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# Macroeconomic Effects of Fiscal Policy – Summary

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## INTRODUCTION AND SUMMARY

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Fiscal policy plays a key role in economic stabilisation policy, and during the financial crisis many countries have eased fiscal policy. Economists in the USA and Europe have disagreed about the impact of fiscal expansion on growth and employment. This debate has rekindled interest in studies of the macroeconomic effects of fiscal stimulus. These effects consist of direct effects, e.g. that an increase in government purchases of goods and services is reflected in higher employment in the firms supplying goods and services to the public sector, as well as more indirect effects. Indirect effects include e.g. that new employees receive higher incomes and are able to increase their consumption, and also changes in the consumption and savings behaviour of households and firms. Therefore, the aggregate real economic effects of fiscal policy can be determined only through an economic model, and all models are based on assumptions about economic relationships, which can be debated. Therefore, it is important to subject the macroeconomic effects of fiscal policy to analysis within various model frameworks.

Part 2 of this Monetary Review contains an empirical study, cf. Ravn (2012), and a model-based analysis, cf. Pedersen (2012), of the effects of fiscal policy. This article provides a non-technical summary of the most important findings and conclusions of these articles.

In the USA, the debate on the effects of fiscal policy was intensified by the adoption of the *American Recovery and Reinvestment Act*, ARRA, in February 2009, in the midst of the financial crisis. ARRA was a fiscal package designed to revive the US economy. The underlying calculations had been performed by Obama administration economists and were based on an assumption of a fiscal multiplier of 1.6. This means that a one-dollar increase in government spending leads to a rise in the output level of 1.6 dollars. This assumption has been challenged as being overly optimistic e.g. by academic economists, who have stated that there is no theoretical or empirical justification for a fiscal multiplier of this magnitude in the USA.

The debate has led to a number of new empirical and model-based analyses of the effects of fiscal policy. The host of new studies should also be seen in the context of an increased focus on the development of Dynamic Stochastic General Equilibrium models, DSGE models. In some respects, these models are based on very different model assumptions from those applied in the macroeconometric model framework, e.g. Statistics Denmark's model – ADAM, or Danmarks Nationalbank's model – MONA, traditionally used for analysing the effects of fiscal policy in Denmark.

Overall, the empirical analyses conducted in Ravn (2012) show that fiscal policy in Denmark may have a significant impact on real gross domestic product, GDP, but that the dynamic effects are limited. Thus the effect on GDP of fiscal expansion gradually dies out as the stimulus itself is removed. This would indicate that the dynamic effects of fiscal policy are moderate in Denmark. In other words, the impact on economic activity of a fiscal stimulus package is largely equivalent to the direct effect of that package.

Since the planning and implementation of fiscal stimulus is a time-consuming process, detailed fine-tuning of the Danish economy through activist fiscal policy is hardly feasible in practice. Instead, fiscal policy should be designed with a stability-oriented objective over the medium term, so as to avoid both periods of overheating and periods of high unemployment. This ensures that there is room for the automatic stabilisers to work and thus contribute to ironing out short-term cyclical fluctuations.<sup>1</sup> Moreover, expansionary fiscal policy during an economic crisis must be accompanied by willingness to tighten fiscal policy during good times, so as to conduct fiscal policy in a symmetric way. This ensures long-term fiscal sustainability, which is necessary to maintain the credibility of the Danish economy.

The analyses in Pedersen (2012) show that although the underlying mechanisms of the results differ in some respects, MONA and a DSGE model for Denmark produce relatively similar estimates of the effects on GDP of a temporary debt-financed fiscal expansion aimed at stabilising the business cycle. In the very short term, the effects on GDP of this stimulus in the two models are less pronounced than indicated by the empirical analysis, while the models concur in the longer term. At the same time, analyses in the DSGE model show that shifting demand from the future into the present through government purchases of goods and

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<sup>1</sup> Automatic stabilisers reflect that fiscal policy is automatically eased during an economic downturn, since expenditure e.g. for unemployment benefits rises when unemployment increases. Moreover, taxes are reduced when the earnings of firms and households decline. On the other hand, fiscal policy is automatically tightened during an upswing through higher tax revenues and lower expenditure for transfer benefits.

services comes at a price, even if higher government expenditure is fully financed in the future so that government debt is brought back to the initial level. The explanation is that fiscal expansion causes competitiveness to deteriorate, and due to stickiness in price and wage formation competitiveness is slow to be restored.

## OVERVIEW OF EMPIRICAL EFFECTS OF FISCAL POLICY

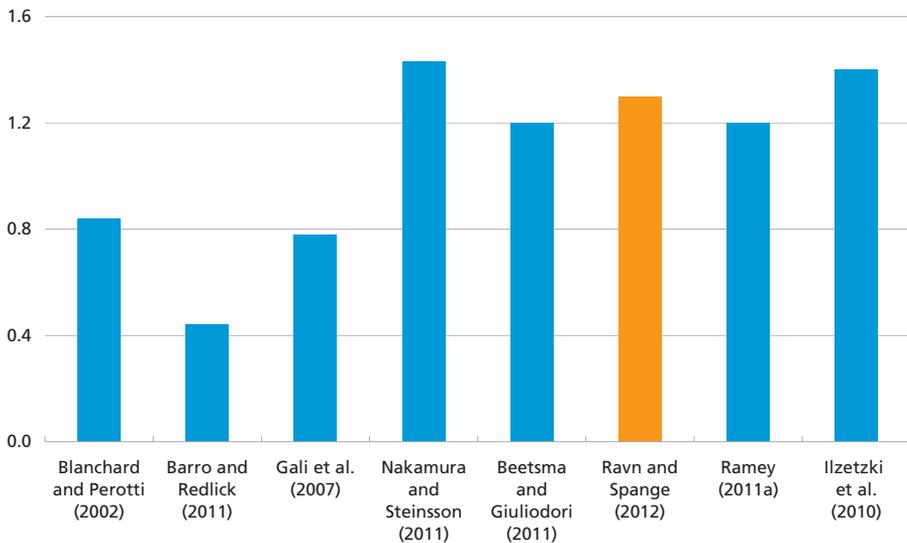
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One focus area of the empirical literature when it comes to the size of the fiscal multiplier has been to examine the effects of fiscal policy under various economic circumstances, e.g. under different exchange rate regimes, during booms and recessions, or during periods of very low interest rates. Others have sought to compare the findings from different econometric methods. Between them, these studies have helped to shed light on the background of the sometimes conflicting findings in the literature, which have been one of the reasons for the heated disagreement among economists about the effects of fiscal policy. It has become clear, in particular, that there is no unconditional fiscal multiplier. Rather, the multiplier varies over time and place, depending on a number of economic conditions. The design of the specific fiscal stimulus package and, not least, its financing also influence the effect. For instance, the effect of fiscal policy depends on whether changes are made to the revenue or expenditure side; moreover, changes to different types of government expenditure may have different effects. This underlines the importance of examining the effect of fiscal policy in Denmark in a country-specific study rather than simply applying the results from other countries to a Danish context. To promote comparability with a number of international studies, Ravn (2012) primarily considers the effects of changes in government purchases of goods and services.

A number of recent studies have drawn on the significant body of analysis in this area to define what could be referred to as a kind of confidence interval for the fiscal multiplier. For example, Hall (2009) sums up that, under normal economic conditions, the multiplier of government spending is typically estimated to range between 0.7 and 1 for the USA. Ramey (2011b) specifies an interval between 0.8 and 1.5, also for the USA. Chart 1 compares the multiplier from some of the more prominent recent studies of the effects of fiscal policy in different countries. The comparison illustrates the considerable range of multiplier values in the literature. This may be attributed both to disagreement as to the effect of fiscal policy and to differences in the countries' economic structures.

FISCAL MULTIPLIER IN SELECTED EMPIRICAL STUDIES

Chart 1



Note: The Chart summarises the main findings of the respective studies, which should be compared with caution. All of the multipliers shown relate to government spending. The multipliers in the two columns on the right (Ilzetzki et al. (2010) and Ramey (2011a)) show the *cumulative* multiplier, i.e. the cumulative increase in GDP relative to the cumulative increase in government spending over a number of years. The effects from the other studies show the multiplier during the period in which fiscal policy is changed. In the study by Ravn and Spange (2012), the impact multiplier and the cumulative multiplier are identical.

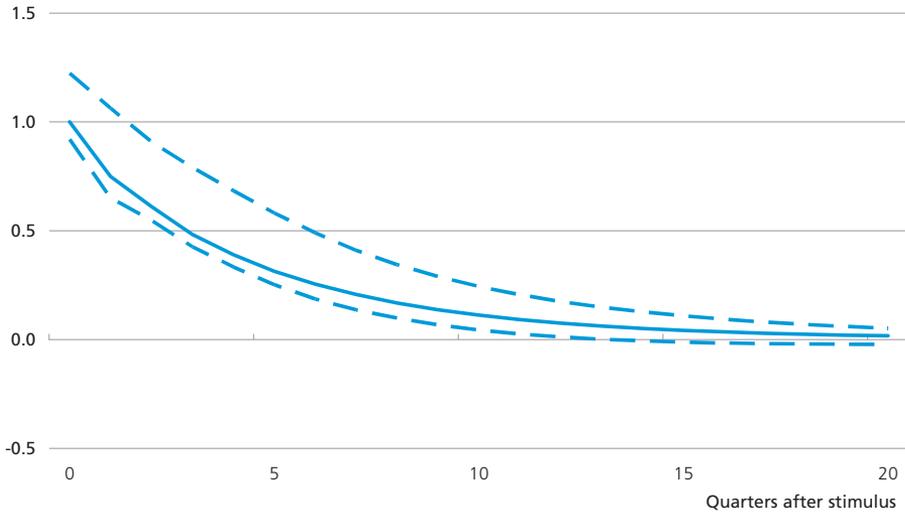
## EMPIRICAL EFFECTS OF FISCAL POLICY IN DENMARK

Ravn (2012) presents new empirical results on the effect of fiscal policy in Denmark.<sup>1</sup> Applied to Danish data, the results of this study can be summarised in Charts 2 and 3, illustrating the effects of an unanticipated, temporary increase in government purchases of goods and services. The full lines show the estimated effect of the increase in government spending, while the dashed lines indicate 95 per cent confidence limits for the estimated effect. In the experiment, government spending is raised by kr. 1 billion for one quarter, falling back towards the initial level over a number of quarters as illustrated by Chart 2. It is assumed that the increase is unexpected and unannounced, e.g. in the form of an exogenous, discretionary increase in government spending. It could, however, also reflect an unplanned increase following a slide in a component of government spending that has not been actively decided, but shows up in the data. In other words, this is a stylised experiment designed with a view to promoting comparability with similar experiments in the other studies mentioned. However, it is not similar to the way in which fiscal stimulus is often designed in practice. For example, in

<sup>1</sup> The details of this study are described in a working paper by Ravn and Spange (2012).

COURSE OF GOVERNMENT SPENDING

Chart 2



Note: The dashed lines reflect uncertainty about the estimated response of government spending in the model after the initial increase in the first quarter.

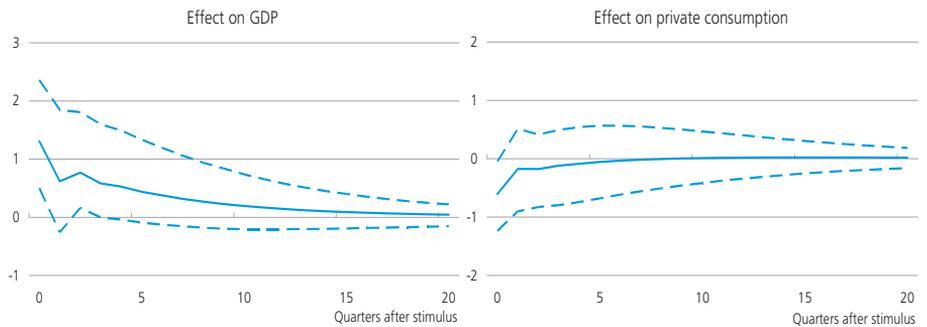
reality, fiscal stimulus often tends to be more persistent and possibly also stronger than the shock illustrated and often, to some extent, anticipated.

Chart 3 illustrates the effect on GDP and private consumption of the increase in government purchases of goods and services. The effect on GDP has been converted so that the vertical axis shows the increase in GDP in kr. billion following the increase of kr. 1 billion in government spending. The same applies to the effect on private consumption. This way, the fiscal multiplier can be observed directly from the vertical axis.

Chart 3 shows that an increase in government spending in the form of higher purchases of goods and services is reflected in a rise in GDP. During the first quarter, the fiscal multiplier is greater than 1; 1.3 to be

ESTIMATED EFFECT OF AN INCREASE IN GOVERNMENT SPENDING

Chart 3



exact. But the expansionary effect quickly dies out. Already in the next quarter, the multiplier is below 1. It appears from the confidence limits that the increase in government spending has no significant effect on GDP beyond the first year after the implementation of the stimulus. The effect on GDP seems to die out as government spending returns to its initial level. In other words, the expansionary effect of fiscal policy dies out more quickly in Denmark than in other countries. One explanation could be that the Danish economy is very small and very open, extensively driven by external impacts. Another contributing factor could be that automatic stabilisers are stronger in Denmark than in most other countries. Finally, the Chart shows that the effect on private consumption is limited.

The results thus indicate that fiscal stimulus mainly impacts economic activity through the direct effect of higher government spending. On the other hand, the relatively short-lived effect on GDP and the moderate impact on private consumption would indicate that the dynamic effects of changes in government spending are fairly small in Denmark.

*Timing* fiscal stimulus correctly may be difficult in practice. First, the need for fiscal stimulus is to be identified, then the stimulus is to be designed and passed through the legislative procedure, and finally the actual effect of the fiscal stimulus is to kick in. In other words, measuring out fiscal stimulus so as to have the effect kick in at the desired time may be difficult. Hence, in practice, short-term discretionary fiscal policy is not a very suitable instrument for detailed fine-tuning of business cycle fluctuations in Denmark. Instead, fiscal policy should be designed with a stability-oriented objective over the medium term, so as to avoid both periods of overheating and periods of high unemployment. This ensures that there is room for the automatic stabilisers to work and thus contribute to ironing out short-term cyclical fluctuations.

The analysis also demonstrates that the effects of fiscal policy have increased in Denmark during recent decades relative to the 1970s and the 1980s. More specifically, the fiscal multiplier was below 1 in the 1970s and 1980s, but has been greater than 1 since the early 1990s. Presumably, the reason is Denmark's adoption of a credible fixed exchange rate regime and the increased focus on sound public finances. In the 1970s and well into the 1980s, the Danish economy was characterised by high interest rates, high and fluctuating inflation, frequent devaluations and unsound public finances. Thus, there was a risk that fiscal stimulus would result in a lack of confidence in the sustainability of public finances with an ensuing risk of rising interest rates. Although the fixed exchange rate policy was introduced in 1982, it takes time to build up credibility for a fixed exchange rate regime and to reduce govern-

ment debt. But with a credible fixed exchange rate regime and sustainable public finances, fiscal policy may achieve the desired impact on the real economy. However, there is no reason to expect that the effects of fiscal policy will continue to rise in the future, since the Danish fixed exchange rate regime has achieved very high credibility and public finances are relatively sound.

## **EFFECTS OF FISCAL POLICY IN MONA AND IN A DSGE MODEL – A STYLISTED TEMPORARY FISCAL PACKAGE**

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For a number of years, Danmarks Nationalbank has used its MONA model primarily for forecasting purposes.<sup>1</sup> The model is also used for calculating stress test scenarios in connection with assessments of financial stability, for simulation of policy changes and for calculation of the effects of structural changes in the Danish economy. For a more detailed description of MONA, see Danmarks Nationalbank (2003).

MONA can be classified as a macroeconomic model. This also applies to the other two major Danish models, SMEC<sup>2</sup>, used by the Secretariat of the Economic Councils, and ADAM<sup>3</sup>, which is maintained by Statistics Denmark and used by the Ministry of Finance, the Ministry of Economic Affairs and the Interior, the Economic Council of the Labour Movement and the Confederation of Danish Industry, among others. The short-term properties of the models are based on the principle that output is demand-determined, while their long-term properties reflect supply conditions in the economy.

Over the last 10-15 years, a new type of macroeconomic model has attracted attention from central banks in other countries, international organisations and the research community. These models are Dynamic Stochastic General Equilibrium models, or DSGE models. They are based on forward-looking behaviour and expectations to a higher degree than macroeconomic models.

Pedersen (2012) analyses the effects of fiscal policy in Denmark in a DSGE model compared with the effects in MONA. Thus, analyses of the Danish economy within a DSGE model framework can be a useful supplement to analyses using the Danish macroeconomic models. At the same time, such analyses provide experience with a model framework that has been used for a number of years for macroeconomic analyses, including analyses of the Danish economy, by international organ-

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<sup>1</sup> Model for Danmarks Nationalbank.

<sup>2</sup> Simulation Model of the Economic Council.

<sup>3</sup> Annual Danish Aggregate Model.

isations and the economic research community. However, the two model frameworks are not substitutes for each other in all respects.

Macroeconometric models are often developed as general tools to be used in practical and detailed economic-policy planning, and they typically contain a detailed description of e.g. the tax system, government expenditure, the business structure, etc. Conversely, DSGE models are normally less detailed and particularly suitable for addressing issues where behavioural incentives, forward-looking behaviour and formation of expectations play a decisive role. A case in point is changes of the tax system, causing shifts in economic incentives and affecting savings and investment decisions. Another example could be labour-market reforms with a direct impact on households' incentives regarding the work/life balance.

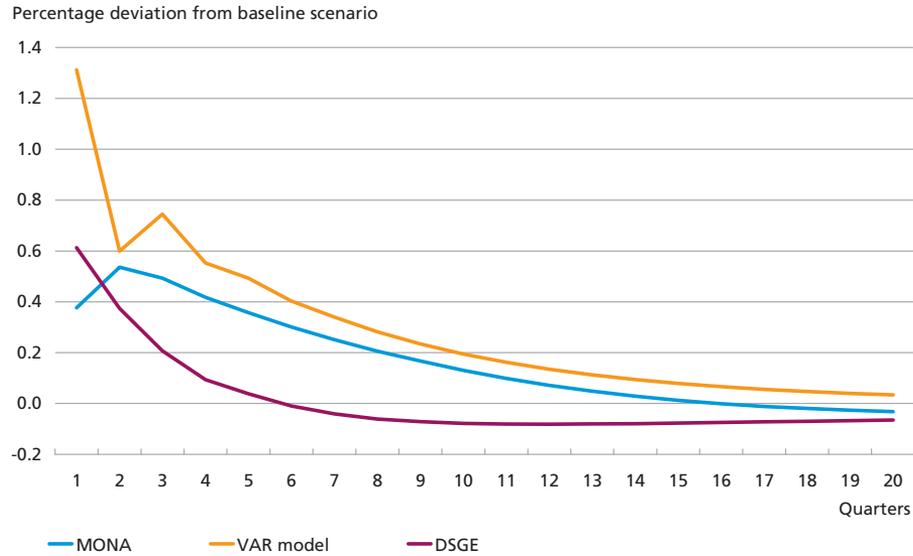
Initially, Pedersen (2012) looks at a debt-financed increase in government purchases of goods and services equivalent to 1 per cent of GDP, which is then reduced by around 20 per cent per quarter. The experiment entails a scenario for government purchases of goods and services as illustrated by Chart 2 above. The calculations assume that the stimulus is not announced in advance, but that households and firms are aware, when the stimulus is implemented, of how much government purchases of goods and services will rise in excess of the planned increase, and for how long.

The GDP multiplier for increased government purchases of goods and services is illustrated by Chart 4. As the Chart shows, MONA and the DSGE model produce fairly similar estimates of the effects on GDP of fiscal expansion. The higher government purchases of goods and services cause real GDP to rise by approximately 0.4 per cent in MONA and around 0.6 per cent in the DSGE model in the first quarter after the increase in government purchases of goods and services. In the subsequent quarters, the effect on GDP subsides relatively faster in the DSGE model than in MONA. The effect on GDP is zero already after 6 quarters in the DSGE model, while it takes around 15 quarters in MONA.

However, there are pronounced differences as regards the underlying structures and mechanisms producing the effects. These differences should particularly be viewed in conjunction with various assumptions regarding formation of expectations and forward-looking behaviour in the modelling of firms and households. In the DSGE model, private consumption declines a little, as forward-looking consumers realise that their future tax payments will be higher. This is the case, since fiscal policy in the DSGE model is assumed to be sustainable, entailing that the increase in government debt has to be repaid some time in the future. The driver of the multiplier in MONA after the first year is private con-

## EFFECTS ON REAL GDP OF A TEMPORARY INCREASE IN GOVERNMENT PURCHASES OF GOODS AND SERVICES

Chart 4



Note: The VAR model refers to the calculated effects in the study by Ravn and Spangne (2012) described in the previous sections.

sumption, rising slowly and peaking after approximately 1 year. This effect should be seen in the context that consumers in MONA make consumption decisions on the basis of current income without considering the future, including repayment of the additional government debt.

Most of the DSGE literature assumes that expectations are formed rationally, wholly or in part, and this assumption plays a significant part in the effect on consumption of higher government purchases of goods and services in the DSGE model. Rational expectations imply that households and firms do not systematically commit errors and are also known as model-consistent expectations. A substantial advantage of rational expectations is that they are relatively easy to work with in the model, constituting an assumption that contributes to enabling calculations in models with forward-looking behaviour.

However, it is important to point out that rational expectations are based on strict assumptions. Rational expectations imply that consumers are assumed to know the entire economy, i.e. the model relationships, model parameter values, etc., and that they use this information optimally in the formation of their expectations of future economic developments. In other words, rational expectations mean that the households in the models can and will calculate accurately how much their current and future tax payments must increase in the event of fiscal expansion

to ensure that fiscal policy remains sustainable in future. They also entail e.g. that consumers know and can observe that fiscal policy is generally sustainable for fiscal experiments.

The differences between the calculated effects in MONA and the DSGE model in the first quarter should also be seen in the context that the increased demand in MONA is partially met by higher imports and depletion of inventories. The import ratio is particularly high in the first quarter, since a portion of government purchases of goods and services is spent directly on imports. In MONA, inventories are depleted, since the model assumes that it takes time for domestic output to adjust sufficiently to the higher demand for domestic products. These effects are not included in the DSGE model.

In the DSGE model, the labour market is modelled as a search and matching process, entailing that hiring new employees involves costs for firms and that it takes time to find employees. Consequently, there is no direct pass-through to employment – and thus output – from the additional demand generated in the economy by higher government purchases of goods and services. One result of the DSGE model is thus that the effect of fiscal policy depends on the degree of flexibility in the labour market, including firms' expectations regarding the value of hiring extra employees, how quickly employees can be hired and wage formation. In MONA, however, output mechanically determines employment, entailing that the employment effect is stronger in MONA than in the DSGE model.

On the other hand, the models both show the decline in exports as a mechanism that contributes to returning the multipliers to 0 in the longer term. A small open economy like Denmark is prone to significant leakage effects, and increased demand is reflected in higher demand for both Danish and foreign goods. Moreover, higher activity causes competitiveness to deteriorate and puts a squeeze on exports. This occurs in spite of the fact that forward-looking consumers reduce their consumption, since part of the additional public-sector demand is reflected in higher wages and prices. However, the fiscal effects subside more slowly in MONA than in the DSGE model.

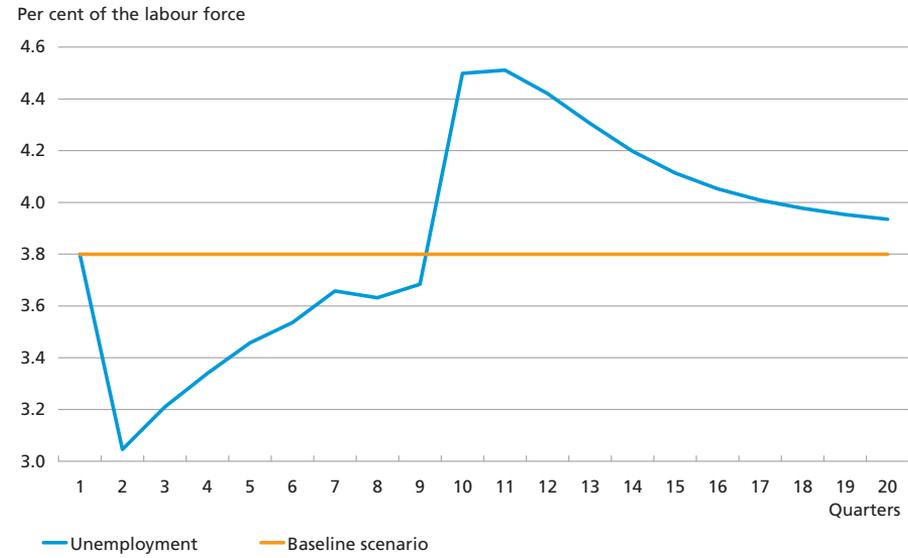
## **EFFECTS OF FISCAL POLICY IN MONA AND IN A DSGE MODEL – A REALISTIC, BUT STYLISED FISCAL PACKAGE**

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Pedersen (2012) also analyses the effects of a more realistic, but stylised fiscal package aimed at stabilising the business cycle and consisting of temporary easing of fiscal policy over a 2-year period. The package is fully financed, since higher taxes will ensure that government debt re-

EFFECT ON UNEMPLOYMENT OF A 2-YEAR FISCAL EXPANSION WITH  
SUBSEQUENT STABILISATION OF GOVERNMENT DEBT

Chart 5



turns to the initial level within 2 years from the expiry of the fiscal stimulus. The calculations assume that the package is not announced in advance, but that households and firms receive full information on the fiscal package when it is implemented. The purpose of the package is to shift demand and output from the future to the present without jeopardising fiscal sustainability.

The analysis using the DSGE model shows that such a fiscal package comes at a price, since unemployment will be higher and output lower after government debt has been brought back to the initial level, cf. Chart 5. This should be viewed in light of the slow recovery of competitiveness – and hence exports – due to stickiness of prices and wages.

### EFFECTS OF FISCAL POLICY IN MONA AND A DSGE MODEL – THE 2004 SPRING PACKAGE

Finally, Pedersen (2012) analyses the effects of the 2004 Spring Package using the DSGE model. The analysis throws light only on the isolated effects of the actually adopted elements of the Spring Package. Consequently, fiscal stimuli in subsequent years, which are not related to the Spring Package, are not considered in the analysis. Thus overall fiscal policy was not tightened in subsequent years as had originally been planned.

The Spring Package contained elements to stabilise the business cycle, i.e. increased government investment, enhanced active labour market

programmes, suspension of the mandatory Special Pension Savings Scheme, SP, as well as a structural element in the form of permanently lower tax on earned income. All else equal, suspension of a mandatory pension savings scheme should increase the propensity to consume only if consumers are credit constrained either in the form of a cap on lending or in the form of a large gap between lending and deposit rates. The explanation is that the suspension does not increase consumers' lifetime income. The forward-looking behaviour and formation of expectations thus make the DSGE model particularly well suited for modelling the suspension of SP. In the model, the SP suspension causes a change in behaviour only in credit constrained consumers. The effect on consumption for the rest of the consumers is zero.

The calculations in the DSGE model show that, viewed in isolation, the permanently lower tax on earned income introduced with the Spring Package resulted in improved competitiveness in the long term. The tax cut provided the basis for higher export growth which, viewed in isolation, contributed to permanently lower unemployment and permanently higher output. This, in turn, offset the initial deterioration of competitiveness resulting from the elements designed to stabilise the business cycle. According to the DSGE model, permanently higher output also contributes to fiscal sustainability.

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