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The effects of fiscal policy on economic activity in Finland

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Abstract

This study analysis whether fiscal policy decisions have real effects on the economy of Finland, and if they do, what are the strength and durations of the effects. We utilise two different approaches in our empirical part. One is the Structural Vector Autoregression (SVAR) method and the other is the Vector Stochastic Process with Dummy Variables (VSPD) method. Fiscal policy shocks do have an effect on the economic activity of Finland when the time period 1990 – 2007 is investigated. A positive tax shock (or a policy that increases public sector revenues) seem to have a positive effect on Investment and GDP using both approaches but the response of private consumption is mixed. From both models it seems that increase in Government spending crowds out private sector activity, and the effect takes place sooner than with the Revenue variable in question. This is a clear evidence for the crowding out effect.

Tiivistelmä


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1. Introduction

The motivation behind this research is to find out whether fiscal policy decisions have real effects on the economy of Finland, and if they do, what are the strength and durations of the effects. In economics there is an ongoing debate whether government can actually influence real economic performance. Surprisingly, empirical research in this field is still relatively scarce. The two seminal papers are Burnside, Fisher and Eichenbaum (2004) and Blanchard and Perotti (2002). Other interesting papers are Caldara and Kamps (2008), Fatas and Mihov (2001), Giordano et al. (2008), McGrattan and Ohanian (1999) and Ramey (2006, 2007).

The Classical and New Classical economists believe that fiscal policy can only have real effects in the short term, but as wages and prices adjust, the real economy will return to its original equilibrium. The main policy conclusion of this interest group is to say that the less the government intervenes with free markets, the better. The economists with a Keynesian approach argue that government policies can have positive real effects on the economy, even in the long run, since prices and wages are rigid. Hence the government should intervene with the markets, especially in the case, where free markets cannot solve their “externalities” by themselves. It has to be noted that the Keynesian are more concerned with the short run than long run.

This paper will not focus on the debate itself, but will attempt to produce evidence to whether fiscal policy has had real impacts on the Finnish economy. We utilise two different approaches in our empirical part. One is the Structural Vector Autoregression (SVAR) method and the other is the Vector Stochastic Process with Dummy Variables (VSPD) method. We consider the SVAR model as our benchmark approach. To utilise the VSPD approach we need to be able to identify the dates when policy maker(s) have acted. In the literature, the fiscal policy decisions are considered as “shocks”, i.e. something that “surprises” the economic agents and hence influences the economy.

In the public expenditures one observes a peak in the fourth quarter of the year 2000. This is because government decided to allocate 2.4 billion marks (about 400 million euros) from the Value Added Taxes to KELA, the agency that takes care of income transfers (unemployment benefits etc.). Secondly, on November the government de-
cided to distribute 420 million marks of extra financial help to 148 municipalities.
Thirdly, in the second and third supplementary budgets on November and December, the expenditures were raised by a total of 1378 million marks (230 million euros) due to unexpected tax revenues. This period is identified for to be used when VSPD method is applied.

The two approaches give similar results. Fiscal policy shocks do have an effect on the economic activity of Finland when the time period 1990 – 2007 is investigated. However, when we bring the two models together we get an image of how the private sector activity responds to changes in public sector policies, i.e. fiscal policy shocks, when these particular methods are applied. Increases in Public Sector revenues seem to have a positive effect on Investment and GDP using both the models. Private consumption seems to be positive in the SVAR (benchmark) case and negative in the dummy variable approach. However it would be counterintuitive to claim that increased taxes would lead to increases in private sector activity and therefore it seems more plausible, that the two coincide. It can well be that a good economic era causes both the increases in Public Revenues and private sector activity.

From the dummy variable approach it seems that the private sector variables react slower to the revenue variable than the expenditure variable, which is quite intuitive. Government Expenditure decisions are a lot more transparent to the public than the total Public Sector revenues. This enables economic agents to react to it quicker. From both the models it seems that increase in Government spending crowds out all the three private sector variables, and the effect takes place sooner than with the Revenue variable. Our results support that Government Expenditure clearly reduces private sector activity hindering its economic performance.

Our results are organised as follows. Section 2 discusses the related literature. Section 3 presents the statistical framework: SVAR and the Vector Stochastic Process with Dummy Variables (VSPD). Section 4 describes the data. In section 5 empirical specifications and results are discussed. Section 6 concludes the paper.
2. Related Literature

One of the key articles within this field is Burnside, Eichenbaum and Fisher (2004) where they follow the empirical approach utilised by Ramey and Shapiro (1998). They investigated the response of hours worked and real wages to fiscal policy shocks in the post-World-War II US. The method by which they identify the shocks is to find dates, when the US defence forces has carried out extensive purchases, which has had large effects on government purchases, tax rates on capital and labour income, a persistent rise in aggregate hours worked as well as declines in real wages. Technically, the identification occurs through creating date-dummy variables to distinguish the effect that particular shock has had on the time series. The data used is quarterly measured US fiscal variables since 1950s.

The basic question addressed by Burnside, Eichenbaum and Fisher (2004) is to find whether normal neoclassical models can account for the response of hours worked and real wages to a fiscal policy shock. “If taxes were lump-sum in nature, the answer would be unambiguously yes. The negative income effect associated with a rise in government purchases would increase the aggregate supply of hours worked. With diminishing marginal productivity of labour, we would observe a rise in hours worked along with a decline in real wages.”

One very important feature in their analysis is that, they explicitly allow for movements in capital and labour tax rates as well as government purchases. Their main results are firstly that a benchmark version of the neoclassical model can account for the qualitative effects of a fiscal shock on both hours worked, real wages, consumption and investment. Nevertheless the model has difficulties, especially in accounting for the timing of how the hours respond. Secondly, when habit formation (see e.g. Fuhrer (2000)) was incorporated into consumption and investment adjustment costs, the model performed better quantitatively.

Hence Burnside, Eichenbaum and Fisher claim that fiscal policy shocks have neoclassical effects on real economy, labour supply increases with a lag, reaching its peak after 10 quarters. Real wages also do fall after such a shock. Their model shows that when habit formation is incorporated into the standard neoclassical model, fiscal
policy shocks do have effects on real economy, even though real wages are not strictly rigid.

The other article very often referred to in this particular research field is Blanchard and Perotti (2002). This paper uses a mixed structural VAR and an event study approach on US quarterly fiscal data since 1950s. They use “institutional information about tax and transfer systems to identify the automatic response of taxes and spending to activity, and, by implication, to infer fiscal shocks.”

Blanchard and Perotti state that “in contrast to monetary policy, fiscal variables move for many reasons, of which output stabilisation is rarely predominant; in other words there are exogenous (with respect to output) fiscal shocks.” As fiscal decisions are made, they have two sources that cause a lag, before the decisions influence the economy. The decision process itself takes time, and after the decision has been taken, the implementation of it will require even more time. Hence the impulse response from a fiscal policy shock takes time before the effect is fully realized. This assumes implicitly, that the announcement of a decision itself has no, or very little effect on the real economy; i.e. even though financial markets respond to these decisions almost immediately after they have been announced, they do not affect the real macroeconomic variables.

In their mixed SVAR and the event study approach Blanchard and Perotti (2002) find a high degree of similarity between the impulse responses obtained by tracing the effects of estimated VAR shocks, and by tracing the effects of these special events. The first conclusion Blanchard and Perotti arrive to is a standard Keynesian one; when government spending is increased (a balanced budget fiscal expansion), GDP and private consumption also increase. When taxes increase, output falls. However, they find that a similar expansion in government spending crowds out private investment, and this finding is more in line with a neoclassical approach rather than Keynesian wisdom. Hence their findings are intriguing; the models used so far seem insufficient to provide an exhaustive picture how the economy behaves as a whole. Some parts of the economy feature Keynesian impulses, whereas others portray neoclassical. Hence they claim that this area deserves further investigation.
Claeys (2007) applies the same method as above in his paper “Rules and their effects: fiscal policy in a small open economy” where the small economy is Sweden in the time frame 1970-2006. He estimated empirical fiscal rules to test the sustainability for Swedish fiscal policy, looking in detail the government spending and taxes to lay out the mechanism behind debt creation. Different to Blanchard & Perotti, Claeys finds that “shocks to government consumption have significantly negative effects on private output for at least four quarters after the initial shock.” He claims that the results are robust; adding interest rates and inflation to the framework does not alter the results.

Claeys states three possible reasons for his findings, the size of the Swedish government sector relative to GDP, high levels of taxation and the fact that some of the major expansions started at the same time as the major economic downturns. The size of public sector relative to the whole economy induces a strong substitution effect from public to private consumption. The high levels of taxation can produce distortionary effects on the economy, which undo the wealth effect of increased government consumption. Finally, if expansionary government policy coincides with an economic bust, the empirical results would show negative effects, even though this might not be the case in reality. Hence Clayes argues in favour of the neoclassical view with some reservations to his results.

Finally, Mountford and Uhlig’s (2006) study apply the SVAR method. In their study they were able to distinguish “between the changes in fiscal variables caused by fiscal policy shocks and those caused by business cycle and monetary policy shocks.” Their key finding is that the most efficient fiscal policy to stimulate the economy is a deficit-financed tax cut, and that the long term costs of fiscal expansion through government spending are probably greater than the short term gains. Hence this paper defends the neoclassical view of government intervention on the economy.
3. The statistical framework for the analysis: SVAR and the Vector Stochastic Process with Dummy Variables (VSPD)

This section will briefly discuss the statistical frameworks behind this paper. We start by constructing a Structural Vector Autoregression (SVAR). We treat the basic SVAR model as our benchmark and the results from the VSPD approach are compared to it.

3.1 SVAR

It is well known that the atheoretical VAR model does not yield interpretable results, mainly due to the correlation between the error terms. However, when the decomposition of the covariance matrix is done, we have a recursive form VAR, in which the economic structure is embedded in the ordering of the variables.

Paper presents a dynamic structural model of Total Public Revenue (TPR), Government Expenditure (G), Private Investment (I), Private Consumption (C) and Gross Domestic Product (Y). When this is constructed that all variables are assumed to be endogenous, affecting each other contemporaneously as well as with lags. In vector form the equation looks like:

\[( 1 ) \quad B_0 y_t = k + B_1 y_{t-1} + B_2 y_{t-2} + B_3 y_{t-3} + \ldots + B_p y_{t-p} + u_t,\]

where

\[ y_t = (TPR_t, G_t, I_t, C_t, Y_t), \]

\[ u_t = (u_t^{TPR}, u_t^G, u_t^I, u_t^C, u_t^Y), \]
\[ B_0 = \begin{bmatrix}
1 & -\beta_{12}^{(0)} & -\beta_{13}^{(0)} & -\beta_{14}^{(0)} & -\beta_{15}^{(0)} \\
-\beta_{21}^{(0)} & 1 & -\beta_{23}^{(0)} & -\beta_{24}^{(0)} & -\beta_{25}^{(0)} \\
-\beta_{31}^{(0)} & -\beta_{32}^{(0)} & 1 & -\beta_{34}^{(0)} & -\beta_{35}^{(0)} \\
-\beta_{41}^{(0)} & -\beta_{42}^{(0)} & -\beta_{43}^{(0)} & 1 & -\beta_{45}^{(0)} \\
-\beta_{51}^{(0)} & -\beta_{52}^{(0)} & -\beta_{53}^{(0)} & -\beta_{54}^{(0)} & 1 
\end{bmatrix} , \]

\[ k = (k_1, k_2, k_3, k_4, k_5)' . \]

Vector \( y \) collects the variables, vector \( u \) collects the stochastic terms and \( k \) is the vector for constants. Matrix \( B_0 \) collects the coefficients.

Multiply eq. 1 by \( B_0^{-1} \) to get:

\[ (2) \quad y_t = c + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \ldots + \phi_p y_{t-p} + \varepsilon_t , \]

in which \( c = B_0^{-1}k, \phi_j = B_0^{-1}B_j, \varepsilon_t = B_0^{-1}u_t \).

If the error term \( u_t \) is a white noise process, then it will also follow that the error term \( \varepsilon_t \) will also be white noise. Hence a VAR can be viewed as the reduced form of a general dynamic structural model. If we assume that the matrix of the structural parameters \( B_0 \) was exactly equal to the matrix \( A^{-1} \), then the orthogonalised innovations would coincide with the true structural disturbances:

\[ u_t = B_0 \varepsilon_t = A^{-1} \varepsilon_t . \]

If this was the case, we could use the diagonalisation methods to calculate impulse responses. Since \( A \) is lower triangular, \( B_0 \) would have to be as well. The way to achieve this would be to use economic theory to place an ordering to the variables, such that the first variable is not affected by any current values of the variables, and the last variable will be sensitive to the current values. In the matrix form the multiplication would look like (the matrices of lagged values excluded from presentation for simplicity):
So, in our case it is assumed that the current values of the variables do not affect TPR. G is affected by TPR, I is affected by TPR and G and etc.

If we can find an ordering of the variables for which $B_0$ is lower triangular, we can write the dynamic structural model as:

\[
B_0^{-1} y_t = -\Gamma x_t + u_t ,
\]

where

\[
-\Gamma = \begin{bmatrix}
 k & B_1 & B_2 & B_3 & \ldots & B_p
\end{bmatrix},
\]

\[
x_t \equiv \begin{bmatrix}
 y_{t-1} \\
 \vdots \\
 y_{t-p}
\end{bmatrix} .
\]

If furthermore the disturbances in the structural equations are serially uncorrelated and uncorrelated with each other, we can write the SVAR as:

\[
y_t = \Pi' x_t + \varepsilon_t ,
\]

where

\[
\Pi' = -B_0^{-1} \Gamma , \quad \varepsilon_t = B_0^{-1} u_t .
\]
3.2 Vector Stochastic Process with Dummy Variables (VSPD)

VSPD is an expanded version of the basic VAR approach. This method enables us to construct an impulse response function to a period of time when the particular shock appeared. Whereas in VAR framework the construction of the shock is taken from mathematical theory, -it is the standard error of the residuals of the particular variable used over the time period-, in the VSPD we can take the shock more intuitively from a priori economic knowledge (e.g. a certain date when an important tax decision was taken) and calculate the impulse to the variables from the date dummy. Also the model itself is simpler, the main difficulty will arise from the estimation of the impulse responses from the dummy variables and the confidence intervals related to them.

The dummy variables can be identified as follows:

\[
D_{it} = \begin{cases} 
1, & \text{if} \quad t = d_i, \quad (i = 1,2,3...) \\
0, & \text{otherwise}, 
\end{cases}
\]

where the d_i is the date identified for the fiscal policy shock, such as an important tax or spending decision taken on that date.

The model used can be written as follows:

\[
(6) \quad Z_t = A_0 + A_1 t + A_2 (t \geq \text{date of structural break}) + A_3(L)Z_{t-1} + \sum_{j=1}^{k} A_4(L)\psi_j D_{it} + u_t,
\]

where A_0 is the intercept, A_1 the coefficient on the deterministic trend and A_2 is the possible coefficient on the structural break dummy. It has to be noted, that in this research we do not include a structural break. Here the coefficient A_2 would measure the relative difference between the regimes.

In the model (18) A_3(L) is the lag polynomial matrix of the reduced form VAR framework, and the A_4(L) is the matrix attached to the set of dummy variables created. The first of the scalars ψ is normalised to unity and the rest of them hence measure the intensity of the impulses relative to the first period shock.
It is also important to note that:

\[ E(u_t) = 0, \]

\[ E(u_t, u_{t-s}) = \begin{cases} 
0, & \text{for all } s \neq 0, \\
\Sigma, & \text{for } s = 0.
\end{cases} \]

The above means that the error terms are not correlated over time. Hence we can identify the impulse responses from the date dummy approach from the following expression:

\[ (7) \quad \psi_i [I - A_i(L) L]^{-1} A_4(L). \]

In which the \( \psi \) scalar is normalised to I, and the inverted matrix \([I - A_i(L) L]^{-1}\) is calculated separately for each lag, and then multiplied by the vector of the dummy variable \( A_4(L) \), again separately for each lag. This gives the values of the impulse response for each lag for that particular dummy.\(^1\)

### 4. Data

This section will describe the variables\(^2\) (see also appendix 1) used in empirical analysis. The data is quarterly time-series covering the time period 1990 quarter 1 to 2007 quarter 4. All the data is seasonally adjusted and indexed to the price level of the year 2000.

First of all, GDP is increasing throughout the sample apart from the break in the early 1990s. When the unit root test was carried out firstly covering the whole time period, and including both an intercept and a trend, we could reject the null hypothesis of unit root at the 10%-significance level, but not at 5%-level. However, when the sample was adjusted to exclude the break in the early 1990s we could not reject that null hypothesis.

\(^1\) Impulse responses were constructed using the programme R. Code is available from the authors.

\(^2\)
Using the Akaike Information Criteria, the optimal lag length for the test in the first case was found to be 4, and in the latter case 6. The slow decay of the autocorrelation in the correlogram of the series indicates that there actually seems to be a unit root in the series. This was done to the whole sample, and therefore we can conclude that the GDP variable is integrated of order one I(1).

The investment on fixed capital is stagnant until the year 1997, from where it has an upward direction. Hence it can be said, that investment was affected by the depression even after the turning point in 1994. When the unit root test is carried out to this series, the optimal lag length was 1. We cannot reject the null hypothesis of a unit root at 5%-level, and when this test is compared to the correlogram, we conclude that this series seems to contain a unit root.

Government Expenditure will show the total spending of the Finnish government throughout this period. This variable is one of the two fiscal policy variables considered in this analysis. Apart from the major break in the early 1990s, the public expenditures started growing in late 1993, early 1994. Since then it displays significant growth, and has a major peak at the year 2000 quarter 4. When this series was tested for a unit root with Augmented Dickey Fuller test at 5%-level, the unit root cannot be rejected with the whole sample, but is rejected, when the time period is limited to 1994-2007. The test was carried out with an intercept and a trend in both cases. The correlogram displays the same character in both cases, the autocorrelation decays slowly, and the partial autocorrelation has a major peak at lag 1 and then disappears. Therefore we conclude, that this seems to be I (1) for the whole period, but when the initial depression is considered, the series seems to be stationary.

Total Public Revenue has a major difficulty in that, the tax revenues (and other public revenues) are recorded only at the end of the tax year (December in Finland). Hence this series is actually annual in nature, but was interpolated to be quarterly, such that every yearly value was taken to be the value of every quarter in that particular year. This sample period extends only to the year 2006, so we lose 4 observations due to that as well. The Total Public Revenues were stagnating in the early 1990s, and facing even a decline. The turning point of this series was the year 1993, after which there is a clear increase in revenues every year. When this series was

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2 Tables and test statistics are not presented in the paper. These are available from the authors.
tested for a unit root, we found that the null hypothesis of there being one cannot be rejected at 5%-level. The average annual growth of public revenues is 4 per cent in the period described above, making it significantly more than the average growth of the public expenditures. Therefore it would seem, that there has been a policy of balancing the budget deficit, which was acquired during the recession.

Alongside with Private Investment, private consumption is used to determine how fiscal policy affects private sector economic behaviour. The depression in the early 1990s shows a clear decline in consumption, but after 1993 it has been increasing every year. The unit root test for this variable at first sight would indicate that the null hypothesis could be rejected at the 10% significance level, but not at 5%, using Akaike Information Criteria with a trend and intercept. However, when the correlogram is inspected, the autocorrelation for the series is persistent; and indeed using the Schwarz Information Criteria we cannot reject the null hypothesis of a unit root at 5%-level.

Our conclusion is that we can use levels in our empirical specifications following the arguments stated in Sims et al.(1990).

5. Empirical Specifications

The model used is the VAR in levels. This framework imposes the stationarity condition on the variables and from that we obtain the impulse responses we use to analyse the effects of government policy. The benchmark model in this case is the Structural VAR. After these results are shown, we will present the results from the VSPD-Model, and compare the two with each other.

5.1. SVAR Results

The variables used in this framework are: Total Public Revenues (TPR), Government Expenditure (G), Private Investment (I), Private Consumption (C) and Gross Domestic Product (Y). The model in the reduced form looks as follows VAR (5):
\[
\begin{bmatrix}
TPR_t \\
G_t \\
I_t \\
C_t \\
Y_t
\end{bmatrix}
= 
\begin{bmatrix}
c_1 \\
c_2 \\
c_3 \\
c_4 \\
c_5
\end{bmatrix}
+ 
\begin{bmatrix}
\beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\
\beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\
\beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \\
\beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} \\
\beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55}
\end{bmatrix}
\begin{bmatrix}
TPR_{t-1} \\
G_{t-1} \\
I_{t-1} \\
C_{t-1} \\
Y_{t-1}
\end{bmatrix}
\]

The ordering of the equation above is also the ordering used for the Cholesky factorisation of this model, when the impulse responses are calculated.

The intuition for using the ordering above is as follows: The Gross Domestic Product is the sum of all economic activity (depending on the method of calculation) and hence is dependent on the current values of all variables, and will be placed last. Total Public Revenues is an annual variable, where the revenues are recorded at the end of the tax year, and hence can be seen as the least sensitive to changes in the current values of the other variables. And since the tax variable is placed first, the model assumes that it affects all of the other variables in the same period. This is logical because the private sector agents most likely change their behaviour, when they observe the state of the government budget.

The public expenditure variable is placed second, so the model assumes, that only the tax variable affects this variable in the same period, but the expenditure variable affects investment and consumption in the same period. The choice in the ordering of investment and consumption was decided to be investment first, and consumption after this, since a large part of fixed investment decisions are considered sunk, and cannot be instantaneously reversed, whereas major part of consumption patterns can be. There is some room for interpretation within these two however, and when the ordering of these variables was changed, the impulse responses were almost identical.\(^3\)

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\(^3\) Even though some of the orderings in this case could be disputed, it has to be underlined, that even when the ordering was changed, that impulse responses displayed a rather similar format, except in...
When the Cholesky ordering is imposed on the system, the equations of current values looks as follows:

\[
\begin{bmatrix}
TPR_i \\
G_t \\
I_t \\
C_t \\
Y_t
\end{bmatrix}
= \begin{bmatrix}
\beta^*_1 & 0 & 0 & 0 & 0 \\
\beta^*_1 & \beta^*_2 & 0 & 0 & 0 \\
\beta^*_1 & \beta^*_2 & \beta^*_3 & 0 & 0 \\
\beta^*_1 & \beta^*_2 & \beta^*_3 & \beta^*_4 & 0 \\
n & n & n & n & n
\end{bmatrix}
\begin{bmatrix}
TPR_i \\
G_t \\
I_t \\
C_t \\
Y_t
\end{bmatrix},
\]

where the \( \beta^* \) coefficients are the results from the Cholesky ordering.

As it was discussed above, the model states that two lags are sufficient so summarise all autocorrelation in it. When the autocorrelations of the system were investigated, the system with 2 lags has very little autocorrelation exceeding the 95% confidence interval. When the system was investigated there was always some autocorrelation present in the residuals and adding more lags to the framework did not improve the situation. This casts some shadow to the analysis, but when we consider the effects of the ordering of the variables and all other factors outlined above we can say that the impulse responses obtained from this framework are robust.

The impulse responses of investment and consumption from one standard deviation shock to tax and expenditure are presented in figure 1.
Figure 1. Investment and Consumption responses to Public Expenditure and Public Revenue shocks

According to these impulse responses one standard deviation shock to TPR (left-hand column) leads to increase in private consumption (or precedes increase in private consumption). This is shown in the bottom left diagram. Investment displays a similar pattern, at first the effect is not statistically different from zero but this reverses when time passes by. Both the investment and consumption responses are persistent, and the effect does not disappear even after 16 quarters, 4 years. The public expenditure shock (right-hand column) has a negative effect on both private investment and consumption, but as the graphs indicate, the 95% confidence intervals include the zero-hypothesis, and it cannot be said with absolute certainty, that they would be statistically different from zero even in the long term. The impulses were adjusted to degrees of freedom, and the confidence intervals were calculated using the asymptotic standard errors.

However, if we consider just the shape of the impulses, it seems that increase in government expenditure actually crowds out both private consumption and investment and is in line with the classical view of economics. However, the increase in the private sector activity as a response to positive tax shock (or a policy that increases public sector revenues) is more in line with Keynesian view. At this point we need to be
careful of the causality analysis however. It is still possible, that the increase in taxes is due to increased investment and consumption, and not vice versa, even though the impulses would indicate this. In other words, in real life increase in private investment and consumption and public sector revenues occurred at the same time, and the results are simply due to that fact without an analysis of cause and effect. Indeed, it is more intuitive to think that public revenues increase due to increased economic activity rather than private sector activity increasing due to higher public sector revenues. It is generally thought that increases in taxes decreases economic activity.

The response of public sector revenues to one standard deviation shock to private sector variables are shown below.

Figure 2. Public Sector Revenue response to Investment and Consumption shock.

As can be seen from the graphs above, Total Public Revenues increase after a positive investment and consumption shocks, although the results cannot be assumed to be non-zero with absolute certainty. There is one more aspect to be considered in this analysis nevertheless.

The Total Public Revenue variable consists of taxes (income, capital gains etc) in both the state and the different municipalities. It also incorporates the revenues from selling the public sector ownership (privatisation) and the dividend income from the government ownership in private or semi-private companies. Therefore the positive shock to the public revenues could also be seen as a positive income stream due to
privatisation. If this was the case, it could be argued, that the increase in private investment and consumption after the positive public revenue shock was due to privatisation of the economy. In this case this result would be intuitive and in line with new classical economics, which argues, that the less government intervenes with the economy, the better. So we conclude, either we cannot draw inference of causal relationships in those two impulse responses, or they are in favour of the neoclassical view. These results are line with the ones received by Burnside et.al. (2004) and Mountoford and Uhlig (2005).

5.2 VSPD Results

The following results show the impulse responses from the shocks to the date dummy variables, where we observed a Public Revenue shock in the first quarter of the year 2000, and an expenditure shock in the fourth quarter in that year. Note that it is extremely difficult to estimate the confidence intervals when utilising the VSPD approach.
The graphs above show the effect of the first quarter of the year 2000 to the variables. In this quarter the double taxation of dividends was changed such that it is only the firm paying the capital gains tax and the person receiving the payment does not have to pay a tax on it (Economic Survey, Ministry of Finance, 2000). This is one factor behind choosing this date as a dummy for this approach. This resulted in positive income stream to the Public Revenues, and hence this quarter is also statistically significant as a dummy variable.

The Public Revenue is positive at its shock, which is intuitive, and then remains positive for several periods. The apparent explosion to negative infinity is due to the
mathematical construction, and hence can be ignored. Also it has to be noted that the magnitudes of the variables do not provide meaningful analysis in this case, but the shapes do.

Government Spending curve is negative after the Public Revenue shock. In this case the intuition could be that an increase in Total Public Revenues could mean that there is less need for the government support for regional authorities. Investment curve is initially negative after the Revenue shock, but then turns positive after 3 periods and remains positive. This is similar to the benchmark model, an increase in the public sector revenues seems to increase private investment. But we do need to remember that this effect might not be causal. It could well be, that a good economic era is increasing both investment and public revenues simultaneously. As we do not consider the magnitudes, we do not draw inference from them.

Private consumption has a near-zero initial response, then turns negative, and remains negative for several periods. This is clear evidence for the crowding out effect. It has to be noted however, that in the model, as in real life, that the explosion to negative infinity is not possible. This is a different result to the one obtained in the benchmark-model. The Public Revenue shock (larger-than-expected public revenues) seems to coincide with lower Private Consumption. This is more in line with the Classical view. When the causality mentioned in previous paragraph is taken into account, it actually seems more plausible that increasing public revenues decreases private consumption due to decreased disposable income.

GDP reacts initially positive to the Revenue shock, and turns negative after about 8 periods. This result is similar to the benchmark model in the early period, since in that GDP also increased in the framework due to a public revenue shock. As the impulse response is exploding, we do not consider the large negative values. Hence we can conclude, that the Public Revenue shock has a very similar impact to the economy in the dummy variable case as in the Benchmark model. And as in the benchmark, it is intuitive that increasing Public Revenues does not cause increase in private sector activity, but rather they coincide at the same time, and the causality might actually be the reverse.
The Government Expenditure shock has initially a negative effect on Public Revenues, and after that remains on a lower level. It could be that increase in Government Expenditure crowds out private sector activity, and hence also the revenues will be smaller. The initial negative value of the impulse can be explained by the fact that the impulse is constructed from the date dummy, which includes all variables.

Government Spending is positive after the Spending shock and remains on the higher level. It seems that an increase in spending is followed by a permanent higher level of spending. So when government increases the expenditures, they are not temporary, but will stay on the higher level. This could be for example increases in income transfers, which stay on a higher level after increases.
Investment reacts initially positively after the Spending shock, after which it turns negative and remains on the negative level. This is clear evidence for the crowding out effect as in the benchmark model. Initially the increase in Government Expenditure could be seen in the investment series, since inevitably some increases will be put to investment. After the initial effect the crowding out starts to take effect.

Private consumption reacts negatively to the Expenditure shock, and remains on a negative level after this. This has no asymptotic convergence to the initial level. It indeed seems that Government Expenditure has an adverse effect on private consumption. We can ignore the magnitude of the impulse, but it is still clear that that crowding out takes place.

GDP is initially near zero, and after the expenditure shock reaches a negative first impact, and then slowly converges to a new level below the original value. This is a similar result as in the benchmark model, although the initial impact is different. It has to be noted that the initial impact in this case is due to the construction mechanism of the responses. So we can conclude that increase in Government Expenditure has a negative effect on the GDP series, and in this sense the classical view seems to be stronger.

6. Conclusions

The two models applied give similar results. Fiscal policy shocks do have an effect on the economic activity of Finland when the time period 1990 – 2007 is investigated. Both models use the VAR-framework with two lags, an intercept and no trend. In the benchmark model the impulse responses are obtained from the mathematical construction of the residual series, and in the dummy variable approach they are obtained from the observed dates. In the year 2000 quarter 1 we observed a Public Revenue shock, and in the same year in quarter 4 we observed a Government Expenditure shock. In the dummy variable case the impulse comes from all the variables, and can therefore affect the analysis.

However, when we bring the two models together we get an image of how the private sector activity responds to changes in public sector policies; fiscal policy
shocks, when these particular methods are applied. Increases in Public Sector revenues seem to have a positive effect on Investment and GDP using both the models. Private consumption seems to be positive in the Benchmark case and negative in the dummy variable approach. However it would be counterintuitive to claim that increased taxes would lead to increases in private sector activity and therefore it seems more plausible, that the two coincide. It can well be that a good economic era causes both the increases in Public Revenues and private sector activity.

From the dummy variable approach it seems that the private sector variables react slower to the revenue variable than the expenditure variable, which is quite intuitive. Government Expenditure decisions are a lot more transparent to the public than the total Public Sector revenues. This enables economic agents to react to it quicker. From both the models it seems that increase in Government spending crowds out all the three private sector variables, and the effect takes place sooner than with the Revenue variable. This is clear evidence for the crowding out effect. Hence we conclude that Government Expenditure clearly reduces private sector activity hindering its economic performance. Public Revenues would initially imply to increase it, but intuitively this does not seem plausible. When taking into account, that VAR-frameworks are not used to infer strict causal relationships, we conclude that these two coincide, rather than the Revenues would cause the good private sector activity. Therefore it seems that the Classical view of economics is more accurate in describing Finnish economy in the period 1990-2007.

**Bibliography**


Appendix 1

Time Series

Gross Domestic Product

Gross formation of fixed capital

Government Expenditure

Total Public Revenues

Consumer Price Index, 2000=100

Inflation

Private Consumption
1/2009  Mika Kuismanen – Ville Kämppi  The effects of fiscal policy on economic activity in Finland. 2009. 26p