series in levels. The same null is however rejected when testing first differences. Hence, the first-differenced model in (7) is used.¹²

¹⁰The authors are grateful to Birger Nilsson for helpful discussions on the SA algorithm.

¹¹The authors thank Jesper Hansson for supplying the data. The original data is culled from Monthly Digest, Statistics Sweden, SCB.

¹²It can be noted that we also tested for cointegration both between consumption and income and

Figure 2: The data.



A common problem when estimating models including many contemporaneously indexed variables is endogeneity. To test for endogeneity we perform a Hausman test, as presented by Wu (1973), on (7). The Hausman test is performed by extracting the fitted values from a regression of ΔY_t and ΔG_t on lagged values of ΔC_t , ΔY_t , ΔG_t and a constant¹³. The fitted values are then inserted into (7), yielding (19).

$$\Delta C_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 \Delta G_t + \gamma_1 \widehat{\Delta Y_t} + \gamma_2 \widehat{\Delta G_t} + e_t \quad (19)$$

If $\widehat{\gamma}_1 = \widehat{\gamma}_2 = 0$ in (19) the null of no endogeneity cannot be rejected. The test result is presented in Table 3. The null of no endogeneity cannot be rejected and hence we continue to use the right hand side variables in uninstrumented form.

4.2 Testing for parameter stability

In this subsection we will test for parameter stability in the standard linear model. As estimation of TVP models may be quite cumbersome, it is advisable to subject the data to some pretests for parameter stability before actually estimating the TVP model. It

between consumption, income and government expenditure. The tests were performed using both the Engle and Granger methodology and the Johansen methodology. However, the tests indicate that the variables are not cointegrated. Hence, we state our model in first differences and not in error-correction form.

¹³We use two lags of the variables as our instruments.

Table 2: Test for no endogeneity

| F-Statistic | Critical value ^a |
|-------------|-----------------------------|
| 0.59 | 2.35 |

Notes: ^a10% significance level.

Table 3: Diagnostic tests for original model

| Test | ARCH ^a | BG ^b | CUSUMSQ ^c | LaMotte ^d | Nyblom ^e | White ^f |
|--------------------|-------------------|-----------------|----------------------|----------------------|---------------------|--------------------|
| Statistic | 3.58 | 1.52 | 0.191 | 3.77 | 0.973 | 0.982 |
| 10% critical value | 2.00 | 2.00 | 0.133 | 2.35 | 0.841 | 1.83 |

Notes: ^aWe use four ARCH terms in the test, hence ARCH is distributed F(4,104)

^bWe use four lagged residuals in the test, hence BG is distributed F(4,106).

^cWe use a critical value calculated as proposed by Edgerton and Wells (1994).

^dThe LaMotte-McWhorter statistic is distributed F(2,106)

^eWe have three degrees of freedom in our test.

^fWe use cross-terms in our test, hence White is distributed F(6,106)

can be shown that estimating a standard linear regression when the parameters are time-varying will introduce heteroscedasticity in the estimated residual series. Hence, many of the tests for parameter stability are in fact tests for homoscedasticity. We will employ five pretests on (7), the ARCH LM test, the CUSUM squared test, White's test, the Nyblom test and the LaMotte-McWhorter test. The latter two tests do arguably carry more weight as they explicitly operate under the alternative hypothesis of time-varying parameters. To confirm that the dynamic specification of the consumption function is acceptable, we also investigate the presence of autocorrelation using the Breusch-Godfrey (BG) test. The results are presented in Table 3.

As can be seen from Table 3 we do not reject the null of homoscedasticity using White's test, which implies constant parameters. However the same null is rejected by the ARCH LM and CUSUM squared test. More importantly, the Nyblom and the LaMotte-McWhorter test reject the null of stable parameters. Taken together the results from Table 3 indicate that a stable parameter specification such as (7) may be too restrictive. Hence, we want to allow for time-varying parameters. In its time-varying form, (7) is rewritten as (20).

$$\Delta C_t = \beta_{0t} + \beta_{1t}\Delta Y_t + \beta_{2t}\Delta G_t + e_t \quad (20)$$

4.3 Estimating the time-varying consumption function

We estimate (20) using the techniques described in Section 3. The resulting parameter estimates are shown in Table 4 together with calculated t-values.

Table 4: TVP estimates

| Parameter | Estimate | t-value ^a |
|------------------------|----------|----------------------|
| σ_{β_0} | 0.00 | 0.00 |
| σ_{β_1} | 0.01 | 0.50 |
| σ_{β_2} | 0.04 | 1.42 |
| σ_{ε} | 0.27 | 11.9 |

Notes: ^a10% critical value is 1.28, see Gouriéroux, Holly and Monfort (1982).

As reported in Table 4, apart from σ_{ε} , only σ_{β_2} is significantly different from zero. Hence it does appear as if the parameter instability found in Table 4 is concentrated to β_2 which is the parameter associated with government expenditure. Using the estimated parameters, we now construct the smoothed coefficients using (17) and (18). The smoothed series together with 90% MSE bands are graphed in Figure 3.

In the upper panels of Figure 3 we find that the smoothed estimates of β_0 and β_1 are quite stable over the sample period, which is expected since neither σ_{β_0} nor σ_{β_1} are significantly different from zero according to Table 4. The interesting fact in Figure 3 is that the smoothed parameter estimate for government expenditures (lower left panel) has been trending downwards since the early 1970s. This suggests that the effect of government expenditure has become less Keynesian as time has progressed, indeed during the early 1990s the point estimate is in fact negative, which suggests *anti-keynesian* effects. As mentioned earlier, Blanchard (1990) and Sutherland (1997) suggest that level of 'Keynesianism' in fiscal policy is related to the size of the public debt. The lower right panel of Figure 3 shows the evolvment of the Swedish debt-to-GDP ratio during 1970-1997, which has trended upwards during the sample period¹⁴. It should be stressed that there is no exact correspondence between the lower right and the lower left panel of Figure 3 and some of the changes in β_2 cannot be explained by changes in public debt. For example, the debt ratio actually decreases during the latter half of the 1980s, yet no corresponding increase can be found in β_2 . However our consumption function is a quite simple one and to demand an exact correspondence would be asking too much. Nevertheless, the Swedish experience is in broad terms consistent with the view that the level of public debt might affect the way in which fiscal policy instruments work. This can quite clearly be seen from Figure 4. In Figure 4 we have plotted the annual averages of β_2 against the corresponding

¹⁴The series is gross government debt as percentage of GDP. The data is drawn from the OECD Statistical Compendium #2:2001.

Figure 3: Smoothed estimates and debt ratio.

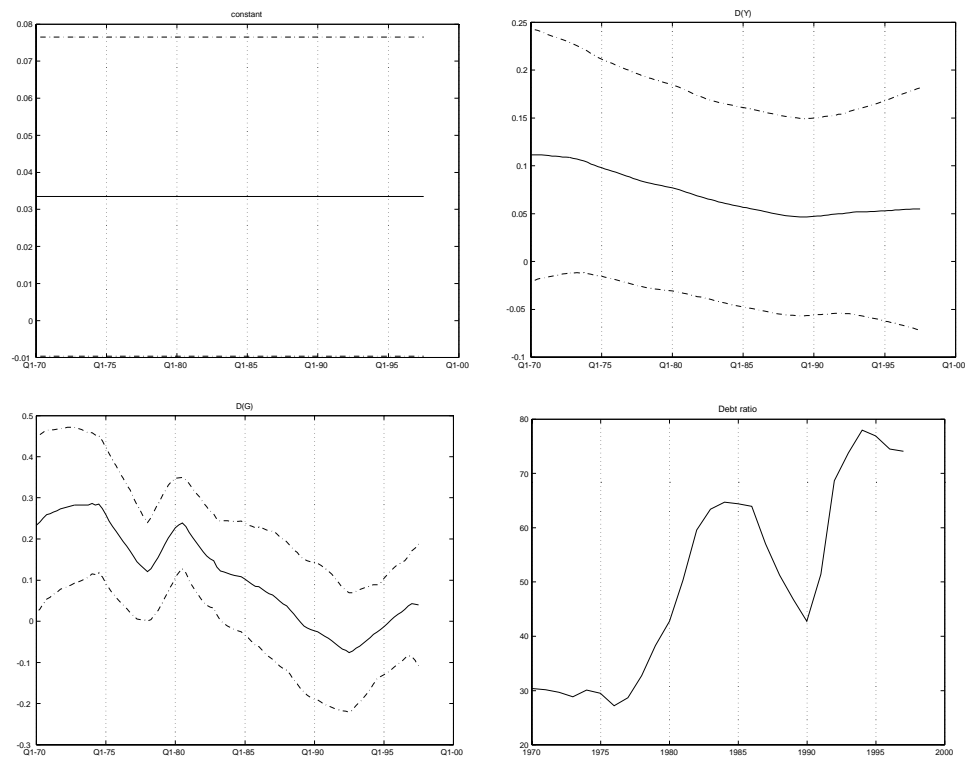
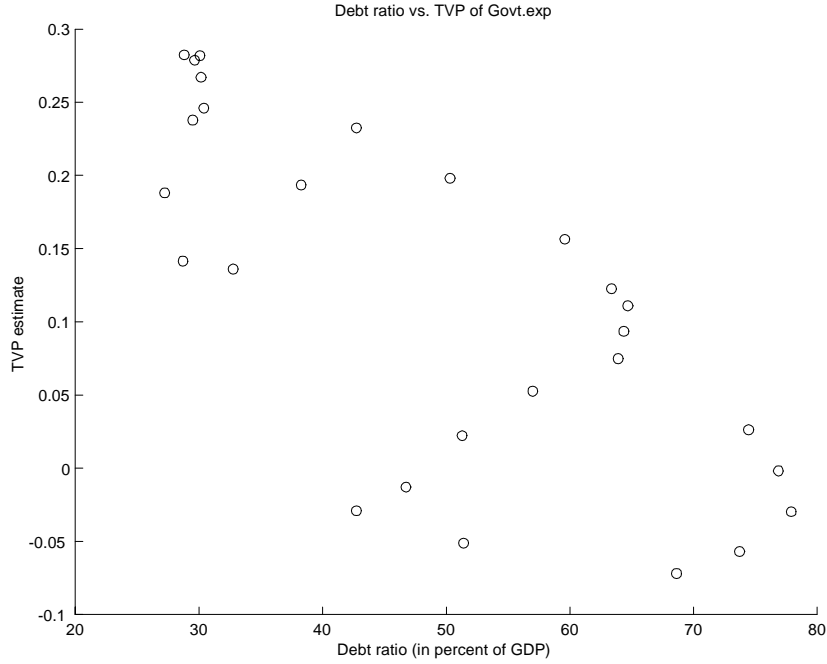


Figure 4: Plot of TVP against debt ratio.



debt ratio and we can observe a negative relationship between the impact of government expenditure on private consumption and the debt ratio.

What are the implications of our results? First and foremost, the Swedish data during 1970-1997 provides evidence in favor of non-linear effects of government expenditure on private consumption. Furthermore, the explanation for this observation seems to be consistent with the theoretical models provided by Blanchard (1990) and Sutherland (1997). During periods when the public debt-to-GDP ratio is high the expansionary effects on private consumption of an increase in government expenditure are smaller than under periods when the debt ratio is lower. It is instructive to compare the regression results in this paper with those from the earlier study on non-Keynesian effects in Sweden by Giavazzi and Pagano (1996). They find that a standard linear consumption function produces large in-sample forecast errors for consumption during the early 1990s and attribute this to non-Keynesian effects of fiscal policy. In this paper we explicitly estimate the marginal effect on consumption from government expenditure and find that the sign of the parameter indeed suggests non-Keynesian effects. Hence the results in this paper both confirm and lend further insight to the earlier results.

5 Conclusions

This paper investigates the effect of government expenditures on aggregate consumption in Sweden 1970-1997. Estimating a time-varying parameter model, we find that the influence of government spending on aggregate consumption has steadily decreased over the years. This coincides with a steady rise in public debt and hence our results lend support to the theoretical models by Blanchard (1990) and Sutherland (1997).

Our results also highlight some of the problems with conducting of stabilization policies within a monetary union such as the EMU. As no independent monetary policy can be pursued within EMU, the full weight of stabilizing the economy falls on fiscal policy. Yet, as our results show, the impact of government expenditure on aggregate consumption in Sweden has steadily decreased since the 1970s which means that, in practice, it is doubtful if any stabilization policy at all can be carried out using government expenditures. If this decrease in 'Keynesianism' is due to the build-up of public debt it would be recommendable that Sweden, upon joining the EMU, pursue a fiscal policy that aims for a lower level of public debt¹⁵.

The change in effects of government expenditures on private consumption that we observe is not all bad news though. On the bright side is the fact that if government expenditures have less impact on private consumption during periods with high debt ratios, the cost of contractionary policies to bring down the debt ratio will be slight in terms of forgone consumption. However, the distributional effects of such policies should not be neglected. For the households most in need of transfers (e.g. low-income households) a cut in this budgetary item will reduce their welfare and increase the inequality in income distribution.

¹⁵Incidentally a low debt ratio is also what the Growth and Stability Pact stipulates. However, the reasons for this requirement are not likely to be based on the debt-dependent effects of government expenditures.

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