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A survey of the effects of
discretionary fiscal policy*

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The views expressed in this report are those of the author and do not necessarily represent those of the Swedish Fiscal Policy Council.

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Abstract

Discretionary fiscal policy is undergoing a revival. Recently, the US government has implemented a fiscal stimulus package. Also, prominent economists and the IMF are pleading in favour of fiscal stimulus. In this paper we survey the theoretical and empirical literature on the effects of discretionary fiscal policy changes through taxes and government spending. We also provide some of our own evidence. Most empirical evidence indicates that a fiscal expansion raises output and consumption and deteriorates the trade balance. Our own evidence, though, suggests that the stimulating effect is weaker and the trade balance deterioration is larger for more open economies. Keynesian-type models with imperfections such as for example credit restrictions seem most in accordance with the empirical evidence. Does this imply that an active fiscal stabilisation policy is desirable? Certainly not: there exists substantial uncertainty about the size of the effects of fiscal policy, the long-run cost of a short-run expansion may be high, a government spending increase aimed at stabilisation may be wasteful or create long-term obligations, there exists uncertainty about the state of the economy and there is a substantial time lag before a policy change is implemented. It is best to impose credible fiscal restrictions and have fiscal policy focus on medium-term balance or surplus, leaving enough room for the automatic stabilisers to do their work. That leaves monetary policy free to pursue price stability and stabilize the economy.

1 Introduction

Until the early eighties fiscal policy was widely regarded as a useful tool for economic stabilization. In response to the oil shocks of the seventies many governments relied on monetary and fiscal expansion. However, active fiscal policies did not prevent the widespread increases in unemployment, while at the same time they resulted in high deficits and rising public debts. The demonstrated ineffectiveness of fiscal policies has made many economists sceptical about its usefulness as a tool for macroeconomic stabilization. Nevertheless, politicians continue to regard an active fiscal policy as an instrument for solving their economic problems. Quite recently, Japan has implemented (without success) large fiscal expansions to drag its economy out of its liquidity trap. Moreover, after they secured membership of the euro area, a number of countries relaxed fiscal policy, sometimes implementing tax cuts (such as in the case of Germany and France). In fact, the US will implement a 150 billion (roughly one percent of the US gross domestic product) fiscal stimulus package this year, of which two-thirds are intended for tax rebates to private individuals and one-third for tax cuts for firms. The fiscal stimulus of the US economy has been supported by prominent economists, such as Lawrence Summers and Martin Feldstein (The Economist, 2008). Also the IMF, normally a promotor of fiscal austerity, has applauded this fiscal expansion.

While fiscal expansion may work in simple textbook theory, it often fails in reality. This article discusses both from a theoretical and an empirical perspective the effectiveness of various types of fiscal expansion under different circumstances. We focus mostly on the short-run consequences of fiscal expansions, because the main question we are interested in is to what extent fiscal policy is able to stabilize the business cycle.

While the consequences of monetary policy changes have been widely studied in the literature and there is substantial consensus about their effects, we know relatively little about the effects of fiscal policy changes. We are not even sure about the direction of the responses of some variables, let alone the magnitude of those responses. This may not be surprising in view of the large variety of different fiscal instruments available. Fiscal expansions may take the form of a reduction in net taxes (taxes minus transfers) or an increase in government purchases (roughly, the sum of government consumption and government investment). In turn, each of these types of instruments can be applied through a variety of different measures. However, quite recently, and armed with the instruments used for monetary policy analysis, academic researchers have regained interest in the empirical study of the effects of fiscal policy changes.

The remainder of this paper is structured as follows. In Section 2, we review the theoretical predictions of the consequences of fiscal expansions for the macroeconomy, both in closed and open economies. Section 3 reviews the empirical evidence from the literature and presents some of our own estimates. Again we distinguish between closed and open economy effects of fiscal policy. Section 4 introduces monetary policy and explores its interactions with fiscal policy. Section 5 briefly discusses some evidence on the actual behaviour

of fiscal authorities to see whether they have been affected by the EU fiscal restrictions. This is relevant for Sweden, should it at some point join the eurozone or should it self-impose some fiscal constraint. Section 6 concludes this paper with a discussion of the practical pros and cons of using fiscal policy for cyclical stabilization.

2 Theory

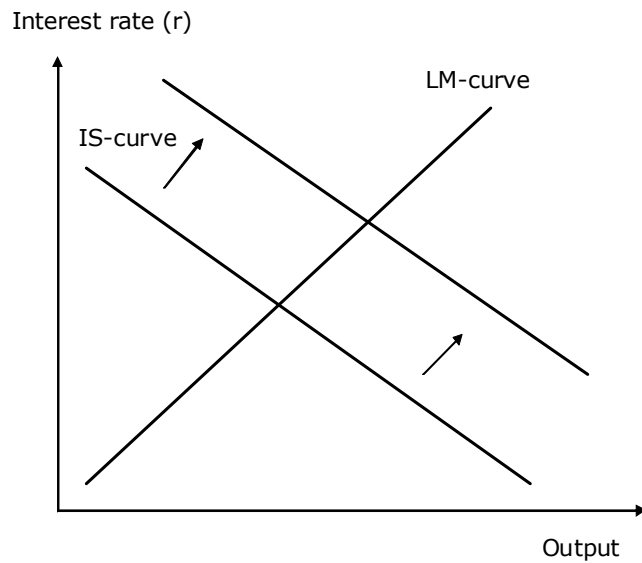
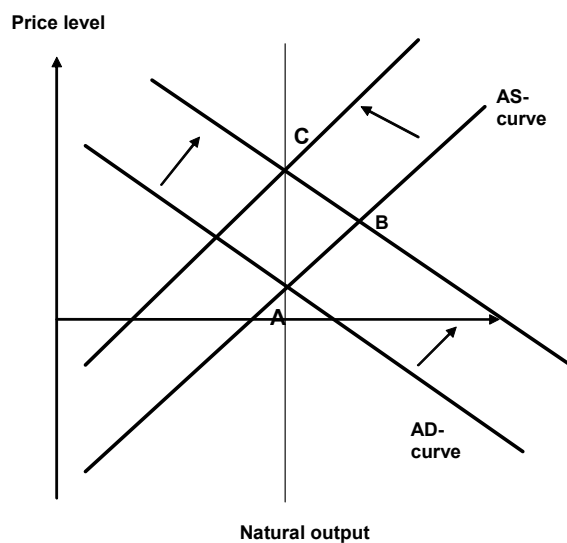
Not surprisingly, what theory says about the economic consequences of changes in fiscal policy depends much on the specific theoretical framework that is adopted. We are mostly interested in the effects of fiscal expansions on output and consumption. However, we shall also briefly address the effects on other variables, such as investment and employment, which helps us to better understand the mechanisms through which fiscal policy affects the economy. We focus on *discretionary* fiscal expansions. These are fiscal expansions that are the result of “active” policy decisions and that are not systematically linked to the business cycle or other variables such as inflation.

In discussing the mechanisms we will distinguish between a closed economy and an open economy. For the open economy we are also interested in how fiscal expansions impact on specific “open economy” variables, such as the trade balance and the real exchange rate.

2.1 Fiscal policy in models of closed economies

The IS-LM model

Basic textbooks usually teach us fiscal policy in the context of the IS-LM model (see Figure 1). As this is a short-run model, prices are assumed constant. Short-run price rigidity is a universal empirical phenomenon and so this assumption is reasonable. The IS-curve is formed by the combinations of output and the interest rate for which the goods market is in equilibrium. An increase in the interest rate reduces investment and a fall in output is needed to restore the goods market equilibrium. The LM-curve is the (upward sloping) set of combinations of output and the interest rate for which the money market is in equilibrium. An increase in output implies more transactions in the economy and boosts the real demand for money. With the nominal money supply and the price level both fixed, the real money supply is fixed, and an increase in the interest rate is needed to reduce the real money demand to its original level and restore equilibrium in the money market. An increase in government purchases or a reduction in net taxes raises output for any given level of the interest rate and shifts the IS-curve to the right. The economy settles at a new short-run equilibrium characterised by a higher level of income and a higher interest rate.

Figure 1. Fiscal expansion in the IS-LM model**Figure 2. Fiscal expansion in the AD-AS model**

The IS-LM model forms the demand side of the economy for given price level. An increase in the price level produces an inward shift of the LM-curve, which implies equilibrium with lower output. The output-price combinations obtained in this way form the aggregate demand (AD) curve. Combining the AD-curve with the short-run aggregate supply (AS) curve yields Figure 2. The AS-curve depicts how much producers are willing to supply at a given price level. The AD-AS framework abolishes fixed prices, but allows for sluggish price

adjustment. A fiscal expansion shifts out the AD-curve and produces a new short-run equilibrium (point B) with higher output and a price level that exceeds the one that was originally expected by wage setters. The AS-curve starts shifting upwards and the price level starts rising. Eventually the economy ends up at the new long-run equilibrium (point C) with output at the natural level and a permanently higher price level.¹

Fiscal policy effects in intertemporal models with optimising individuals

The AD-AS model neglects important intertemporal aspects of fiscal expansions. A deficit-financed increase in government spending or a tax reduction not matched by a spending reduction results in additional public debt accumulation and requires higher tax payments or spending reductions in the future. To the extent that taxes are distortionary, potential short-run benefits of the fiscal expansion need to be traded off against future contractions.

More recent literature analyzes the consequences of fiscal policy shocks in intertemporal models with micro foundations. That means that these models are based on a description of the optimizing behaviour of individual consumers and firms. Table 1 provides a systematic overview of the macroeconomic effects of an increase in government purchases in different settings.

Table 1. Predicted effects of a positive government purchases shock in a closed economy

	Y	C	w	L^s	L^d	L
Neoclassical	↑	↓	↓	↑	0	↑
Deep habits	↑	↑	↑	↑	↑	↑
NK – Nominal rigidities	↑	↓	↑	↑	↑	↑
NK – Rule-of-thumb	↑	↑	↑	↑	↑	↑

Note: This table is based on Pappa (2006). The symbols and mnemonics are as follows: Y = output, C = consumption, w = real wage, L^s = labour supply, L^d = labour demand, L = employment, NK = New-Keynesian.

In their seminal contribution, Baxter and King (1993) conduct a number of fiscal policy experiments in a standard neoclassical model. Taxes are lump sum, hence, for a given path of government expenditures the time profile of tax revenues does not matter. Consider a temporary or permanent increase in government consumption. The discounted value of future tax payments rises, which generates a negative *wealth effect* and induces individuals to reduce both private consumption and leisure. The labour supply increases, hence real wages

¹ During the transition the economy may oscillate around the new long-run equilibrium and the AD curve may shift further. Also the equilibrium may be reached after one period if agents are rational and foresee the eventual outcome. We abstract from these aspects here.

fall and total output expands. Moreover, the rise in employment raises the (marginal) productivity of capital and induces more private investment. Obviously, the described effects are stronger when the spending increase is permanent instead of temporary.

A permanent increase in government consumption is able to generate an output multiplier higher than unity in both the short and long run. In the long run, it is the effect of the higher employment level on the capital stock that generates the high multiplier. In the short run, the higher investment needed to build up the higher capital stock boosts labour input.

If the additional government consumption is financed by distortionary taxes, labour supply and output rise by less, or may even fall as Fatas and Mihov (2001) show in a closely related experiment.

Raising public investment instead of public consumption produces additional positive effects on the economy by boosting the productivity of capital and labour. Private consumption may then even increase (with some lag).

Burnside et al. (2004) introduce a number of features into the neoclassical model that produce more realistic responses to shocks in government purchases. In particular, they assume that there are costs to changing the capital stock, while there is “habit persistence” in consumption in the sense that individuals want to maintain a given consumption level. This way, changes in output, consumption, employment and taxes exhibit a more drawn out (and, therefore, realistic) pattern after government purchases increase.

The most distinguishing feature of the neoclassical model is that it generally predicts a fall in private consumption following an increase in government purchases. Empirical analysis (discussed below) tends to find the opposite. Hence, the private consumption response provides a possible test to discriminate between different models on the basis of whether they provide a suitable description of the economic consequences of fiscal policy changes.²

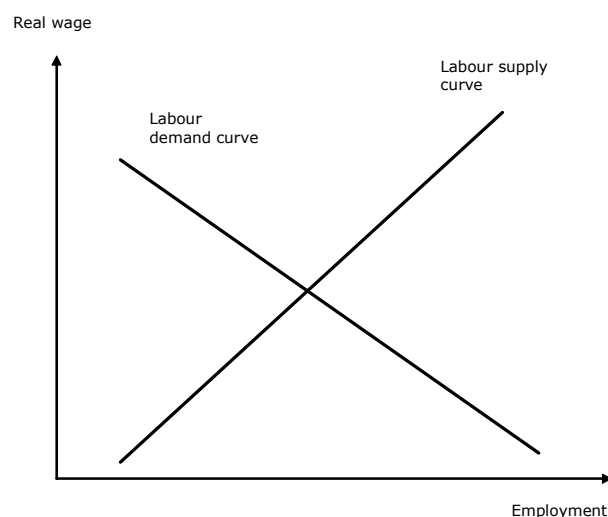
The main obstacle in reconciling theory with the empirical effect of government purchases on private consumption is the rightward shift of the labour supply curve (see Figure 3), which for a given labour demand curve produces a lower wage and thus lower consumption spending. Hence, to have a positive effect on consumption it is necessary (though not always sufficient) to have a mechanism that also shifts the labour demand curve to the right.

One mechanism is found in Devereux et al. (1996) where more government spending raises the equilibrium number of firms in intermediate goods sectors characterized by increasing returns to specialization. The productivity of all firms in the sector rises and the resulting outward shift in the labour demand by firms may offset the negative wealth effect described above and produce a higher real wage. The higher real wage may result in higher consumption,

² There are ways, though, to reconcile the neoclassical model with a positive private consumption response to a government purchases increase. Linnemann (2006) provides an example based on the way utility from private consumption and leisure is specified.

thereby reproducing the empirical positive effect on consumption after an increase in government purchases.

Figure 3. The labour market



Another mechanism relates to the “deep habits” introduced by Ravn et al. (2006) into a model with monopolistic competition in goods production. Monopolistic competition refers to a setup in which a large number of firms produce goods that are not perfectly substitutable. The price of an individual good can thus differ from the price of other goods. “Deep habits” refer to habit formation about the amount of consumption of individual goods. The model implies that demand for a specific good is composed of a price-elastic component (as in standard monopolistic competition models) and an inelastic component that does not react to price changes. An increase in aggregate demand raises the weight of the elastic component, inducing producers to lower prices. On the one hand, an increase in government purchases produces the standard negative wealth effect, resulting in a higher labour supply. On the other hand, because aggregate goods demand rises with the fiscal expansion, the prices of goods are lowered. Therefore, also private demand for goods rises, *ceteris paribus*. The increased demand for goods implies more demand for labor to produce those goods. In turn, this has a positive effect on the real wage. Overall, the simultaneous shifts of the labour supply and labour demand curves to the right may result in a higher real wage.

Alternatively, a number of contributions try to remedy the negative consumption effect of government purchases by introducing nominal rigidities into a

New-Keynesian framework with monopolistic competition.³ Nominal rigidities could take the form of pre-set prices for products. It will then take time for prices to respond to changes in the economy. Such a framework has originally been used to focus on the effects of monetary policy, but has recently become a vehicle for studying fiscal policy as well. As in the neoclassical model, in the New-Keynesian model with nominal rigidities an increase in government purchases generates a negative wealth effect owing to the rise in tax payments. As before, this puts downward pressure on consumption and raises the labour supply. However, with sticky prices, and because the price of output exceeds the marginal cost under monopolistic competition, an increase in the demand for goods will be met with an increase in the supply of output: at the given price level, firms are prepared to produce the additional output as long as the price exceeds the marginal cost. Hence, the demand for labour increases after the government spending shock and this puts upward pressure on the real wage rate.

Linnemann and Schabert (2003) study shocks to government purchases in a New-Keynesian framework where they pay explicit attention to the type of monetary policy rule followed by the central bank. One type of rule is a so-called Taylor rule. Under this rule, the central bank sets the short-run nominal interest rate in response to expected inflation and the expected output gap. This rule is of high practical relevance, as modern central banks are often believed to follow such a rule. It is important that inflation reacts sufficiently fiercely to expected inflation: otherwise the economy may become unstable. Indeed, with a Taylor rule the responses of the economy to the fiscal shock are roughly as just described.

Even if the positive labour demand effect dominates the labour supply effect, and the real wage rises, this does not guarantee a (substantial) positive effect on consumption. The reason is that consumers have an incentive to save at least part of the higher real wage for the future. Knowing that the rise in government purchases will also require higher future tax payments, consumption may still fall. Some additional imperfection may be needed to produce higher consumption.

Therefore, Galí et al. (2007) assumes that there is a group of “rule-of-thumb” consumers who consume their entire disposable income (income minus taxes) and, thus, do not save. Hence, these consumers spend the entire increase in their real wage after a government purchases shock in the New-Keynesian model on current consumption. Provided that this group of consumers is sufficiently large, this positive effect on current consumption may overturn the negative consequences for consumption of the wealth effect.

Callegari (2007) proposes an alternative mechanism in the context of a New-Keynesian model and instead assumes a group of so-called “buffer stock” consumers. These consumers maintain a buffer of assets in order to avoid that

³ Van der Ploeg (2005) provides a critical overview of the ability of New-Keynesian models to account for key macro-economic facts.

consumption drops to zero in any single period (because of some restriction on borrowing against future income). As a result, these individuals feature a negative relation between asset holdings (“cash-on-hand”) and consumption. When assets are too low for some reason, they replenish assets by reducing current consumption. As before, higher government purchases produce a negative wealth effect. At the same time, with monopolistic competition and sticky prices, labour demand rises, thereby putting upward pressure on wages. The wage rise raises cash-on-hand and induces buffer stock agents to consume more. This effect may dominate the negative wealth effect.

2.2 The open economy

Like other EU countries, Sweden is best characterized as an open economy. Hence, the consequences of fiscal expansion for Sweden would best be studied in an open-economy framework. Such a framework not only allows us to explore the effects of fiscal policy changes on variables relevant for internal balance (output, consumption and employment), but also on the trade balance and its components, the real exchange rate and the terms-of-trade.

The Mundell-Fleming model

The basic textbook treatment of fiscal policy in the open economy is the Mundell-Fleming (MF) model, which was developed in the early sixties and which is the open-economy counterpart to the IS-LM model. The model makes a distinction between flexible and fixed exchange rates. Moreover, one can use it to study the effects of policy under perfect and imperfect capital mobility. We assume perfect capital mobility, because this is the reality for industrialized economies nowadays. Again, the model describes the short run and assumes a fixed price level. A fiscal expansion shifts the IS curve out, putting pressure on the domestic interest rate r to rise above the foreign interest rate r^* . There will be an inflow of capital leading to excess demand for domestic currency on the foreign exchange market. Under a flexible exchange rate regime, the domestic currency appreciates, thereby undermining the competitive position of the country. Net exports fall and the IS curve shifts back to its original position, leaving output and consumption unchanged (Figure 4a). With a fixed exchange rate, the pressure on the exchange rate is eliminated with an automatic expansion of the domestic nominal money supply which shifts the LM-curve to the right until it intersects the IS-curve at the line $r = r^*$. Equilibrium output (and consumption) rises, while net exports are unchanged (Figure 4b).

Varying the price level in the Mundell-Fleming model, one again derives an aggregate demand curve, which combined with a short-run aggregate supply curve yields a diagram similar to Figure 2. A fiscal expansion leaves the aggregate demand curve unchanged under a flexible exchange rate, but shifts it to the right under a fixed exchange rate. Then, an adjustment mechanism starts that is similar to the one discussed above.

Again, this open-economy model is not based on micro foundations and the future consequences of a fiscal expansion in the form of debt accumulation

and higher taxes are neglected. We now turn to the discussion of models that do take these aspects into account.

Fig. 4a. Fiscal expansion in the Mundell-Fleming model with a lexible exchange rate

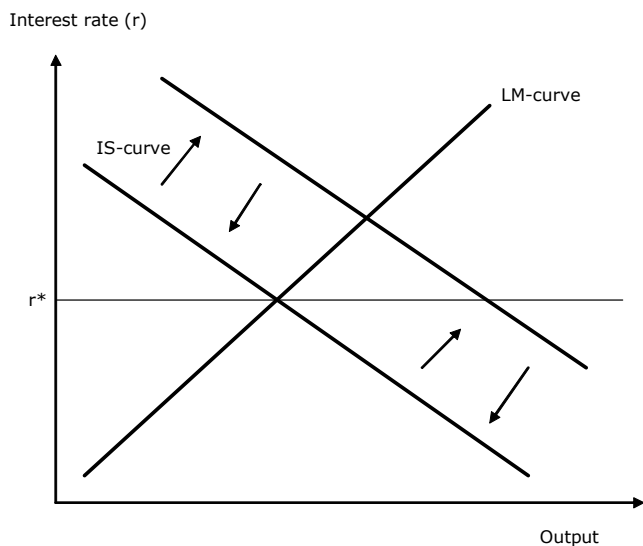
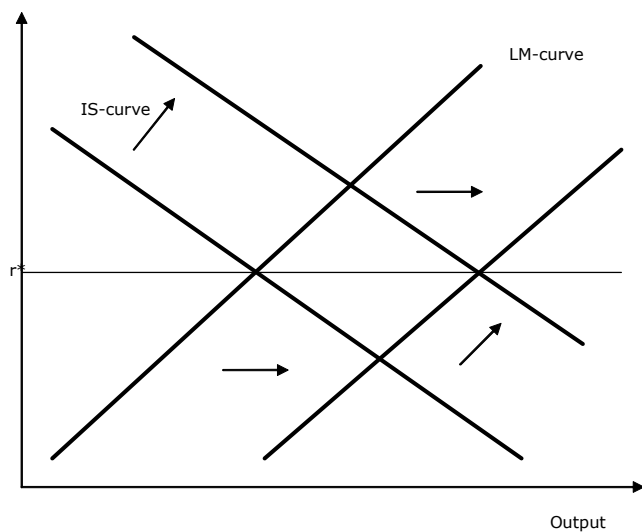


Fig. 4b. Fiscal expansion in the Mundell-Fleming model with a fixed exchange rate



Fiscal policy effects in open-economy intertemporal models with optimizing individuals

As before, we are interested in the effects of discretionary fiscal expansions on output, consumption and investment. However, with the move to the open economy, we are now also interested in the consequences of such expansion on exports and imports and thus on the trade balance. In this regard, the question is whether the twin deficits hypothesis holds, which says that a fiscal expansion produces a simultaneous deterioration in the government budget balance and the trade balance.

A number of determinants of the effects of discretionary fiscal policy under a closed economy are also relevant for the open economy. These are the distinction between a neoclassical framework and a New-Keynesian one with nominal rigidities, the presence of credit restrictions or “buffer-stock” consumers and the degree of persistence of a government purchases shock.

However, the move to an open economy also introduces other relevant factors for the consequences of fiscal shocks. One is whether the economy is small or large. If it is small, it has no influence on conditions in the world market (such as the interest rate). A second relevant factor concerns the degree of international “asset market completeness”, that is the extent to which asset markets allow for international risk sharing. Under internationally complete asset markets, there exists a sufficiently wide range of available assets that risks can be perfectly shared between countries. Of further importance are the degree of openness of the economy (usually measured by the shares of exports plus imports over GDP), the elasticity of substitution of domestic and foreign products (that is, how easily do consumers shift away from domestic to foreign products if the relative price of domestic products rises) and (related to this) the degree of “home bias” in government purchases (that is, what is the relative weight of domestic products in government purchases).

It may be best to take as a starting point an increase in government purchases in a neoclassical open economy setting, such as Baxter’s (1995). The economy (denoted by “Home”) is of non-negligible size relative to the rest of the world (“Foreign”). Further, there is a single good consumed everywhere. In other words, Home and Foreign products are perfect substitutes. As before, anticipating higher future tax payments, individuals start to save and work more now and to consume less. The additional labour supply again raises the productivity of capital, thereby stimulating investment. Moreover, the enhanced claim of the government on resources raises the world interest rate, which deepens the fall in consumption (and leisure), but also raises its subsequent growth rate. With complete international asset markets, the fall in consumption is perfectly shared with Foreign. As a result, also the output and investment responses in Foreign are the same as in Home. The fall in public saving due to the rise in government purchases and the increases in private saving and investment produce a deterioration of the trade balance.

With (sufficiently) incomplete international asset markets, the entire wealth effect is borne by Home. Hence, labour input in Home rises by more than under complete markets and the fall in the real wage will be larger. Labour

input and wages in Foreign also move, but by less than under complete markets, because now they are only influenced by the world interest rate effect. For this reason, Foreign investment now falls.

Also the size of the Home economy is relevant. If the Home economy is very small relative to the “rest of the world”, then perfect risk sharing under complete asset markets implies that the effects of the government purchases shock on the Home economy are negligible (the entire world shares in the effects). Because the world interest effect is now negligible, with incomplete asset markets, the rest of the world is completely unaffected, while Home bears all the effect of the government purchases shock.

In contrast to Baxter (1995), Corsetti and Müller (2007) assume that Home and Foreign products are only imperfectly substitutable. Hence, it becomes important how government purchases are spent. The authors assume that government purchases are spent entirely on domestic products, an assumption that is generally quite a reasonable approximation of reality. With complete international asset markets the consumption fall after the government purchases increase is again shared with foreigners. However, because the purchases increase falls on Home products, the Home real exchange rate appreciates and international risk sharing implies that the fall in Home consumption will be larger than the fall in Foreign consumption (see the Appendix). Also, the terms-of-trade (the price of Home exports relative to Home imports – which is equal to Foreign exports) improve.

Again investment rises as a result of higher labour supply due to the wealth effect. Now there is an additional positive effect on investment. The reason is that the price of the final goods produced with the additional investment equipment rises relative to the price of investment goods, because these are partly constructed from imported goods that have become relatively cheaper. This stimulates investment. As before, given that the government absorbs more resources, the interest rate also increases which by itself depresses the increase in investment.

The authors also study the role of openness. Openness dampens the fall in consumption, because the real interest rate falls with openness. Intuitively, with better terms-of-trade today, the price of consumption today is relatively low compared to what it will be in the future (when the terms-of-trade has returned to its original value) and the more so, the larger the consumption share on foreign goods. Hence, while the real interest rate (being the price of today's consumption in terms of future consumption) still rises after the shock, it does less so in more open economies. Greater openness thus dampens the negative effect on consumption. Because of the fall in the real interest rate, openness also has a positive effect on the investment response. In addition, investment is positively affected because openness raises the price of final output relative to the cost of the investment good of which a larger part is now imported. Obviously, the consequence of the positive effect of openness on consumption and investment is that the trade balance deteriorates by more after a government purchases shock.

As in Corsetti and Müller (2007), Müller (2006) assumes imperfectly substitutable Home and Foreign products. He pays particular attention to role of the degree of substitutability between Home and Foreign products for the effects of an increase in government purchases. The increase falls entirely on Home products. Hence, it raises the price of Home products relative to that of Foreign products. This real exchange rate appreciation causes an “expenditure switching effect”: with Home products becoming relatively more expensive, Home and Foreign consumers switch towards consuming Foreign products. This switch will be larger the higher is the elasticity of substitution between Home and Foreign products. Thus, with a higher substitution elasticity, the positive effect of the government purchases increase on output will be smaller, while the negative effect on the trade balance will be larger. Monacelli and Perotti (2006) produce similar results with their model.

In sum, we conclude that the less complete are international asset markets, the larger is the effect of the government purchases shock on the domestic economy. In reality, of course, international asset markets are always incomplete to some extent, but the question is how different the outcomes are quantitatively from those under perfect international risk sharing. We conclude also that if the economy is smaller, the effect of the government purchases shock is also smaller, at least if there is some international risk sharing. Openness dampens the fall of consumption and stimulates investment after the shock. It probably has a positive effect on the output response. Finally, a higher degree of substitutability with foreign products is likely to have a negative effect on the output response and lead to a larger trade balance deterioration.

Further work

Fiscal expansions that are designed to stimulate the economy may have different effects on different sectors of the economy. While the effect on overall activity of the expansion may be positive, the fortunes of different sectors may develop in very different ways implying that some parts of the population would be worse off. The likelihood of this happening is higher for a government purchases increase than for a tax reduction. The reason is that a change in government purchases is more likely to be concentrated in certain specific sectors of the economy. For example, Ramey and Shapiro (1998) build a two-sector neoclassical model in which it is costly to reallocate capital between the two sectors. Either capital can be shifted between sectors at a loss or new capital has to be generated within the sector in which it is to be used. The authors study the substantially different dynamics of the two sectors after a government purchases shock that is concentrated in one of the sectors. An obvious example of such an asymmetric shock is an increase in defence spending, which falls disproportionately on manufacturing and aircraft industry. Monacelli and Perotti (2007) discuss an analogous asymmetry in the context of an open economy, where an increase in government purchases is biased towards spending on non-tradable products (realistically, one can think of government purchases primarily consisting of civil servants' wages). This generates a fall in the relative price of tradable goods. Hence, labour starts moving from the tradable

to the non-tradable sector, generating negative co-movements between the two sectors in their production levels.

3 Empirical consequences of discretionary fiscal expansions

This section focuses on recent empirical literature that studies the effects of fiscal policy shocks on economic activity and other macroeconomic variables. Before turning to a detailed discussion of this literature, it is useful to explain some concepts that are relevant for empirical analysis. In the absence of any “active” policy intervention, government spending and tax revenues automatically move with the economic cycle. Government transfers, such as unemployment benefits, increase as the economy slows down and unemployment rises, while at the same time tax revenues on labour, capital income and consumption fall. The opposite happens when the business cycle is improving. The *automatic* movements of the government budget as a result of the business cycle are referred to as the *cyclical component* of the budget. The *structural component* of the public budget (or the *fiscal stance*) is the component that is obtained when the cyclical component is subtracted from the actual government budget. Also this structural component may be systematically linked to the economic cycle. For example, the government may systematically raise tax rates whenever activity rises above potential and reduce them whenever activity falls below potential. The structural component could also be systematically linked to other variables such as the stock of outstanding public debt or inflation. The systematic response of the structural component to economic activity or other macroeconomic variables will be referred to as the *endogenous* structural component. The other part of the structural budget is called the *exogenous* component. Examples are an increase in public spending to finance a war or a politically motivated extra transfer to the population prior to an election. The shocks to government purchases discussed in the previous section all refer to this *exogenous* structural component and in this section we are precisely interested in exploring the economic effects of such exogenous shocks to net taxes and government purchases.

The main problem of the empirical analysis is to identify exogenous and unexpected fiscal events. In this regard, the literature has followed two major approaches. One is to study the effects of specific events that can reasonably be assumed exogenous. The most obvious examples are military expenditures in response to war or the threat of a war.

The other major approach is to set up a structural vector autoregression (SVAR) model – see the Appendix for an example. The model explains a system of macroeconomic variables by their lags and exogenous shocks to the variables in the system. In addition, the model imposes restrictions on the relationships among the variables included in the system. The “trick” is to find the right restrictions, for example motivated by economic theory or institutional features, to be able to uncover the exogenous shocks from the data. A complication with the SVAR approach is that fiscal events may be anticipated before

they actually take place and thus show up in the data. This anticipation may lead to changes in private sector behaviour before the event actually takes place. Because information about the moment of a policy announcement is usually not present in the data available to the econometrician, this may lead to wrong inference. As an example, take an increase in government purchases that is announced well in advance. Immediately after the announcement, the negative wealth effect induces a fall in consumption. After that consumption starts rising again. The econometrician might only pick up the rising part of the consumption path at the moment the government purchases impulse is given, inadvertently concluding that a government spending shock raises consumption.

3.1 Domestic effects of fiscal shocks

This subsection discusses the literature that investigates the effects of fiscal impulses in closed-economy empirical models. We address the consequences of such impulses for economic activity, consumption, investment and monetary policy.

Empirical analyses based on structural VARs

One of the main contributions employing the SVAR approach is Blanchard and Perotti (2002), who apply it to study the effects of fiscal policy shocks in the US after World War II. To be able to uncover the exogenous shocks they assume that government purchases do not contemporaneously react to output. This seems reasonable in view of the fact that they use quarterly data. Moreover, the procedure makes use of detailed institutional information about the tax system, as well as information on the elasticities of taxes and transfers to income. They find that an increase in government purchases affects economic activity positively with a multiplier that tends to be close to unity, while an increase in net taxes has the opposite effect. Further, an increase in government purchases boosts consumption, while both an increase in government purchases and a net tax increase exert a negative effect on investment. The effect of government purchases on consumption is consistent with a number of New-Keynesian models. In a variant the authors also take account of the possibility that the shocks may have been anticipated. However, this does not affect the results.

In a closely related empirical analysis for the US, Fatas and Mihov (2001) largely confirm the findings of Blanchard and Perotti (2002). They also study the consequences of fiscal expansions for other macroeconomic variables. Further, they explore the economic responses to shocks to the various components of government purchases (public wage spending, non-wage spending and government investment). The main result is that in all cases consumption goes up and that this increase is most pronounced when government wage spending rises.

In another closely related study, Mountford and Uhlig (2005) uncover shocks by imposing theory-motivated signs on the responses to these shocks. They

assume three fundamental and independent shocks: a business cycle shock, a monetary policy shock and a fiscal shock. The approach allows in a natural way for anticipated policy changes. The authors find that a surprise deficit-financed tax cut is the best fiscal policy to stimulate the economy. A deficit-financed spending shock has only a weak positive effect on activity. The response of consumption is small and is only significant on impact. The increase in government purchases crowds out both residential and non-residential investment. Although the government purchases shock stimulates overall activity, the negative effect of the higher taxes in the future more than offsets the benefit from higher spending in present value terms.

Analyses based on exogenous events

The main problem with the SVAR based analyses is that they may have difficulty to pick up truly exogenous fiscal events. For example, the SVAR model may simply identify as shocks the actual money outlays resulting from a shock in the past.

Therefore, economists have been looking for major events that can beyond reasonable doubt be assumed exogenous and whose timing can be pinned down precisely. Ramey and Shapiro (1998) study the responses of the US economy to large military buildups resulting from wars or war threats (the Korean War, the Vietnam War and the Carter-Reagan military buildup). These events are exogenous. Moreover, they occur rapidly and unexpectedly, so that they can be naturally modelled as shocks. Another advantage of looking at these episodes is that they allow us to study differential sectoral effects because they are heavily concentrated in the manufacturing sector. The shocks are dated at 1950Q3 (Q = “quarter”) for the Korean War, 1965Q1 for the Vietnam War and 1980Q1 for the Carter-Reagan build-up. The procedure consists of regressing a variable of interest (for example, GDP) on its own lags and lags of a dummy variable that indicates the quarters in which the war shocks occur (see the Appendix). The regression also includes a time trend that contains a break in 1973Q2.

The responses to these “Ramey-Shapiro events” show a strong increase in government defence purchases and quite a large fall in non-defence purchases. Total GDP rises substantially, while the private sector component of GDP initially rises and then falls to a significantly negative level. Also residential investment exhibits a strong fall, while non-residential fixed investment strongly increases. Durables consumption initially increases, followed by a large fall to a level below the initial one. Further, consumption of non-durables and services falls. These latter effects are consistent with what the “wealth effect” predicts. Manufacturing employment increases significantly, while overall employment in the business sector does not move.

Edelberg et al. (1999) extend the Ramey and Shapiro (1998) dummy approach to a VAR that contains the various macroeconomic variables of interest in one system. By and large they obtain the same results as Ramey and Shapiro (1998), though there is now a positive effect on aggregate employment. Edelberg et al.

(1999) also do some robustness testing finding that small perturbations to the dating of the dummies leave the results roughly unchanged.

Burnside et al (2004), in turn, extend Edelberg et al. (1999) by allowing for different economic responses to the different Ramey-Shapiro episodes dummies. The motivation for this extension is that the magnitudes of the episodes were different, while moreover the financing of the additional defence outlays was different across the episodes. The results remain roughly unchanged.

Perotti (2007) compares the dummy variable (event) approach with the SVAR approach and tries to explain why the two approaches tend to yield different results regarding the effects of government purchases on consumption and real wages. He criticises Ramey and Shapiro (1998) for imposing the same dynamic responses of the economy to all Ramey-Shapiro episodes. Further, he criticizes the VAR-based extensions of Ramey and Shapiro (1998) for introducing lags of the Ramey-Shapiro dummies to explain variables other than government spending and taxes. The effect of other potential exogenous events at these lags would thereby be excluded. It would be more appropriate to include only the contemporaneous values of the dummies to explain the non-fiscal variables. Then, after the impact, the behaviour of these non-fiscal variables is explained by their “normal” dynamics after a shock to the fiscal variable. Indeed, following this approach (and allowing each war episode to have its own specific dummy with its own specific responses of the economy), the Ramey-Shapiro episodes produce consumption and real wage increases, in line with the SVAR approach. A final criticism of Perotti (2007) of the dummy variable approach is that immediately after the news about the event the entire fiscal path associated with the event is perfectly foreseen by the private sector, which is obviously a strong assumption.

The contribution that likely yields the most reliable results up to now is Romer and Romer (2007). Their approach has some similarity to the “event approach” pioneered by Ramey and Shapiro (1998) in that they search for direct observations of exogenous fiscal events in the US, rather than trying to identify exogenous fiscal shocks from a structural VAR. They go back to official documents such as the Economic Report of the President to construct a series of legislated tax changes and their revenue effects. This way they disentangle revenue changes as a result of changes in legislation from revenue changes occurring for other reasons. Legislated tax changes can be separated further into measures to counteract other influences on the economy (such as negative demand shocks leading to a fall in the output gap), to pay for increases in government spending, to address inherited changes in the budget deficit and to promote long-run growth. Only the latter two types of measures can be reasonably assumed exogenous, because they are not motivated by current or projected economic conditions. Hence, their effects are the most interesting.

The authors use quarterly data for the post-war period and assign changes in legislation to the quarter when the associated changes in tax payments actually take place (which may be a series of several consecutive quarters). Their basic regression equation is presented in the Appendix. The authors find that a permanent one-percent of GDP exogenous increase in tax revenues produces a maximum fall of GDP of 3 percent (after 10 quarters). If one instead uses cy-

clically adjusted tax revenues as independent variable, the estimated maximum effect on output is a (still significant) decline of only 1.1 percent. Hence, the potential presence of endogenous policy-induced tax changes and non-policy effects in traditional measures of tax changes leads to an underestimation of the effect of exogenous tax changes on output. Also, using the series of *all* legislated tax changes produces a much weaker effect on output (a maximum (significant) fall of 1.3 percent). The authors also do a number of robustness checks, such as including additional control variables. None of the variations change the estimates of the effects of an exogenous increase in tax revenues on output. A sample split at the end of 1980, however, shows that the estimated effect on output falls from 3.9 percent in the first sub-sample to 2.3 percent in the second sub-sample. This is consistent with the hypothesis that the enhanced role of financial markets has reduced the dependence of consumption on disposable income.

Finally, the authors investigate how the exogenous (permanent, one percent of GDP) tax increase affects the components of GDP. Consumption falls by a maximum of 2.6 percent, while investment falls by a maximum of almost 13 percent. The negative effect on investment is consistent with investment depending strongly on cash flow and overall economic conditions. Further, splitting consumption into non-durables, services and durables, all three components exhibit a significant fall following the tax increase. However, by far the largest fall is found in durables consumption. Further all components of investment (inventories, residential and non-residential) exhibit a strong fall after the tax rise.

Summarizing, much of the evidence in the literature indicates that a fiscal expansion, whether it is an increase in government purchases or a reduction in taxes has a positive short-run effect on output and consumption. This is also the case for the “dummy variable” approach when appropriate adjustments are made to the regression model. This indicates that New-Keynesian models with “frictions” such as borrowing constraints provide a better description of reality than neoclassical models. The magnitude of the detected effects differs rather substantially across the various studies and the benefits from a government purchases increase may well be dominated by the increase in future tax payments. The to-date most reliable estimates suggest that the effects of exogenous tax reductions are substantial.

3.2 Implications of fiscal expansions in open economies

Most of the empirical work on the effects of fiscal expansions is based on US data. However, the US is a relatively closed economy, at least it is more closed than most other OECD economies, in particular also Sweden, the country that we are most interested in. As discussed earlier, openness may influence the effectiveness of a fiscal expansion for domestic activity and other variables. Of course, we are also interested in the consequences of fiscal expansions for specific “open economy variables” such as the exchange rate, the terms-of-trade and the trade balance.

Below we first discuss some of the findings of the relevant literature. This is followed by some estimates of our own for the EU.

Fiscal expansions in the open economy

A large part of the empirical literature focuses again on the US and is concerned with the twin deficits hypothesis. Maybe, somewhat surprisingly, Kim and Roubini (2004) find that an increase in the budget deficit actually produces a short-run *improvement* of the current account, regardless of whether the budgetary expansion is caused by an increase in public spending or a reduction in taxes. However, this conclusion is not shared by many other researchers, as we shall also discuss below. Kim and Roubini (2004) argue that the direct effect of the expansion on the current account is dominated by the extra private saving (to pay for the higher future taxes) and the rise in the interest rate, which depresses investment. On the basis of this argument one would expect that the twin deficits hypothesis is more likely to hold when it is tested on small open economies, because the interest rate effect would be smaller.

There exist also a number of contributions exploring how fiscal expansions influence the external sector (and activity) in other OECD countries or in the EU. Using quarterly observations, Monacelli and Perotti (2006) and Ravn et al. (2007) estimate impulse responses to an increase in government purchases for Australia, Canada, the UK and the US. Estimations by the former are on a country-by-country basis, while the latter use a panel VAR. The sample periods are roughly the same. Both studies find that an increase in government purchases produces output and consumption increases and a trade balance deterioration. Rather surprisingly, in view of conventional wisdom, the shock also produces real exchange rate *depreciation*.

Based on an SVAR for the US estimated on quarterly data over the past five decades, Monacelli and Perotti (2007) demonstrate that an increase in government spending produces an increase in GDP with a maximum multiplier of roughly two. They find that production rises in both the manufacturing and the services sector. Further, the terms of trade appreciate.

For a large set of OECD countries over the period 1960-1995, Lane and Perotti (1998) regress the trade balance, exports and imports as shares of GDP directly on movements in different components of the public budget (government wage consumption, government non-wage consumption and cyclically-adjusted labor taxes). They find that the composition of a change in fiscal policy and the exchange rate regime (which is interacted with the independent variables) both matter for the effects on the external account. In particular, higher wage government consumption produces a fall in exports and a deterioration of the trade balance, especially under flexible exchange rates. Imports are also negatively affected, or unaffected, depending on the regression specification. A related analysis by Lane and Perotti (2003), also for the OECD, essentially confirms these results. Higher wage government spending boosts real wages and depresses profitability in the tradables sector. The effects are significantly larger under flexible exchange rates, i.e. when the “exchange rate chan-

nel” is operative. Non-wage government spending has only a small effect on the traded sector, while also the effects of tax policy are weaker.

Summarizing across the empirical evidence in the literature, a fiscal expansion in the open economy is likely to stimulate output and consumption, but is also likely to produce a deterioration of the trade balance. The composition of expansion is important. If the objective is to improve the external account, then a reduction in government wage consumption, possibly in combination with devaluation, would be the best strategy.

Some estimates for the EU

Based on Beetsma et al. (2007), we discuss the effects of an increase in government purchases on domestic activity and the external balance for a sample (and sub-samples) of 14 EU countries over the period 1970-2004. The countries are Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Germany, Greece, the Netherlands, Portugal, Spain, Sweden and the UK. We use data from the OECD Economic Outlook and Main Economic Indicators.

In contrast to most of the literature we use annual data instead of quarterly data for the VAR. This has a number of advantages. First, the shocks we observe with annual data may be closer to the actual shocks, because (substantial) fiscal revisions would not usually take place at the quarterly frequency. Also, anticipation effects should be less relevant, because the observed shocks are more likely to be truly unanticipated. After all, a given shock is less likely to be anticipated one year before it actually takes place than one quarter before it actually takes place. Further, there is less need to be concerned with the details of the institutional setting. For example, if tax revenues are systematically larger in one quarter than in another quarter (this is, in particular, the case for corporate tax revenues), then a model based on quarterly data should take this feature into account. Also, with quarterly data, it is more likely that spending decisions take place in a quarter different from that when the actual outlays are done. This raises the chance that the identified shocks are wrongly dated. Finally, with annual data potential seasonality effects are absent from the data.

A drawback of using annual data is that there are fewer observations available.⁴ Hence, to obtain more precise estimates, we estimate the VAR model in a panel format (that is, we pool observations for a number of countries over a given sample period). The new disadvantage then is that one needs to impose cross-country homogeneity on the relationships among the variables. A number of econometric adjustments are done to deal with this objection.⁵ Given that the EU14 countries share many similarities, there may then not be too much heterogeneity left. Nevertheless, we will also investigate whether the

⁴ However, even if one wanted to use quarterly data, this would not be possible for the country sample under consideration. Truly quarterly data (i.e., non-interpolated data) are only available for a limited number of countries.

⁵ However, we eliminate at least part of the potential heterogeneity in these relationships by including country-specific constant terms in the regression and country-specific time trends. We also include year-specific effects to eliminate any cross-country contemporaneous residual correlation.

effects of an increase in government purchases depend on the degree of openness.

The set of endogenous variables in my SVAR consists of government purchases, cyclically-adjusted net taxes (with country-specific cyclical adjustment), exports, output (GDP), imports (all real and in natural logarithms) and the natural log of the real effective exchange rate. An increase in this latter variable amounts to a real domestic depreciation.⁶ To uncover the fiscal shocks, we assume that government purchases are not contemporaneously affected by the other variables, in particular not by GDP. This assumption is not obviously satisfied, but (indirect) tests suggest that it is reasonable. Net taxes are allowed to be contemporaneously affected by government purchases, but not by the other variables.

Figure 5 depicts the impulse responses to a one-percent of GDP increase in government purchases.⁷ On impact GDP rises by 1.2 percent, while it peaks at 1.6 percent after one year. This suggests a substantial multiplier of government purchases. This is consistent with the fact that most countries in the sample have featured only limited exchange rate flexibility against their main trading partners and, consistent with the Mundell-Fleming model, a fiscal expansion would then stimulate the economy in the short run. Somewhat surprisingly, cyclically-adjusted net taxes fall on impact. However, unadjusted net taxes (not reported here) increase on impact. Exports fall, a result that is not too surprising in view of the findings of Lane and Perotti (1998, 2003) if the government purchases increase falls mainly on government wage consumption. There is a substantial increase in imports, consistent with the increase in income being partly spent on foreign products. Finally, the real exchange rate appreciates,⁸ although this happens with some delay.

Based on the responses of the other variables, we construct responses for the primary budget and the trade balance as shares of GDP (see also Figure 5 – the details of construction are given in Beetsma et al. 2007). Exports and imports both contribute to a fall in the trade balance, which amounts to 0.5 percent of GDP on impact and reaches 0.8 percent of GDP after two years. The government budget deteriorates by 0.7 percent of GDP on impact. While the latter shows a U-shaped time pattern, the trade balance returns in a monotonic fashion to its steady state. Overall, these results are consistent with the “twin deficit hypothesis”.

⁶ Of each variable we include two lags in the regression model, which is enough to get rid of any serial correlation in the residuals. However, the results are insensitive to the exact lag length.

⁷ Statistical “significance” will always be based on the ten percent confidence level.

⁸ This finding is in line with what Clarida and Prendergast (1999) find for the G3 countries, but it contrasts with the studies of Monacelli and Perotti (2006) and Ravn et al. (2007) discussed above. However, the latter use a sample with different countries and data frequency. Moreover, there are differences in the details of the specification. In particular, some experimentation suggests that the absence of time effects is quite important for the Ravn et al. (2007) sample, at least when it is estimated on annual data.

Figure 5. Responses after a government purchases shock

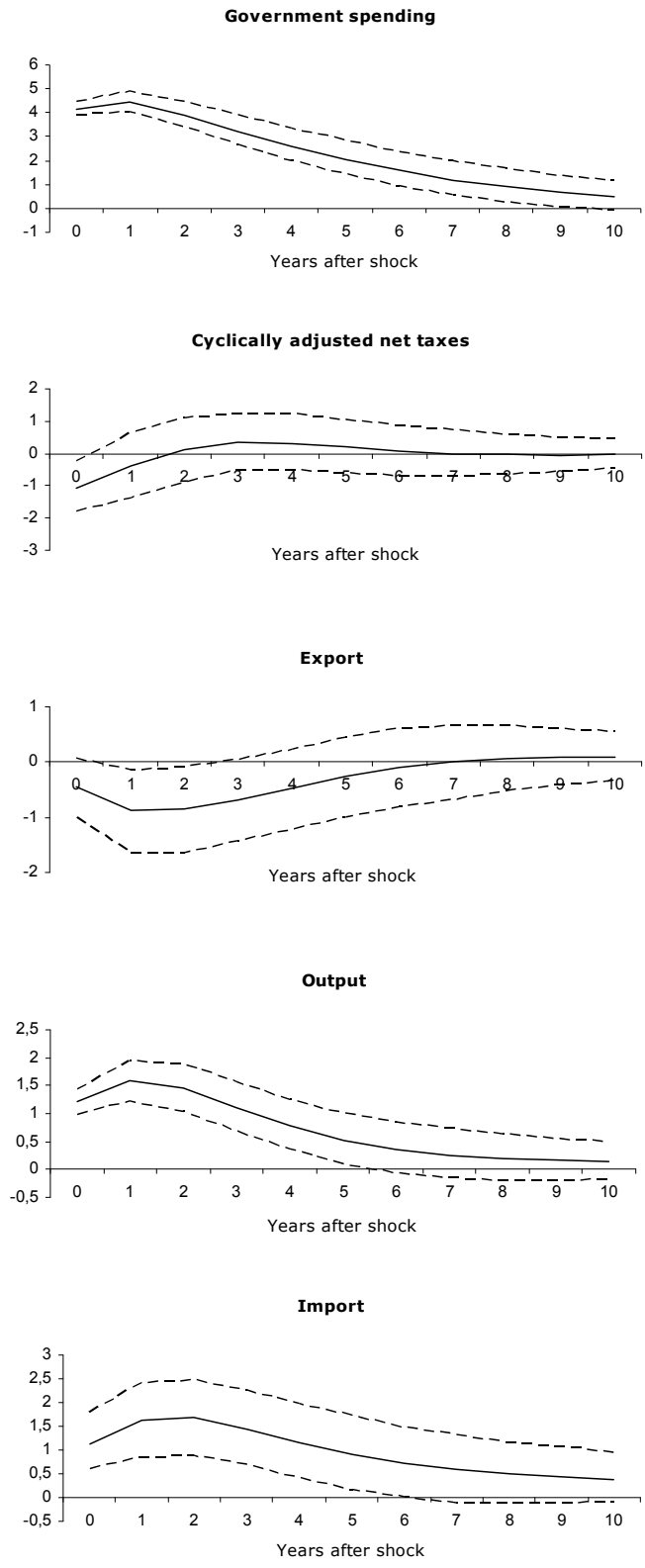
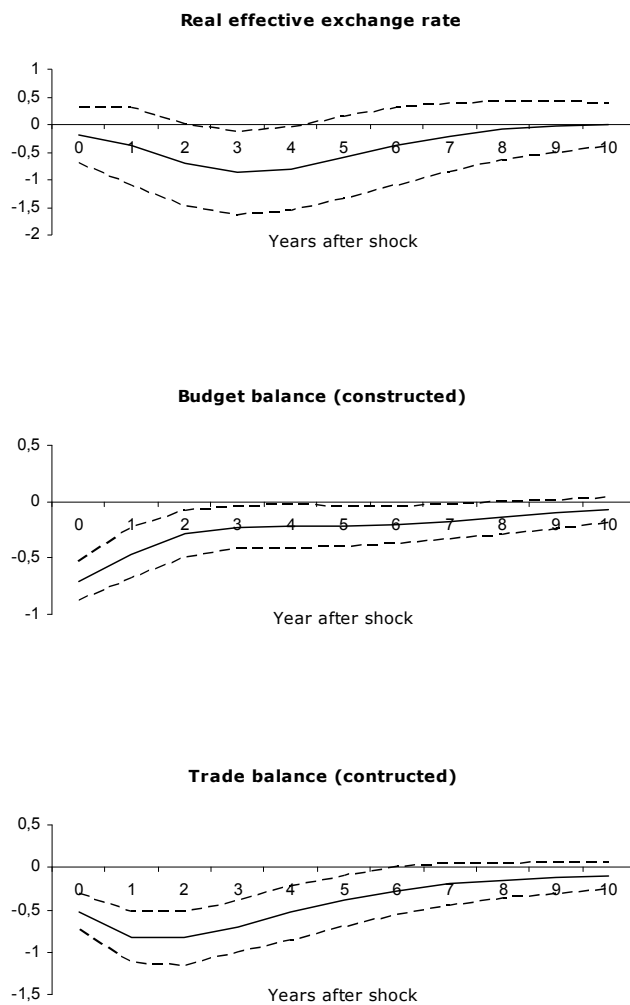


Figure 5. Continued....

Note: Confidence bands (the area between the dashed lines) are the 5th and the 95th percentiles from Monte Carlo simulations based on 1,000 replications. If for a given year after the shock, the lower and upper dashed line lie both above (below) the horizontal axis, the estimate, given by the solid line, is significantly positive (negative). As regards the first panel, notice that the government spending (purchases) shock occurs at time zero, but that in the ensuing periods government spending remains above its initial level. Hence, a given initial shock is followed by a persistently higher than normal spending level.

Figure 6.1. Baseline for Closed EU countries

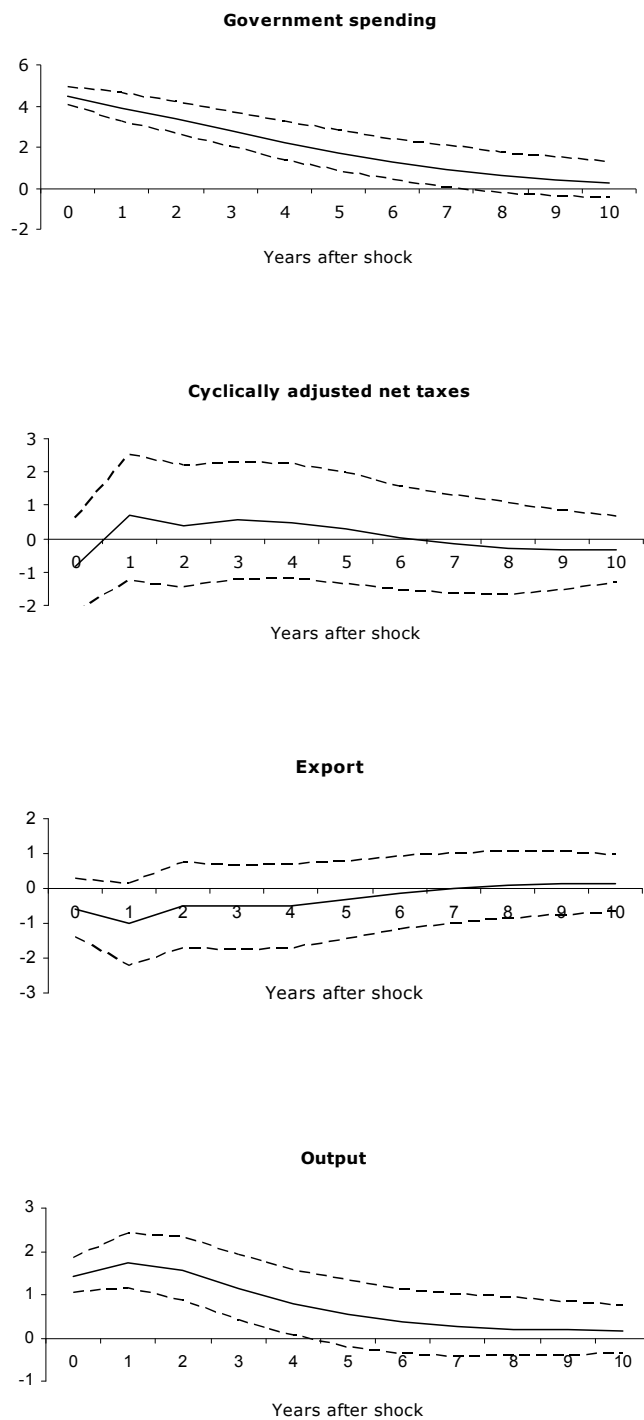


Figure 6.1. Continued....

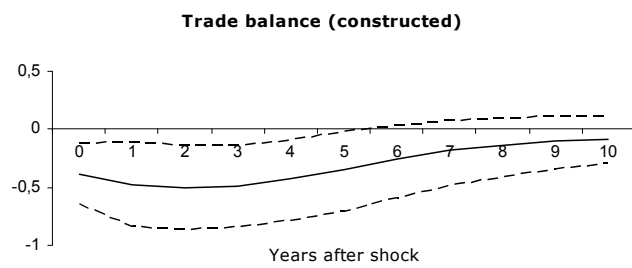
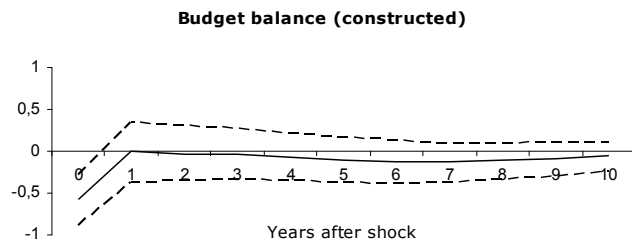
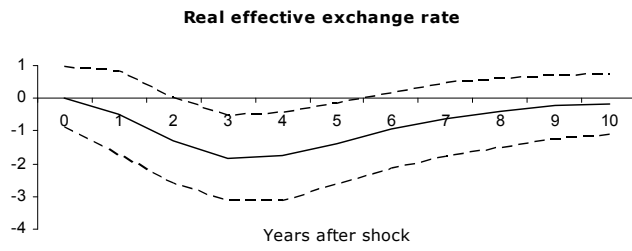
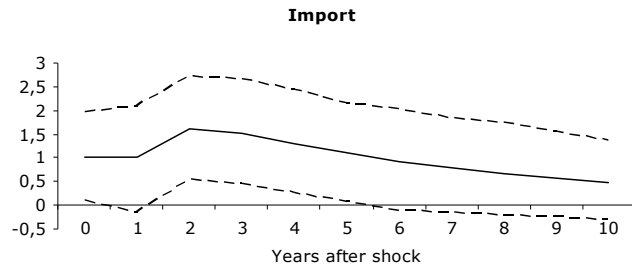


Figure 6.2. Baseline for Open EU countries

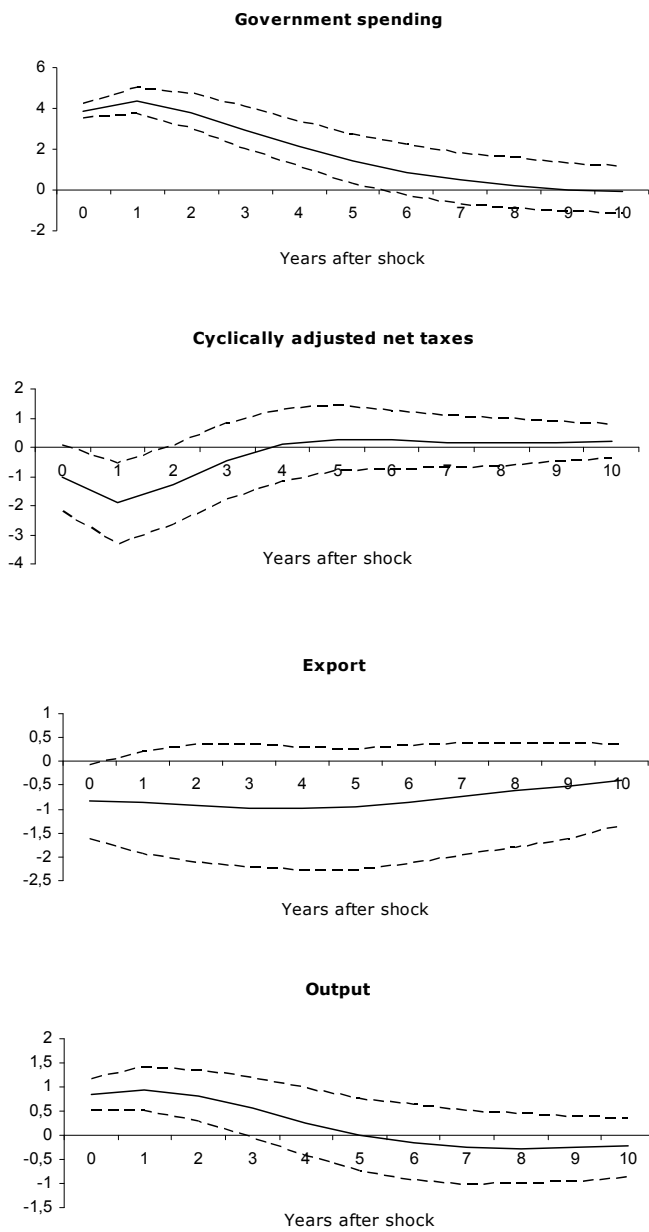
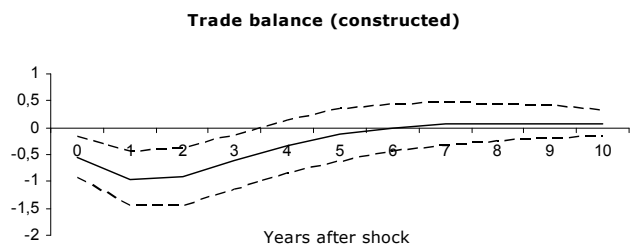
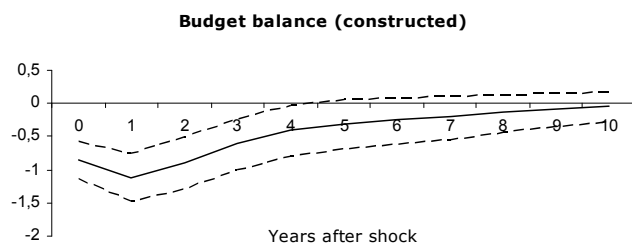
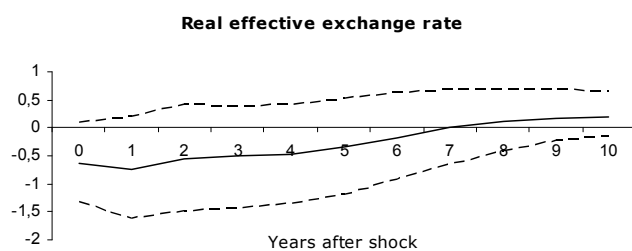
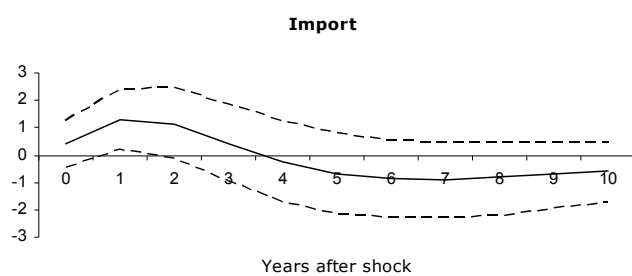


Figure 6.2. Continued....



Note: see Figure 5.

We also split our sample into groups of “open” and “closed” economies and re-estimate the baseline model for each of the two groups. The degree of openness is probably the most important dimension along which our sample countries differ and the relevance of this dimension is emphasized in a number of theoretical contributions that we discussed earlier. We classify as “open” (“closed”) those countries for which the ratio of exports plus imports over GDP has on average over time been in the upper (lower) half of the sample. The open economies are Austria, Belgium, Denmark, Ireland, the Netherlands, Portugal and Sweden. Figures 6.1 and 6.2 depict the impulse responses to a one-percent of GDP government purchases shock for our two groups of countries.

In contrast to what some of the theory discussed above suggests, but consistent with the hypothesis that less of the fiscal stimulus in more closed economies leaks abroad, the output response for the closed economies is much larger than for the open economies (on impact, 1.43 against 0.83). Hence, for the open economies the spending multiplier does not even exceed unity! Owing to the different output responses, one cannot directly compare the responses of imports and exports for the two groups. Therefore, we compare “normalized” responses obtained by dividing the effects on imports by those on output. Perhaps surprisingly, the normalized import response of the closed economies is larger than that of the open economies (on impact 0.72 versus 0.49). However, the normalized export responses are much smaller (in absolute value) for the closed than for the open economies (on impact -0.41 versus -0.99). This is in line with the larger deterioration of the trade balance (over the first three years) for the open than for the closed economies. Further, as far as the government budget is concerned, for the closed economies the impact deficit is smaller and vanishes within a year. For the open countries, the response is U-shaped and the deficit takes a couple of years to vanish.

In line with our discussion above, it would be interesting to split the country-sample into countries that have maintained fixed exchange rates and those that have maintained flexible exchange rates against their main trading partners. The complication is that for many countries the exchange rate regime has varied over time, so that it is not easy to classify the observations. Here we split our sample into those countries that have joined the euro area and those that are currently outside (Denmark, Sweden and the UK). In contrast to the latter group, the former group contains a number of countries that already over a long period before the start of EMU tried to actively stabilize their exchange rates against their main trading partners. A rerun of the baseline regression specification for the two groups yields the impulse responses in Figures 7.1 and 7.2. Note that the scales in the two figures are different. The main difference between the two groups is that an increase in government purchases seems to have a larger effect on output in the euro-11 group. While the impact output reactions are very similar for the two groups, the increase in output for the euro-11 seems to be more persistent. Further, the effects on imports for the non-euro group are not significant, while they revert to zero much quicker. This may partly be the result of the effect on domestic activity being smaller, but it has also likely to do with the larger appreciation of the real exchange rate. These results are consistent with the textbook difference between the effect of

a fiscal expansion in an open economy under flexible versus fixed exchange rates. However, one should also not draw too strong conclusions in this regard, because the number of observations in the non-euro group is relatively small and so the uncertainty about the parameter estimates is correspondingly large.

Figure 7.1. Euro-11 countries

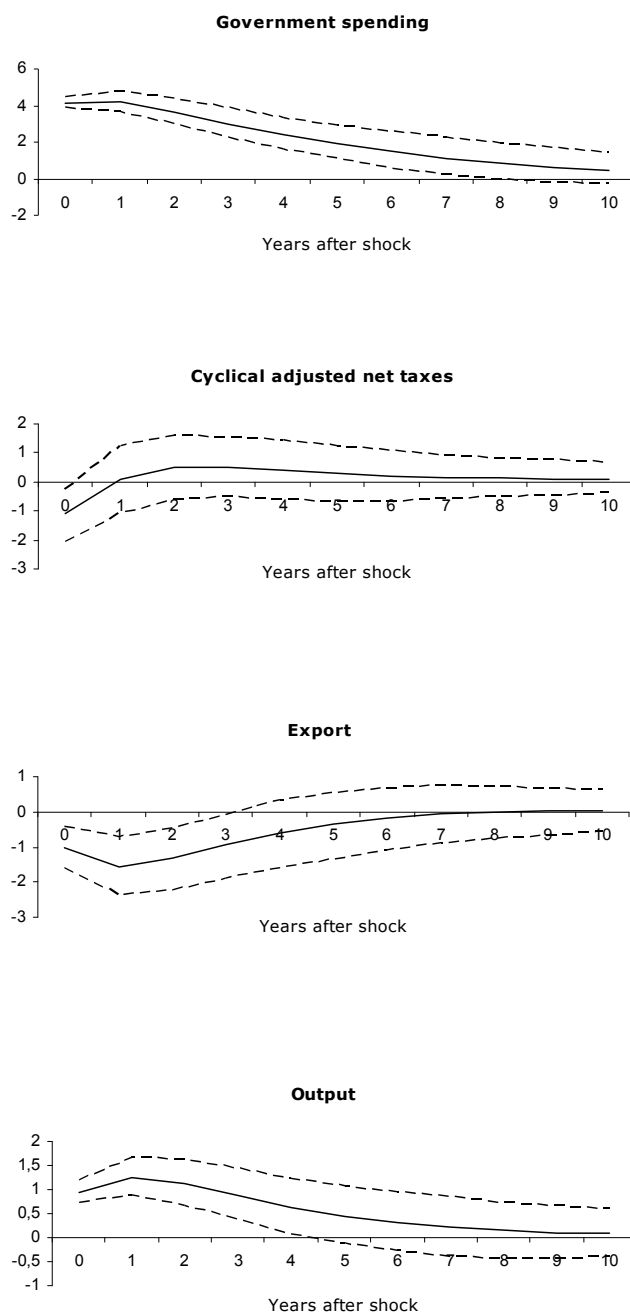


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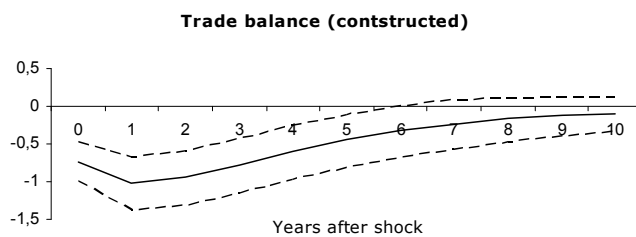
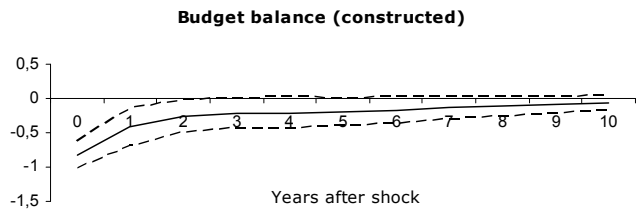
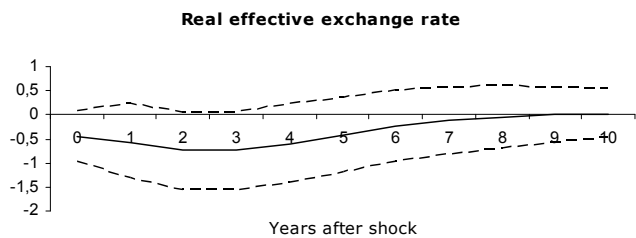
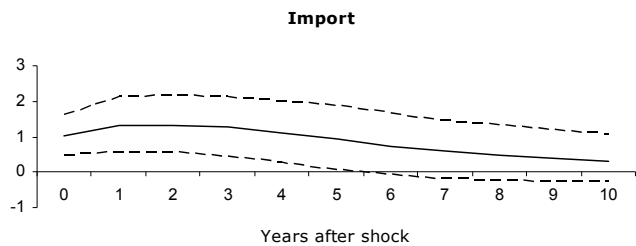


Figure 7.2. Denmark, Sweden and the United Kingdom

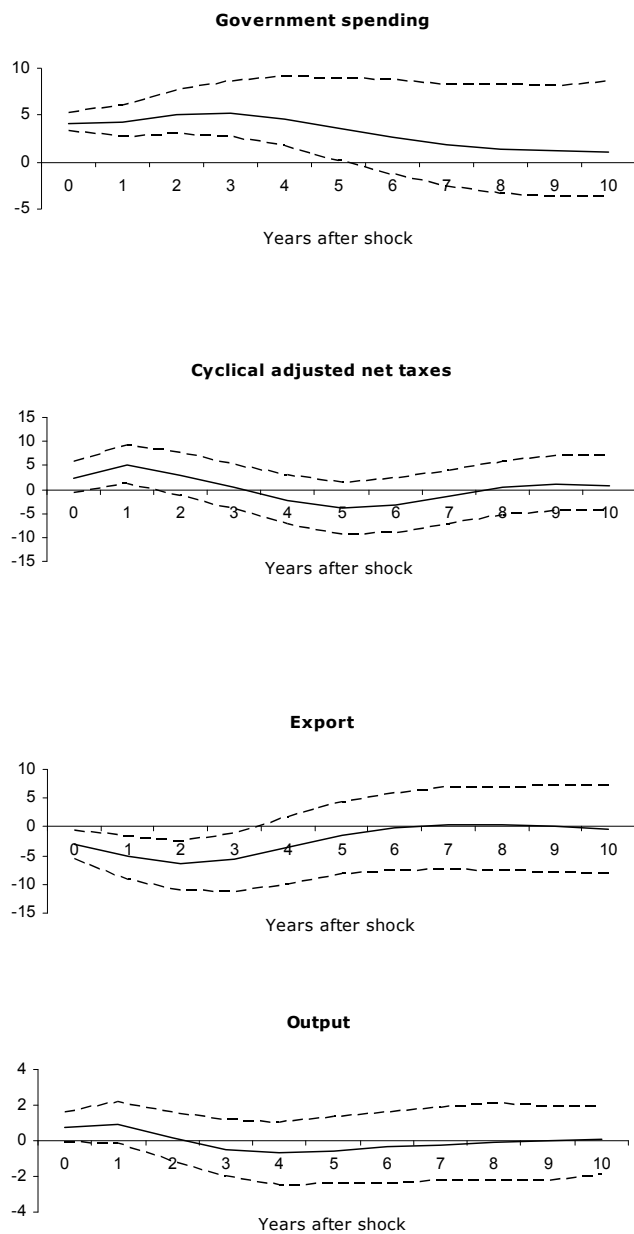
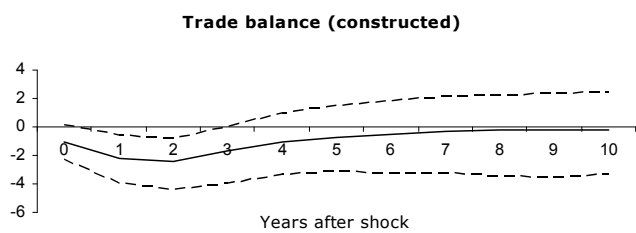
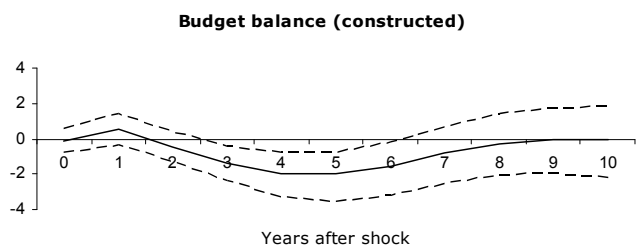
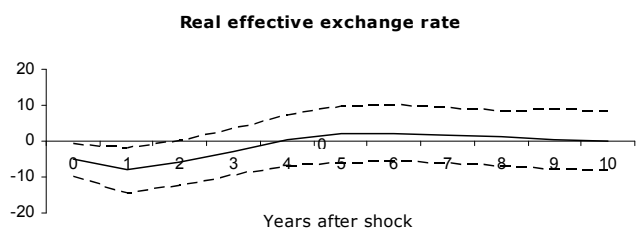
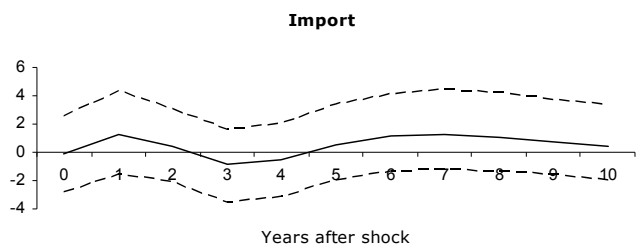


Figure 7.2. Continued....



3.3 Further empirical contributions

Expansionary fiscal contractions

A number of articles have focused on the consequences of large fiscal contractions mostly resulting from severe economic and/or fiscal crises. In these circumstances, a change in fiscal policy may have different effects than during “normal” circumstances. The original idea is due to Giavazzi and Pagano (1990), who found that the large consolidations in Denmark and Ireland in the 1980s were followed by strong positive effects on consumption. The hypothesis has subsequently been tested in a large number of contributions (e.g. Alesina and Perotti, 1986). The rationale behind an “expansionary fiscal contraction” is that it shifts government spending to a structurally lower level that can be supported by a structurally lower level of tax payments. If the contraction is credible, this will boost consumption because of a positive expected wealth effect. In addition, confidence in the economy and the policy makers might increase, which could contribute further to the consumption revival. In a panel data analysis for a large group of OECD countries, Perotti (1999) shows that initial fiscal conditions are an important determinant of the effects of fiscal expansions; at low debt or deficit levels, an increase in government spending is expansionary, while the opposite is true if the initial fiscal conditions are highly unfavourable.

Public debt and long-term solvency restrictions

Claeys (2007) criticizes the SVAR-based contributions discussed above for not taking account of the intertemporal government budget constraint. There are two approaches in this regard. Favero and Giavazzi (2007) include debt into the standard VAR, thereby taking account of the potential responses of spending and taxation to the level of the public debt. They claim that including debt dampens the effects of tax changes on output. Claeys (2007) follows a different approach and directly incorporates the intertemporal budget constraint into the empirical model. The implied long-run relationship between spending and revenues is captured with a so-called “structural vector error correction” model. Such a model allows one to analyze the short-run dynamics following shocks that push the economy away from its long-term (stochastic) equilibrium. Compared with the “traditional” SVAR, the advantage of this approach is that it makes more explicit use of economic theory. Applying the approach to quarterly US data over the past four decades, Claeys finds that a fiscal expansion is less beneficial for output than is usually found.

4 Monetary and fiscal policy interactions in the stabilization of economic shocks

So far, we have mainly discussed the effects of discretionary fiscal policy in isolation. We have thus not paid much attention to monetary policy. Now, we

also introduce monetary policy into the analysis and explore how it interacts with fiscal policy.

Monetary policy has often been driven by fiscal policy. When the central bank is dependent, the government directly controls monetary policy. High money growth and, therefore, high inflation is often the consequence of a lack of fiscal discipline. The government runs high deficits and may have difficulty to finance those deficits on the international capital market. It is then likely to force the central bank to finance those deficits by printing money. This scenario was quite common in Latin America in the 1980s (but also in other countries and during other periods), resulting in hyperinflation in a number of those countries.

Even when the central bank is not under the control of the government, high inflation cannot be excluded, although it is much less likely. Public deficits may put public debt on an unsustainable path. At some point the central bank would be forced to monetize the public debt. This is the “unpleasant monetarist arithmetic” of Sargent and Wallace (1981). The fear that unsustainable fiscal policies may force a bail-out by the ECB, has resulted in a “no-bail-out clause” in the EU Treaty that forbids the ECB (or any government in the EU) to come to the rescue of a financially troubled government in a member country). The fear has in addition led to fiscal restrictions taking the form of deficit and debt limits.

The idea of the “unpleasant monetarist arithmetic” has later been revived (see Leeper, 1991, and Sims, 1994) in a related form with the “fiscal theory of the price level” (FTPL). Under the FTPL the central bank loses control over the price level because the government follows an unsustainable fiscal policy. If public debt is on an unsustainable path the price level will endogenously adjust, thereby reducing the real value of the government’s nominal liabilities. In this case, fiscal policy is said to be active, while monetary policy is passive. In the opposite case, when the price level is under the control of the central bank, fiscal policy is said to be passive, while monetary policy is active. Henceforth, we assume that monetary policy is active. Empirical work also suggests that that is the most relevant case.

4.1 The optimal fiscal-monetary stabilization mix

As just discussed, fiscal and monetary policies interact over the long run via the government budget constraint. Over the short run they interact in their responses to the economic shocks of various types. It is this type of interaction that we are most interested in here.

The most basic analysis of the fiscal-monetary stabilization mix goes back to AD-AS framework depicted in Figure 2. Consider first the case of a closed economy. Under demand shocks, such as unexpected fluctuations in consumer confidence, the task of the monetary policymaker would be relatively easy. A negative demand shock shifts the aggregate demand curve to the left, creating a fall in GDP and in the price level. The shift in the AD-curve can simply be

undone with a monetary expansion alone which brings the economy back to its original equilibrium. A fiscal expansion alone will achieve the same.

With cost-push shocks, such as a rise in oil prices (assuming the country is a net importer of oil), the policymakers' task is a lot more complicated. In the AD-AS framework the shock produces an upward shift of the AS-curve: producers are only prepared to supply a given level of output if they receive a higher price for it. The new short-run equilibrium is achieved at the new intersection of the AD and the AS-curve. Hence, the shock produces a combination of economic slowdown and rising inflation. The central bank thus faces a dilemma. A monetary expansion needed to restore output by shifting the AD curve to the right will push inflation even higher, while a monetary contraction needed to prevent inflation aggravates the slowdown of economic activity. Actually, the fiscal policymaker faces the same dilemma. Over time, the inflationary consequences of both types of expansion lead wage setters to revise their price expectations upwards. This moves the AS-curve further up. The reason is that output can only attain its natural level if price expectations are fulfilled. Hence, a higher *expected* price level also requires a higher *actual* price level for output to equal its natural level. An expansive response to the cost-push shock will in the long run result into output reaching its natural level, but at a permanently higher price level. In the meantime, countries thus suffer inflation, even if the original cost-push shock vanishes after a while.

Only if there are reasons to believe that a fiscal expansion has fewer inflationary consequences than a monetary expansion, can fiscal policy usefully complement monetary policy. While monetary policy aims at restoring price stability, a fiscal expansion could then be used to restore the original activity level.

Let us now turn to the AD-AS framework of the open economy. That situation is the best characterization for Sweden and most other countries. Again, we need to distinguish between the case of a fixed exchange rate (or being part of a monetary union) and that of a flexible exchange rate. An important source of demand shocks is fluctuations in the demand for export products. Under a fixed exchange rate, monetary policy can only react to demand shocks in so far as the partner country with whom the peg is maintained is hit by the same shock and intends to react in the same way. An idiosyncratic fall in demand requires the country to contract monetary policy in order to maintain the peg. The AD-curve shifts to the left, because for given price level, output drops. Hence, only a fiscal expansion can offset the demand shock.

With flexible exchange rates, the fall in demand produces depreciation of the nominal exchange rate and with prices fixed in the short run also depreciation of the real exchange rate. The AD-curve does not shift. Hence, no policy reaction from either the monetary or the fiscal authorities would be needed in this case.

Consider now a negative supply shock, that is a shock that shifts the AS-curve up. The new intersection of the AD and the AS curve lies to the North-West of the original equilibrium. Hence, the price level rises. In the IS-LM diagram, the LM-curve shifts to the left and so does the IS-curve, because net exports depend on the real exchange rate which appreciates. Under a fixed exchange

rate the nominal money supply automatically adjusts to maintain the peg, though at a lower level of output. A fiscal expansion can bring output to the original level by shifting the IS-curve to the right, so that it intersects with the LM-curve at $r = r^*$. In the AD-AS diagram, this is depicted with a shift of the AD-curve to the right. With a flexible exchange rate, the exchange rate adjusts thereby shifting the IS-curve further (or partly back) such that it intersects the LM-curve on the line $r = r^*$ (though at a lower output level than the original one). The original output level can only be restored with a monetary expansion that shifts the LM-curve back to its original position and that produces an exchange rate depreciation that also shifts the IS-curve back to its original position.

4.2 Further aspects of the optimal monetary-fiscal stabilization mix

With the study of the simple AD-AS framework, we have neglected a number of further relevant aspects of the interaction of monetary and fiscal policy in stabilization. One aspect concerns the assignment of the specific objectives or targets of the two authorities. A second, intimately related, aspect concerns the relative strategic positions of the monetary and fiscal authorities against each other. Let us turn to the latter first.

A coordinated fiscal-monetary response to a shock is sometimes desirable. An interesting recent example concerns the response to the current housing and credit crisis in the US. Many economists view the situation as similar to the stagflation (i.e., the combination of stagnation and inflation) that resulted in the past from the oil price rises. Also now, US inflation is relatively high (currently over 4 percent), while the economy is moving into a downturn. The US Fed has rapidly lowered the target for the federal funds rate. The monetary stimulus is being supported by tax rebates for households and tax cuts for firms. Probably the authorities assume that the fiscal support should stimulate the economy without affecting inflation too much (at least less than larger interest cuts). The (partial) substitution of fiscal for monetary stimulus has the further advantage that the monetary authorities still retain some ammunition in case a further, abrupt decline of the economy occurs. There exists a zero lower bound on the nominal interest rate, implying that at some point interest cuts no longer remain as an option, as Japan has experienced in the past decade. Hence, if possible, the monetary authorities would prefer to keep some leeway to the zero lower bound in order to retain an effective policy instrument.⁹

Often, however, monetary and fiscal policies are not coordinated. This is particularly likely when the central bank is highly independent. Absence of monetary-fiscal coordination, however, may lead to a bad policy mix not only from

⁹ Whether this latter argument is really important for the US is unclear because the prospect of a liquidity trap seems quite remote with inflation of over 4 percent. A liquidity trap, as Japan has experienced, is typically accompanied by falling prices and deflationary expectations.

the perspective of fiscal sustainability as described above, but also from the perspective of stabilization. A prominent example concerns the US in the beginning of the eighties in the aftermath of the second oil price shock and the associated high inflation. On the one hand, fiscal policy was expansive due to tax reductions and increased defense spending. On the other hand, monetary policy was contractionary in order to disinflate the economy. The result was a high real interest rate that spread through the international capital markets and that put both investment and government budgets under severe pressure.

A second aspect neglected so far concerns the assignment of the specific objectives or targets of the two authorities. This issue is addressed in a number of papers by Dixit and Lambertini and it is rather tightly linked to the problem of the “bad policy mix” just described. The authors consider a monetary union with an independent central bank and discuss how well-aligned or conflicting objectives between this central bank and the national fiscal authorities affect the macroeconomic outcomes. Their analysis also covers the extreme case in which the monetary union consists of only one country, as is the case for Sweden.

Dixit and Lambertini (2003) assume that all authorities agree on the ideal levels of output and inflation. Fiscal policies will be set such that the ideal output levels are attained. This then also eliminates the incentive to stimulate output through a surprise monetary expansion. Hence, an inability to commit monetary policy has no consequences for the outcomes. Further, in a leadership game, whether it is set before or after the fiscal policies are chosen, monetary policy can always be deployed so as to neutralize the inflationary consequences of fiscal expansions. In other words, the ideal inflation and output levels emerge as equilibrium outcomes, irrespective of whether monetary policy can commit, whether national fiscal policies are coordinated and irrespective of which authority (monetary or fiscal) moves first.

Using the same framework, Dixit and Lambertini (2001) allow for differences in preferences among the authorities. The assumption is that the ideal output level of each fiscal authority exceeds the ideal output level that the union central bank has for that country and that the ideal inflation rate of the central bank is lower than the ideal inflation rate of any of the fiscal authorities. If all authorities simultaneously choose their policies in a non-coordinated way, then the equilibrium output and inflation levels are more extreme than the bliss points of all policymakers. That is, output in each country is above the fiscal authority's ideal level, while inflation is below the central bank's ideal level. These extreme outcomes are the consequence of a non-coordinated “race” among the authorities, with the fiscal authorities trying to raise output and the monetary authority responding with a fierce contraction to offset the effect of the expansive fiscal policies on inflation, and vice versa. In this context, making the common central bank even more conservative (i.e., paying even more attention to price stability) would be counterproductive, because it would result in even more extreme outcomes. Endowing one of the authorities with a leadership role would avoid the suboptimal, non-coordinated policy race and result in less extreme outcomes. The leader anticipates the reaction of the follower

and, by following less extreme policies, the former induces the latter to also adopt less extreme policies.

The undesirable policy mix described above thus arises from a lack of coordination and each policymaker adopting an extreme policy stance in order to offset the consequences of the stance adopted by the other. To avoid such a detrimental combination of policies, it might be desirable to impose constraints on fiscal policy. This way the fiscal authority is forced to follow a disciplined policy, so that the monetary authority needs to follow a less contractionary policy, while still being able to achieve its goal of price stability. With appropriately designed and credibly enforced fiscal restrictions, the benefits from central bank independence in the form of stable prices can be preserved at a relatively low cost.

While extreme policy stances are a possible outcome of lack of monetary-fiscal coordination, the opposite may also occur, as Beetsma et al. (2001) demonstrate. Insufficiently active stabilization by the monetary and fiscal authorities arises when it is costly to use the respective policy instruments and demand shocks prevail. The authors present a model in which the government cares about the stabilization of output and inflation around their bliss points, while the central bank cares only about inflation stabilization. The government's policy instrument is the structural deficit, while the central bank's instrument is the short-run interest rate. The authorities in addition attach a loss to fluctuations in their policy instruments. For example, the central bank may want to minimize uncertainty in the short-run interest rate in order to prevent confusion in financial markets. Similarly, the government may prefer a more stable structural deficit, *ceteris paribus*, in order to smooth distortionary tax revenues over time or to reduce uncertainty about the sustainability of its policies.

The result of the authorities' reluctance to use their instruments is that they try to free-ride on each other when a demand shock occurs. Suppose that demand for the country's products drops unexpectedly. Absent any policy intervention this produces lower growth and deflation. Both a fiscal expansion and a monetary expansion would be able to offset the effect of the shock. However, knowing that the monetary authority would share in the benefit from a fiscal expansion by not having to reduce the interest rate, the fiscal authority restrains its expansion. Vice versa, the monetary authority holds back the reduction in the interest rate, because the fiscal authority benefits from the reduction by having to raise the deficit by less. Hence, failing to internalize the benefit that the other experiences from the use of its policy in the absence of coordination, each authority does too little to counteract the shock. In other words, each authority tries to free-ride on the other's efforts.

In the above examples, undesirable policy settings are the result of some imperfection (badly aligned policy objectives or the costs of employing policy instruments actively) in combination with the lack of coordination of monetary and fiscal policies. This suggests that this lack of coordination is undesirable from a macroeconomic perspective. However, that view would be too simple. In fact, central banks (such as the ECB) are often against explicit coordination of their monetary policy with the fiscal policies conducted by the government.

The reason is that they fear that their independence will be undermined and price stability can no longer be achieved.

The AD-AS framework, but also the other frameworks discussed above, is too simple to provide a general prescription for the ideal stabilization mix. In particular, there is widespread scepticism about the usefulness of an active fiscal stabilization policy. An active fiscal response to a negative shock to the economy requires the authorities to design a suitable fiscal package to stimulate the economy. This package has to be approved in parliament and possibly modified. Only after that it can be implemented. The amount of time from the identification of the shock to the fiscal stimulus having an effect on the economy can be so long that the economy is again in a boom. The fiscal stimulus then has a destabilizing rather than a stabilizing effect. This is the argument of Friedman's "long and variable lags" applied to fiscal policy: fiscal fine tuning is very hard. A second drawback of the fiscal stimulus is that it would imply a higher future tax burden. As discussed above, Mountford and Uhlig (2005) argue that a government spending increase may come at a high future price. Third, a fiscal stimulus through an increase in government purchases might lead to spending projects that are socially not very valuable. If spending on some particular public good is not worthwhile under normal or positive business cycle circumstances, why would it be desirable during a recession? Using transfers as a way to stimulate the economy may lead to permanent fiscal obligations if they take the form of changes in benefit entitlements.

These drawbacks of an active fiscal stabilization policy explain why many economists, and the European Commission in particular, advise not to rely on active fiscal policy, but simply let the "automatic stabilizers" do their work. The automatic stabilizers dampen the business cycle without any active fiscal policy intervention. When the economy slows down tax revenues drop while spending on transfers (in particular, unemployment benefits) rises. Both effects dampen the fall in disposable income and thus dampen the fall in consumption. This, in turn mitigates the slowdown. Exactly the opposite happens when the economy is booming. Of course, if the automatic stabilizers work freely the government budget deficit rises during recession and falls in a boom. As long as the average deficit over the business cycle is not too high, government debt remains on a sustainable path and the fact that the government debt level varies with the business cycle is harmless.

Concluding, the highest likelihood of a socially beneficial monetary-fiscal policy mix is reached by pairing monetary policy with a fiscal policy that is subject to credible restrictions. This way, the potential disadvantages from not coordinating fiscal and monetary policies can be avoided and monetary policy is free to pursue price stability. At the same time fiscal policy should aim at achieving medium-run balance or a medium-run surplus. This would generally leave enough room for the automatic stabilizers to do their job, so that an active (and potentially harmful) fiscal stabilization policy is not needed. The remaining need for macroeconomic stabilization is fulfilled by monetary policy, again under the restriction that it remains consistent with price stability.

5 Some evidence on the actual behaviour of the fiscal authorities

Although Sweden is not part of the eurozone, it is still bound by the requirements of the EU Treaty and it is subject to the Stability and Growth Pact (SGP) in the sense that it has to submit an annual Convergence Programme in which it sets out its budgetary projections for the medium term. Of course, in contrast to the eurozone members, Sweden is not subject to formal sanctions if it fails to comply with the EU fiscal criteria.

Experts have severely criticized the Maastricht/SGP fiscal criteria on several grounds. One of the main criticisms is that the criteria fail to take account of the cyclical condition of the economy, implying that fiscal stabilization is hampered. In particular, as the opponents of the fiscal criteria argue, countries will be forced to contract fiscal policy during downturns, making fiscal policy behave in a pro-cyclical way.

Galí and Perotti (2003) ask the empirical question whether the EU fiscal criteria have indeed hampered fiscal stabilization and forced countries into following pro-cyclical policies. The answer to this question is of interest for Sweden, if it decides to join the euro area at some point in the future, or if it decides to self-impose some fiscal constraint on its government. The authors compare fiscal policy for the euro countries during the period preceding the Maastricht Treaty (1980-1991) to the period after the Treaty was signed (1992-2002). They also compare euro-area fiscal policy with fiscal policy in a control group of the other EU countries (Denmark, Sweden and the UK) and a group of OECD countries outside the EU (Australia, Canada, Japan, Norway and the US).

The authors decompose the primary deficit into a cyclical component, determined by the size and composition of government spending and taxes and the structure of the tax system, and a structural component, the “cyclically-adjusted primary deficit”, which is the primary deficit (total spending minus interest payments minus taxes) when output is at its natural level. The cyclically-adjusted primary deficit (as a share of potential output) is regressed on a constant term, its own lag, the expected output gap for the current period and lagged debt as a share of potential output – see the Appendix.

To model a potential regime shift in fiscal policy as a result of the ratification of the Maastricht Treaty, the authors allow the constant term and the regression coefficient of the expected output gap to be different for the period before and after the Maastricht Treaty was signed. They include the expected output gap rather than the actual output gap as independent variable, because the fiscal policy stance is determined in the year before it is actually implemented, hence it should be based on expectations of the output gap. A positive coefficient of the expected output gap indicates that an increase in this variable is met with a more relaxed fiscal stance. Hence, a positive coefficient of the expected output gap implies a pro-cyclical fiscal policy. Further, by including debt as a regressor, the model allows for a debt stabilization motive (if the coefficient of debt is negative). Finally, including as a regressor the lag of the cyclically-adjusted primary deficit captures the possibility that the authorities try

to achieve their budgetary target only gradually. The estimation of the model takes account of a potential feedback effect from the cyclically adjusted primary deficit on to output.

The main findings are as follows. Generally, comparing before and after Maastricht (1980-1991 versus 1992-2002), there is a trend towards *less* pro-cyclicality. This contrasts with the view that the EU fiscal rules have hampered stabilization. Specifically, the estimates suggest that before Maastricht fiscal policies in eurozone countries were pro-cyclical, while after Maastricht they were acyclical. This trend is not unique for the group of EMU countries, though. The group of five other OECD countries exhibit a shift from acyclical fiscal policy to counter-cyclical fiscal policy. Further investigation suggests that the reduction in fiscal pro-cyclicality is due to a reduction in the pro-cyclicality of government spending. Importantly, the reduction in pro-cyclicality does not seem to have undermined the automatic stabilizers during the period after Maastricht. If anything, the role of the automatic stabilizers in the eurozone has increased after Maastricht.

While the findings by Galí and Perotti (2003) do not indicate that the EU fiscal restrictions have had a harmful effect on fiscal policy in Europe (a conclusion shared by Balassone and Francese, 2003), without further investigation they also cannot be considered good news. The fact that the restrictions have not hampered fiscal policy may simply be the result of them being ignored by the national governments. Their credibility is generally thought to be quite low, a view that is supported by the large number of violations of the three-percent-GDP restriction on the deficit (see European Commission, 2008). However, this observation alone is not enough to conclude that the governments ignore the restrictions. Although the restrictions do not function perfectly they may still have had a positive effect on fiscal discipline.

6 Conclusions and discussion

This paper has reviewed theory and evidence on the effects of discretionary expansions on the economy. We discussed the roles of nominal rigidities such as sticky prices, imperfections such as credit restrictions, economic openness and monetary policy. Most evidence suggests that an increase in government purchases or a reduction in net taxes has a positive short-run effect on economic activity and aggregate consumption and a negative effect on the trade balance. However, the higher future tax cost associated with a government purchases increase may be quite large. Moreover, there exists a lot of disagreement about the size of the short-run stimulating effect of a fiscal expansion. A major problem in empirical analysis is to isolate truly exogenous fiscal shocks. In the case where this was done for tax changes, the results suggested a very substantial positive effect of a tax reduction on the economy. Overall, however, one needs to be careful in drawing strong policy conclusions from the empirical evidence that exists to date.

Combined with the fact that there are lags between the identification of an economic slowdown and the implementation of a discretionary fiscal policy,

using an active fiscal policy as an instrument for short-run stabilization is not advisable given our current knowledge about the effects of fiscal policy. To complicate matters further, macroeconomic data often undergo substantial revisions when going from preliminary to final figures. Hence, basing policies on preliminary figures is a risky business and there will be a serious chance that trying to employ discretionary fiscal policy for macroeconomic stabilization produces higher, rather than, lower economic variability. In fact, in an analysis based on a large set of countries Fatas and Mihov (2003) show that discretionary fiscal policy induces macroeconomic instability, which, in turn, may affect growth negatively.

Taking my own empirical results at face value, given that Sweden is a very open economy, a discretionary increase in government purchases crowds out private spending and would leave Sweden with both a higher budget deficit and a higher deficit on the trade balance.

There is another reason to be careful with discretionary fiscal expansions, in particular increases in government purchases. Such expansions are almost inevitably unevenly distributed across economic sectors and the stimulus to one sector may come at the cost of hurting another sector. For example an increase in government wage consumption, which attracts more workers into the public sector, likely drives up the general wage level and hurts the competitiveness of the export sector. A final danger in using government purchases or transfers for economic stabilization is that the extra purchases during downturns may fall on goods and services for which there is no intrinsic need (why buy an extra bridge during a recession when it is not worthwhile to buy the bridge during a boom) while the extra transfers may create permanent obligations.

In view of the complications with an active fiscal policy, for lack of a better alternative the best advice is to put fiscal policy under credible restrictions and have it aim at a medium-run balance of surplus. Monetary policy independence is then protected, so that the central bank can freely pursue price stability, while the room created by the medium-term budget balance allows the automatic stabilizers to do their work. They dampen business cycle movements without any active policy intervention. Of course, one cannot blindly rely on the automatic stabilizers. They make no distinction between the specific sources of economic shocks or whether they are permanent or temporary. Letting automatic stabilizers operate freely in the case of a very persistent adverse shock could lead to unsustainable budget movements. However, in that case, an automatic link between the cyclically adjusted primary deficit (taxes) and the government debt level would easily restore fiscal sustainability without having to give up the advantages of the automatic stabilizers.

References

- Alesina, A. and Perotti, R. (1996), Reducing budget deficits, *Swedish Economic Policy Review* 3, 13-34.
- Balassone, F. and Francese, M. (2003), Cyclical asymmetry in fiscal policy, debt accumulation and the Treaty of Maastricht, Mimeo, Banca d'Italia.
- Baxter, M. (1995), International trade and business cycles, in G.M. Grossman and K. Rogoff (eds.), *Handbook of International Economics*, North-Holland, Amsterdam.
- Baxter, M. and King, R.G. (1993), Fiscal policy in general equilibrium, *American Economic Review*, 83, 315-334.
- Beetsma, R., Debrun, X. and Klaassen, F. (2001), Is fiscal policy coordination in EMU desirable?, *Swedish Economic Policy Review* 8, 57-98.
- Beetsma, R., Giuliodori, M. and Klaassen, F. (2007), The effects of public spending shocks on trade balances and budget deficits in the EU, *Journal of European Economic Association* 6, 414-423.
- Blanchard, O. and Perotti, R. (2002), An empirical characterization of the dynamic effects of changes in government spending and taxes on output, *Quarterly Journal of Economics* 117, 1329-1368.
- Burnside, C., Eichenbaum, M. and Fisher, J.D.M. (2004), Fiscal shocks and their consequences, *Journal of Economic Theory* 115, 89-117.
- Callegari, G. (2007), Fiscal policy and consumption, PhD thesis, European University Institute, Florence.
- Claeys, P. (2007), Estimating the effects of fiscal policy under the budget constraint, Mimeo, University of Barcelona.
- Clarida, R. and Prendergast, J. (1999), Fiscal stance and the real exchange rate: Some empirical estimates, NBER Working Paper 7077.
- Corsetti, G. and Müller, G. (2007), Twin deficits, openness and the business cycle, *Journal of European Economic Association* 6, 404-413.
- Devereux, M.B., Head, A.C. and Lapham, B.J. (1996), Monopolistic competition, increasing returns, and the effects of government spending, *Journal of Money, Credit, and Banking* 28, 233-254.
- Dixit, A.K. and Lambertini, L. (2001), Monetary-fiscal policy interactions and commitment versus discretion in a monetary union, *European Economic Review* 45, 977-987.
- Dixit, A.K. and Lambertini, L. (2003), Symbiosis of monetary and fiscal policies in a monetary union, *Journal of International Economics* 60, 235-247.
- Edelberg, W., Eichenbaum, M. and Fisher, J.D.M. (1999), Understanding the effects of a shock to government purchases, *Review of Economic Dynamics* 2, 166-206.
- European Commission (2008) (http://ec.europa.eu/economy_finance/sg_pact_fiscal_policy/excessive_deficit9109_en.htm).
- Fatás, A. and Mihov, I. (2001), The effects of fiscal policy on consumption and employment: Theory and evidence, CEPR Discussion Paper 2760.

- Fatás, A. and Mihov, I. (2003), The case for restricting fiscal policy discretion, *Quarterly Journal of Economics* 118, 1419-1447.
- Favero, C. and Giavazzi, F. (2007), Debt and the effects of fiscal policy, Mimeo, IGIER.
- Galí, J. and Perotti, R. (2003), Fiscal policy and monetary integration in Europe, *Economic Policy* 18, 533-572.
- Galí, J., Vallés, J. and López-Salido, J.D. (2007), Understanding the effects of government spending on consumption, *Journal of the European Economic Association* 5, 227-270.
- Giavazzi, F. and Pagano, M. (1990), Can severe fiscal adjustments be expansionary?, in O. Blanchard and S. Fischer (eds.), *NBER Macroeconomics Annual*, MIT Press, Cambridge, MA.
- Kim, S. and Roubini, N. (2004), Twin deficit or twin divergence: Fiscal policy, current account, and real exchange rate in the US, Mimeo, Korea University and New York University.
- Lane, P. and Perotti, R. (1998), The trade balance and fiscal policy in the OECD, *European Economic Review* 42, 887-895.
- Lane, P. and Perotti, R. (2003), The importance of composition of fiscal policy: Evidence from different exchange rate regimes, *Journal of Public Economics* 87, 2253-79.
- Leeper, E. (1991), Equilibria under “active” and “passive” monetary and fiscal policies, *Journal of Monetary Economics* 27, 129-147.
- Linnemann, L. (2006), The effect of government spending on private consumption: A puzzle?, *Journal of Money, Credit, and Banking* 38, 1715-35.
- Linnemann, L. and Schabert, A. (2003), Fiscal policy in the new neoclassical synthesis, *Journal of Money, Credit, and Banking* 35, 911-929.
- Monacelli, T. and Perotti, R. (2006), Fiscal policy, the trade balance and the real exchange rate: Implications for international risk sharing, Mimeo, IGIER.
- Monacelli, T. and Perotti, R. (2007), Openness and the sectoral effects of fiscal policy, *Journal of European Economic Association* 6, 395-403.
- Mountford, A. and Uhlig, H. (2005), What are the effects of fiscal policy shocks?, Mimeo, Royal Holloway College and Humboldt University.
- Müller, G. (2006), Understanding the dynamic effects of government spending on foreign trade, *Journal of International Money and Finance* 27, 345-371.
- Pappa, E. (2006), Discussion of “Comparing alternative methodologies to estimate the effects of fiscal policy by Roberto Perotti”, Mimeo, London School of Economics.
- Perotti, R. (1999), Fiscal policy in good times and bad, *Quarterly Journal of Economics* 114, 1399-1436.
- Perotti, R. (2007), In search of the transmission mechanism of fiscal policy, NBER Working Paper 13143.
- Ramey, V. and Shapiro, M. (1998), Costly capital reallocation and the effects of government spending, *Carnegie-Rochester Series on Public Policy* 48, 145-94.

- Ravn, M., Schmitt-Grohé, S. and Uribe, M. (2006), Deep habits, *Review of Economic Studies* 73, 195-218.
- Ravn, M., Schmitt-Grohé, S. and Uribe, M. (2007), Explaining the effects of government spending shocks on consumption and the real exchange rate, Mimeo, EUI Florence and Duke University.
- Sargent, T. and Wallace, N. (1981), Some unpleasant monetarist arithmetic, *Federal Reserve Bank of Minneapolis Quarterly Review* Fall, 1-17.
- Romer, C.D. and Romer, D.H. (2007), The macroeconomic effects tax changes: Estimates based on a new measure of fiscal shocks, NBER Working Paper 13264.
- Sims, C. (1994), A simple model for study of the determination of the price level and the interaction of monetary and fiscal policy, *Economic Theory* 4, 381-99.
- The Economist* (2008), Aspirin, Not Morphine, January 5, 9-10.
- Van der Ploeg, F. (2005), Back to Keynes?, *CESifo Economic Studies* 51, 777-822.

Appendix

A.1 International risk sharing condition

International asset market completeness implies the international risk sharing condition (after some normalisation),

$$u_C^H / u_C^F = Q, \quad (\text{A1})$$

The left-hand side is the ratio of the marginal utilities of Home (H) and Foreign (F) consumption, while the right-hand side is the real exchange rate, defined such that an increase means an appreciation of Home real exchange rate. Because the Home real exchange rate appreciates, the fall in Home consumption after a government purchases increase is larger than the fall in Foreign consumption.

A.2 Example of SVAR system

An example of a structural vector autoregression (SVAR) is:

$$A_0 Z_t = A(L) Z_{t-1} + e_t, \quad (\text{A.2})$$

where $Z_t = [g_t, \tau_t, y_t]'$ is the (3×1) vector of endogenous variables in period t , where g_t is government purchases, τ_t is cyclically adjusted net taxes and y_t is GDP (all in natural logarithms). A_0 is a (3×3) matrix with structural parameters that describe the contemporaneous relationships among the endogenous variables. Further, $A(L)$ is a (3×3) matrix of polynomials in lag terms. Finally, e_t is a vector of structural shocks. Time trends (not shown) may also be included as additional independent variables in the system. The “trick” is to find the right restrictions, for example motivated by economic theory or institutional features, to identify the shocks. An identification scheme that is frequently employed is to assume that A_0 is a lower triangular matrix with 1's on the diagonal. This amounts to assuming that, within a given period, government spending does not react to the other two variables, while net taxes and output are both allowed to react to government spending. Net taxes, in turn, are restricted not to react to output in the same period, while output is allowed to react to net taxes. This identification scheme may be motivated by the fact

that in reality government spending is fixed in plans made before the period starts and that taxes only adjust in response to changes in government spending.

A.3 The Ramey and Shapiro (1998) regressions

Defining a dummy D_t that equals one for the dates 1950Q3, 1965Q1 and 1980Q1 (and zero otherwise), the authors estimate:

$$x_t = a_0 + a_1 t + a_2 (t \geq 1973Q2) + \sum_{i=1}^8 b_i x_{t-i} + \sum_{i=1}^8 c_i D_{t-i} + e_t, \quad (\text{A.3})$$

where x_t is some variable of interest whose response to the shock one wants to measure. The regression includes a time trend that contains a break in 1973Q2.

A.4 The Romer and Romer (2007) regressions

The basic regression is

$$\Delta \ln Y_t = a + \sum_{i=0}^{12} b_i \Delta T_{t-i} + e_t, \quad (\text{A.4})$$

where the left hand side is the growth rate of real GDP and ΔT is the exogenous tax revenue change as a percent of nominal GDP.

A.5 Gali and Perotti (2003) regression

The authors estimate the following regression equation:

$$d_t^* = a_{BM} + a_{AM} + a_{x,BM} E_{t-1} y_t + a_{x,AM} E_{t-1} y_t + a_b b_{t-1} + a_d d_{t-1}^* + e_t, \quad (\text{A.5})$$

where d_t^* is the cyclically adjusted primary deficit as a share of potential output, y_t is the output gap and b_t is debt as a share of potential output. Further, E_{t-1} denotes the expectations operator conditional on available information in period $t-1$. Hence, the cyclically adjusted primary deficit is split into systematic

components (capturing the responses to the independent variables on the right-hand side of the regression) and a non-systematic component captured by the error term ϵ_t . The constant and the coefficients of the expected output gap are made dependent on the period 1980-1991 ("before Maastricht" indicated with subscript "BM") and the period 1992-2002 ("after Maastricht" indicated with subscript "AM").