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THE MACROECONOMICS EFFECTS OF GOVERNMENT SPENDING UNDER FISCAL FORESIGHT

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Abstract
Consumption and output responses to fiscal shocks are studied in a model with fiscal foresight. Fiscal foresight reduces both output multipliers and consumption. However, key features such as sticky wages, credit constrained households and elastic labour supply, are able to generate both sizeable output multipliers and positive consumption, in effect preserving key Keynesian effects. This model fits a developing economy like South Africa well since it is able to capture transparent communication of government as well as control for credit constrained consumption and sticky wages.
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1. INTRODUCTION

This paper disentangles the effects of fiscal shocks when agents have foresight. As highlighted by Ramey (2011) and Leeper *et al.* (2012) models that do not explicitly account for foresight is misspecified and may produce faulty output and consumption responses to fiscal shocks. To address the issue of foresight we build on the familiar models of Gali *et al.* (2007) and Furlanetto (2011). We investigate whether certain conditions (sticky wages, share of rule-of-thumb consumption and elastic labour supply) are able to preserve the results of Gali *et al.* (2007) and Furlanetto (2011) under foresight, or whether they will inevitably complement the results obtained by Ramey (2011). The Gali *et al.* (2007) model requires an exogenous wage mark-up shock along with a large share of rule-of-thumb consumers to generate positive aggregate household consumption responses given a fiscal shock. Furlanetto's (2011) sticky wage model still generate positive consumption responses despite a fall in household wages due to the beneficial effect of lower interest rate response. The two models are closely related and are appropriate for our study in trying to analyse whether foresight eliminates positive consumption. These models are also well-suited to developing economies like South Africa and capture essential features such as union bargaining on wages, credit constrained households, sticky prices reflecting the monopolistic competition in the market (Fedderke and Schaling, 2005), investment adjustment costs and transparent communication by government on future spending and taxes.

The paper has two contributions. The first shows that fiscal foresight eliminates the results obtained in Gali *et al.* (2007), *i.e.* consumption does not increase with respect to

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an increase in fiscal spending and consequently that a large share of rule-of-thumb consumption is not enough to preserve their original results. The second contribution shows that sticky wages, as in the model of Furlanetto (2011), minimises the negative impact of fiscal foresight. Under certain calibrations we show that with sticky wages one can still generate positive consumption responses and produce sizeable output multipliers.

It is important from the outset to highlight why sticky wages produce such different results. The main difference follows from labour supply and in particular how wages react. Since the model contains lump sum taxes, any increase in fiscal spending today will have to be financed through higher taxes in the future. The lump sum tax, although not distortionary, shifts the consumers' budget constraint to the left. Consequently, optimising consumers reduce their consumption immediately. This negative wealth effect induces consumers to supply more labour, which results in a decrease in the real wage (see Ramey 2011). Here sticky wages ensure that the fall in real wages is muted. A second channel is also at play – an increase in fiscal spending increases prices through an increase in aggregate demand, which increases the monetary policy rate. Higher interest rates reduce investment and decreases consumption even more. Under sticky prices and wages, prices and wages are less prone to a government shock and hence interest rates are muted and have less of an effect on consumption. This result also holds for news shocks.

We add two types of foresight, viz., medium and high to fiscal shocks, which complements the works by both Gali *et al.* (2007) and Leeper *et al.* (2012) in investigating fiscal expansions. Finally, we provide sensitivity analysis as to how the model behaves under different labour supply elasticities and different shares of rule-of-thumb consumption.

Given that the response of labour is crucial within the context of consumption response to government spending, we argue that elastic labour supply along with sticky wages counters the negative effects of foresight on consumption even more. With a large share of rule-of-thumb consumption and elastic labour typical of most developing countries, some of the Gali *et al.* (2007) results, sign not size, are preserved.

2. LITERATURE REVIEW

The effects of foresight have become increasingly important in trying to explain differences in empirical and theoretical work on the macroeconomic consequences of fiscal shocks. Blanchard and Perotti's (2002) paper serves as reference point for the majority of empirical work and has been highly contested by Ramey (2011). While there seems to be some agreement on the effects of government spending on output, there exists a major disagreement regarding the effects of spending shocks on consumption and wages. Some authors find strong evidence of Keynesian effects – both consumption and wages increase in response to spending (Rotemberg and Woodford, 1992; Blanchard and Perotti, 2002; Gali *et al.,* 2007), while others show that household consumption decreases when government spending increases (Baxter and King, 1983; Ramey and Shapiro, 1998; Hall, 2009; Cogan *et al.,* 2009, Farmer and Plotnikov, 2012).

Ramey and Shapiro (1998), Ramey (2011) and Leeper *et al.* (2012) argue that many shocks identified from the standard VAR are anticipated changes in government spending and are not pure government spending shocks. Some agents have information about future spending and tax policy changes before they are implemented, especially when governments communicate transparently. This is called fiscal foresight. This often arises due to pre-announced policy changes, legislative lags or simple policy implementation

lags. These lags imply that time evolves between when news arrives and when the policy gets implemented (Leeper *et al.*, 2011).

This presents a major problem for the econometrician, he does not have enough information to recover the structural shocks. As an example Leeper *et al.* (2008) illustrate foresight in a system of three variables: capital, technology and taxes. If they model only two of the system's variables, say technology and capital, the system becomes non-invertible. However, augmenting the system with the full information set, *i.e.* including taxes render the system stable. Thus Vector Autoregression (VAR) models, although invertible due to structural restrictions, might in theory be non-invertible due to misspecification, *i.e.* the number of variables is not sufficient to disentangle the structural innovations from reduced form shocks. In fact, Forni and Gambetti (2010) and Gambetti (2012) illustrate this by using a large data set in a Factor Augmented VAR to account for possible misspecification. They show that an increase in government spending only has transitory effects on consumption, there is no evidence of crowding out and the reaction to investment is positive.

From an empirical perspective Ramey (2011) augments the same VAR used by Blanchard and Perotti (2002) with a variable that captures foresight. The Survey of Professional Forecasters is used to proxy foresight. The augmented VAR results are different than Blanchard and Perotti (2002), consumption and investment decline with an increase in spending.

Leeper *et al.* (2012) capture foresight or anticipation as the difference between federal and municipal bond yields. The latter is exempt from tax changes while the former is not. As a result, tax announcements would affect only federal bond yields, which allow them to study anticipation. They show that an increase in anticipated tax hikes result in output booms prior to the actual hike. This is because wealth effects occur upon arrival of the news – while the substitution effects come in to play once the tax rate is changed. Here the reduced wealth effects induce agents to increase labour thereby increasing employment and output. Leeper *et al.* (2012) also uses Mountford and Uhlig's (2009) VAR and augments it with this fiscal foresight variable. Unlike Mountford and Uhlig who show that investment is unchanged when taxes increase, the augmented VAR now shows significant positive responses. The main reason cited here is that investment adjustment costs are low–high investment adjustment costs would result in a decrease in investment after a news shock in taxes. Aggregate consumption falls by more under foresight than without foresight; labour decreases in anticipation to an increase in government spending.

The rest of the paper is organised as follows. Section 3 lays out the model and its different blocks. Section 4 examines the equilibrium response to a government spending shock and Section 5 concludes.

3. MODEL OUTLINE

Leeper *et al.* (2011) and Leeper and Walker (2011) show that when information flows (foresight) are modelled correctly and then appended to Dynamic Stochastic General Equilibrium (DSGE) models, the qualitative results of the effects of fiscal news become more accurate.

Hence we amend Gali *et al.* (2007) exogenous government expenditure process to one that captures the essence of foresight as in equation (1):

$$g_t = \rho_g g_{t-1} + \sum_{i=0}^{q} \theta_i^g \varepsilon_{t-i}^g \quad (1)$$

where g is government expenditure and θ_i^g is the Moving Average (MA) component that captures the extent of foresight, ρ_g is the persistence parameter.

Our foresight term can be expanded following Leeper *et al.* (2012):

For high and medium degree foresight:

$$\text{High} = 0.11\varepsilon_t + 0.31\varepsilon_{t-1} + 0.27\varepsilon_{t-2} + 0.28\varepsilon_{t-3} + 0.02\varepsilon_{t-4} + 0.01\varepsilon_{t-5} \quad (2)$$

$$\text{Medium} = 0.59\varepsilon_t + 0.24\varepsilon_{t-1} + 0.09\varepsilon_{t-2} + 0.08\varepsilon_{t-3} \quad (3)$$

The MA terms measure the news of up to five periods ago for high foresight compared to three periods ago for the low foresight case. The fact that ε_t is less than 1 implies that the implementation of the fiscal shock in the current period is discounted and even more so in the case of high foresight scenario. Without foresight, the MA terms would disappear and the contemporaneous term would have a parameter equal to 1. One can also think of the lags in equations (2) and (3) as representing the announcement of an increase in spending. This would mean that agents already factored part of the spending (which is due in period *t*) into their decisions in periods *t-i* when government announced in period *t-i* that it would spend. Since optimising consumers utilise this foresight so that their consumption would already decline in anticipation to the fiscal shock.

Identifying the MA components of equations (2) and (3) requires data on fiscal spending forecasts. Leeper *et al.* (2012) use the Survey of Professional Forecasters conducted by the Federal Reserve Bank of Philadelphia. Specifically, they use forecasts of real government consumption over different forecast horizons. They decompose the forecasts of government spending into two components: one capturing the weight of the forecast conducted in a specific period and the other depending on the persistence of spending using a simple AR(1) model and allowing the forecaster weight to be time varying. The mapping of foresight into the DSGE model relies on decomposing the moving average representation of fiscal policy to the equation using a Wold decomposition. This allows them to map directly the foresight horizon and foresight intensity. Unfortunately to the authors' knowledge, there exists no consistent time series forecast data by professional forecasters regarding government spending in South Africa. As a consequence, we borrow the MA parameters directly from Leeper *et al.* (2012) to study the consequences of foresight.

We incorporate this foresight into the models of Gali *et al.* (2007) and Furlanetto (2011). The two models are similar and differ in one respect – wages are formed differently. Furlanetto (2011) introduces sticky wages on top of the wage mark-up in Gali *et al.* (2007).

The model is a New Keynesian closed economy model with differentiated consumers. Consumers are either Ricardian or rule of thumb. Intermediate firms are monopolistically competitive and prices are sticky.

The household's utility function is given as:

$$U\left(C_t^i, N_t^i\right) = \log\left(c_t^i\right) - \frac{\left(N_t^i\right)^{1+\phi}}{1+\phi} \quad (4)$$

ϕ is the Frisch inverse elasticity of labour supply *(i={rule-of-thumb or optimising households})*.

The nominal budget constraint for optimising households is given by:

$$P_t\left(C_t^o+I_t^o\right)+R_t^{-1}B_{t+1}^o=W_tP_tN_t^o+P_tR_t^kK_t^o+B_t^o+D_t^o-P_tT_t^o-F_t \tag{5}$$

Where C_t^o is consumption, N_t^o is labour, wages are given by W_t, the riskless nominal government bond is given by B_t^o, and pays out one unit of currency in the future, with the nominal gross interest rate given by $R_t^{-1}=(1+r_t{}^r+\pi_t)$. D_t^o represents dividend pay-outs from firms and T_t^o are lump-sum taxes or transfers.[1] F_t is spending on union fees.

The law of motion for capital is given by:

$$K_{t+1}^o=(1-\delta)K_t^o+o\left(\frac{I_t^o}{K_t^o}\right)K_t^o \tag{6}$$

Capital adjustment costs are given by $o\left(\frac{I_t^o}{K_t^o}\right)K_t^o$ which determines the change in capital induced by investment spending. As in Gali *et al.* (2007) we assume that $o'>0$, and $o''\leq 0$, with $o'(\delta)=1$, and $o(\delta)=\delta$. The function of the adjustment costs is convex and the corresponding value of the equilibrium level of the ratio of investment to capital stock is equal to the depreciation rate. In steady state, there are no adjustment costs.

Each union sets the wage rate for its members, who stand ready to satisfy firm's demand for their labour services at the chosen wage. The workers in a union provide the same type of labour differentiated from the type of labour services provided by members of other unions. The labour services provided by each union $N(z)$, is a simple aggregate of its member's (j) labour services $\left(N_t(j)=\left[\int_0^1 N_t(j,z)^{\frac{\varepsilon_w-1}{\varepsilon_w}}dz\right]^{\frac{\varepsilon_w}{\varepsilon_w-1}}\right)$ where ε_w is the elasticity of substitution across different types of households. In turn the labour entering the production function of any firms is a Dixit and Stiglitz (1977) aggregate of the labour services provided by the unions in the economy.

Each period a representative union chooses $W_t(z)$ to maximise the present value of an average of its member's current and future period utility function subject to both consumers' budget constraints. This follows as:

$$\max_{W_t(z)} E_t\sum_{k=0}^{\infty}\beta^{t+k}\left[\lambda U_{t+k}^r+(1-\lambda)U_{t+k}^o\right] \tag{7}$$

subject to the labour demand functions and the budget constraints of its members, thus taking the wage decision on income of its members into account. The costly wage adjustments are quadratic function of the increase in the wage demanded by unions modelled in Rotemberg (1982). A higher wage implies that unions had to put in more effort to obtain that wage. Each member of the union covers an equal share of the wage adjustment cost by paying a union membership fee. Hence the nominal fee paid by a member of union z at time t is given by:

[1] Superscript "o" refers to Ricardian households.

$$F_t(z)=\frac{\phi_w}{2}\left(\frac{W_t(z)}{W_{t-1}(z)}-1\right)^2 W_t N_t \tag{8}$$

Where the size of the adjustment cost is governed by ϕ_w. The first order condition with respect to $W_t(z)$ using (7) and (8) is

$$\begin{aligned}0=&\left(\frac{\lambda}{C_t^r}+\frac{1-\lambda}{C_t^o}\right)\frac{W_t}{P_t}\left[(\varepsilon_w-1)+\phi_w\left(\Pi_t^w-1\right)\Pi_t^w\right]-\varepsilon_w\Pi_t^{\phi}\\&-\beta E_t\left[\left(\frac{\lambda}{C_t^r}+\frac{1-\lambda}{C_t^o}\right)\phi_w\left(\Pi_{t+1}^w-1\right)\Pi_{t+1}^w\frac{W_{t+1}}{P_{t+1}}\frac{N_{t+1}}{N_t}\right]\end{aligned}$$

Log-linearising the above condition gives the New-Keynesian Phillips curve for wages:

$$\pi_t^w=\left(\frac{\varepsilon_w-1}{\phi_w}\right)(c_t+\phi n_t-(w_t-p_t))+\beta E_t\pi_{t+1}^w \tag{9}$$

Notice that if $\phi_w=0$ the wage Phillips curve drops out and only the classical labour supply curve remains – effectively yielding the same result as in Gali *et al.* (2007): $c_t+\phi n_t=(w_t-p_t)$. This is also the primary difference between Furlanetto (2011) and Gali *et al.* (2007).

From the firm's pricing problem and the intermediate firm's marginal cost condition we derive the New-Keynesian Phillips curve (which is standard in the New-Keynesian literature)

$$\pi_t=\left(\frac{(1-\theta)(1-\omega\theta)}{\theta}\right)mc_t+\beta E_t\pi_{t+1} \tag{10}$$

θ is the probability that the price will stay fixed for the next period.

Monetary policy follows a Taylor-rule:

$$r_t=r+\phi_\pi\pi_t \tag{11}$$

Where r is the nominal steady state interest rate and ϕ_π is the weight on the reaction of monetary policy to current inflation.

The government satisfies the following budget constraint:

$$P_tT_t+R_t^{-1}B_{t+1}=B_t+P_tG_t \tag{12}$$

Taxes evolve according to the following rule:

$$t_t=\phi_b b_t+\phi_g g_t \tag{13}$$

Aggregate consumption is given by

$$c_t=\lambda c_t^r+(1-\lambda)c_t^o \tag{14}$$

For aggregate hours worked we have:

$$n_t = \lambda n_t^r + (1-\lambda) n_t^o \tag{15}$$

Note that inflation and wage inflation is linked by $\pi_t^w = (w_t - w_{t-1}) + \pi_t$

The market clearing conditions for labour and goods are:

$$N_t(z) = \int_0^1 N_t(z,j)dj \tag{16}$$

$$Y_t(j) = Y_t^d(j) \tag{17}$$

4. RESULTS

We calibrate the parameters to match the economic structure of the South African Economy. The calibrated values are provided in Table 1. Many of these parameters have been estimated in other DSGE such as Alpanda *et al.* (2011), Ortiz and Sturzernegger (2007), Du Plessis *et al.* (2014) and Jooste *et al.* (2013) – we borrow some values from them while the unidentified parameters are estimated and calibrated outside of the model. β is set to 0.99, which implies an annual steady state real interest rate of 4%. The yearly depreciation rate is set to 10% implying that δ equals 0.025. The elasticity of substitution for consumption is set to 1 implying that consumption in the utility function is logarithmic. The labour supply elasticity in Du Plessis *et al.* (2014) is set at 5 implying an inverse Frisch elasticity of 0.2, which is very elastic. Unfortunately, there are not a lot of reliable estimates for the labour supply elasticity in South Africa. It is due to the lack of available estimates that we vary the elasticity to study the response to consumption given fiscal shocks. We assumed a unit labour supply elasticity in our baseline scenario. It should also be noted that labour supply elasticities at the extensive and intensive margins differ. The intensive margin, using micro studies, usually indicates a more inelastic labour supply. This also differs by individual income and by race. The extensive margin, usually macro studies that use aggregate employment instead of individual hours worked estimate larger supply elasticities to match business cycle characteristics.

Table 1. Calibration

Parameter	Value[1]
β	0.99
η	1.00
σ	1.00
δ	0.025
α	0.33
φ	5.00
ε	6
θ	0.75
φ_π	1.5
φ_b	0.33
φ_g	0.10
λ	0.1-0.9
ρ_g	0.9
φ_w	59.48
ε_w	6

[1]Log-linear equations are similar to Gali *et al.* (2007) and Furlanetto (2011) - see Appendix. Note that $\eta \equiv -1/(o''(\delta)\delta)$.

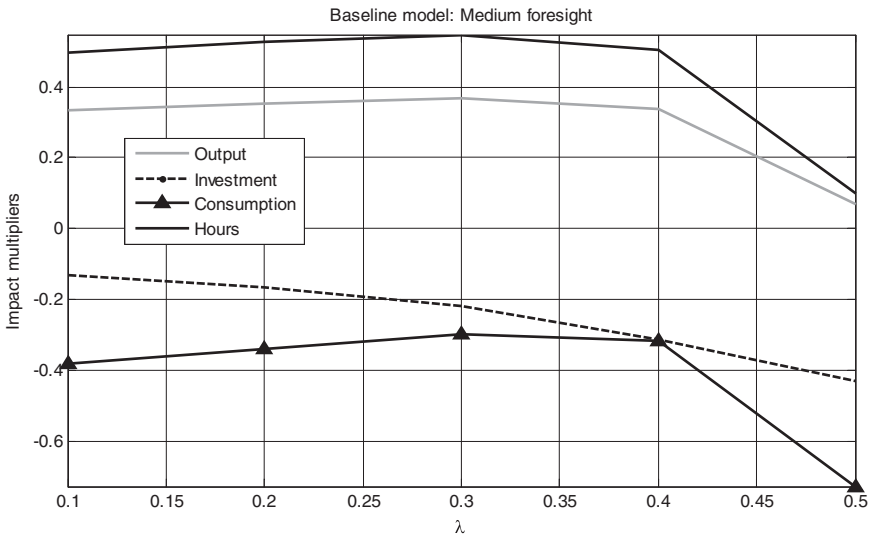

Figure 1. Impact multiplier with medium foresight – non-competitive labour market

The steady state ratios of investment, government consumption and household consumption as a percent of GDP are used so as to match the national statistics produced by the South African Reserve Bank. The Taylor rule weight on inflation is calibrated to be 1.4, while Calvo prices for domestic inflation is calibrated at 0.7. The elasticity of substitution among intermediate goods is set equal to 6 which imply an average mark-up of 20%.

The share or rule of thumb consumers is estimated from Campbell and Mankiw (1990) using the following equation: $\Delta c_t = u_t + \lambda[x\Delta y_t + (1-x)y_{t-1}] + \varepsilon_t$. The parameters are estimated using IV regressions with lagged consumption and income (GDP is used as a proxy) as instruments. Depending on the number of lags, the rule of thumb share λ lies between (0.5, 0.89).[2] Unfortunately again these estimates rely on macro data without a real indication of households that are credit constrained. Savings data from various income surveys in South Africa is also subject to misrepresentation due to underreporting by higher income households. Consequently, we also vary the rule of thumb share to determine aggregate consumption responses. In a related paper, Jooste *et al.* (2013) estimate the aggregate household response to fiscal shocks using a variety of methods. To match the empirical results (a VAR) from a model similar to Smets and Wouters (2007), required an estimate for λ equalling 0.8.

South Africa does not follow an explicit tax rule as set out by Gali *et al.* (2007). However, for consistency, we estimate the responsiveness to taxes to debt and government expenditure in a VAR. The sum of the lagged coefficients is used as our government policy parameters. Our estimates for ϕ_b and ϕ_g equal 0.4 and 0.2, respectively. The persistence of government spending is set equal to 0.9.

[2] The results are available upon request.

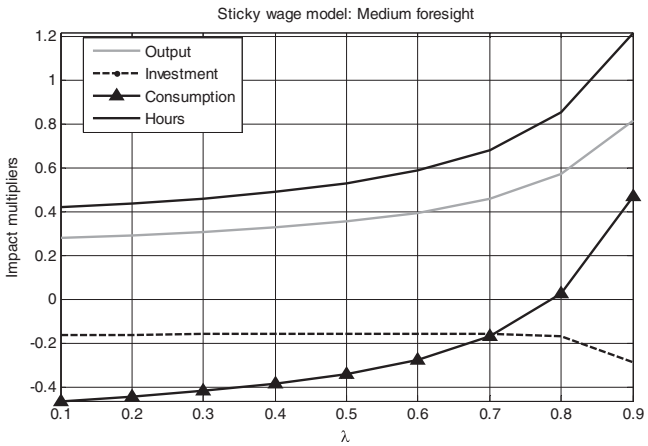

Figure 2. Impact multiplier with medium foresight – Furlanetto sticky wage model

4.1 Comparing Impulse Responses When Agents Have Foresight

We compare the impact of foresight in the standard non-competitive labour market model of Gali *et al.* (2007) with Furlanetto (2011) who adds a sticky nominal wage feature to the analysis. For illustrative purposes, we compare the contemporaneous responses of these models under the case of medium foresight and with varying degrees of the share of rule-of-thumb consumption in Figs. 1 and 2. It is clear that foresight reduces both output and consumption responses to fiscal spending compared to the original results obtained by both

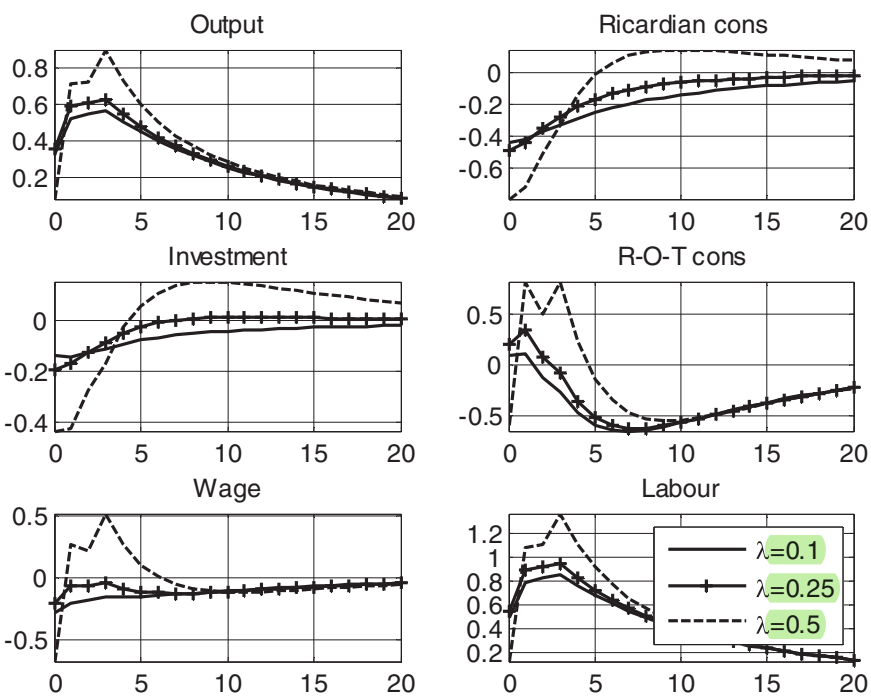

Figure 3. Non-competitive labour market (medium foresight) – different λ

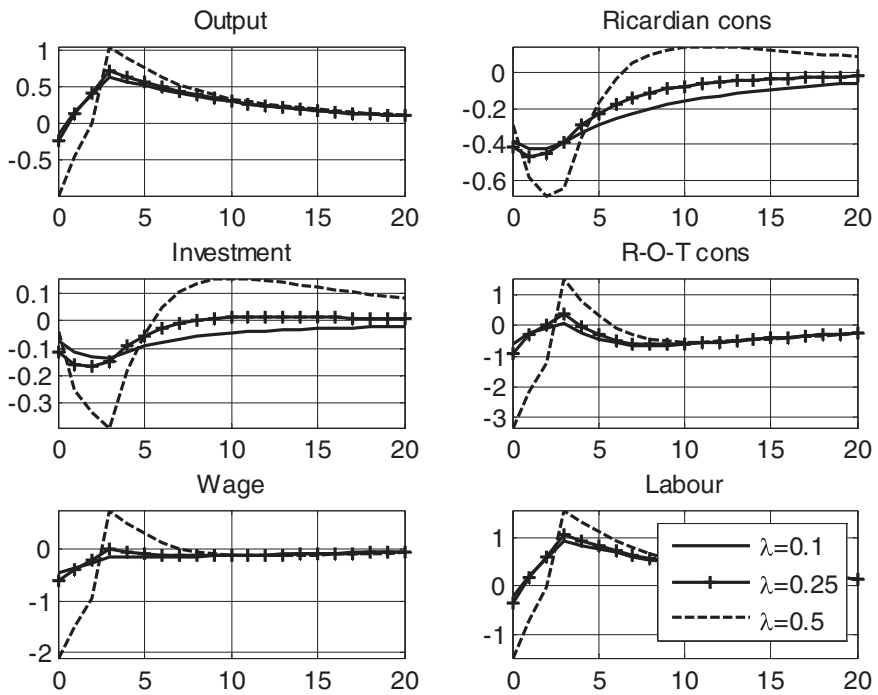

Figure 4. Non-competitive labour market (high foresight) – different λ

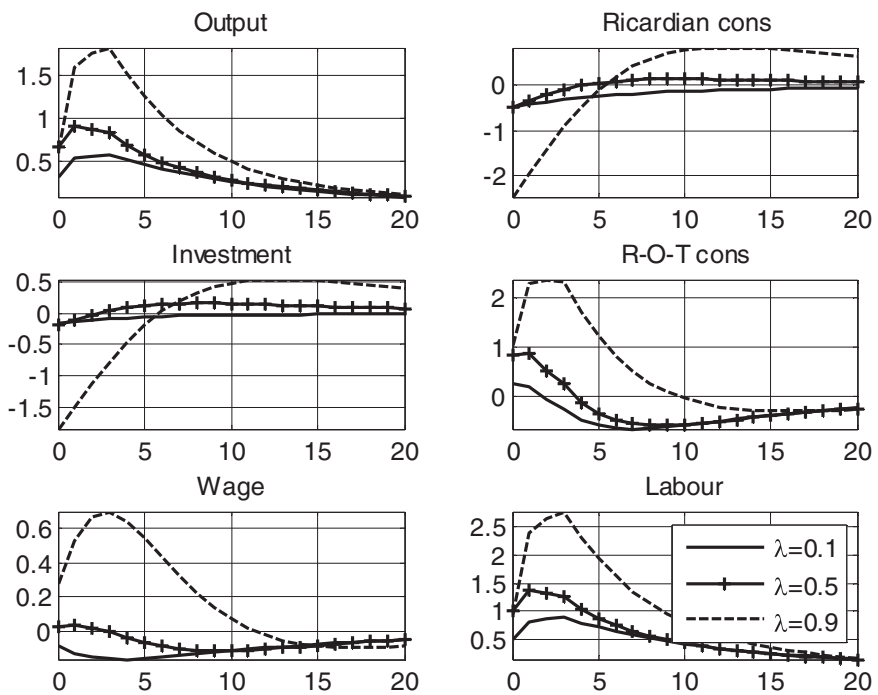

Figure 5. Sticky wage model (medium foresight) – different λ

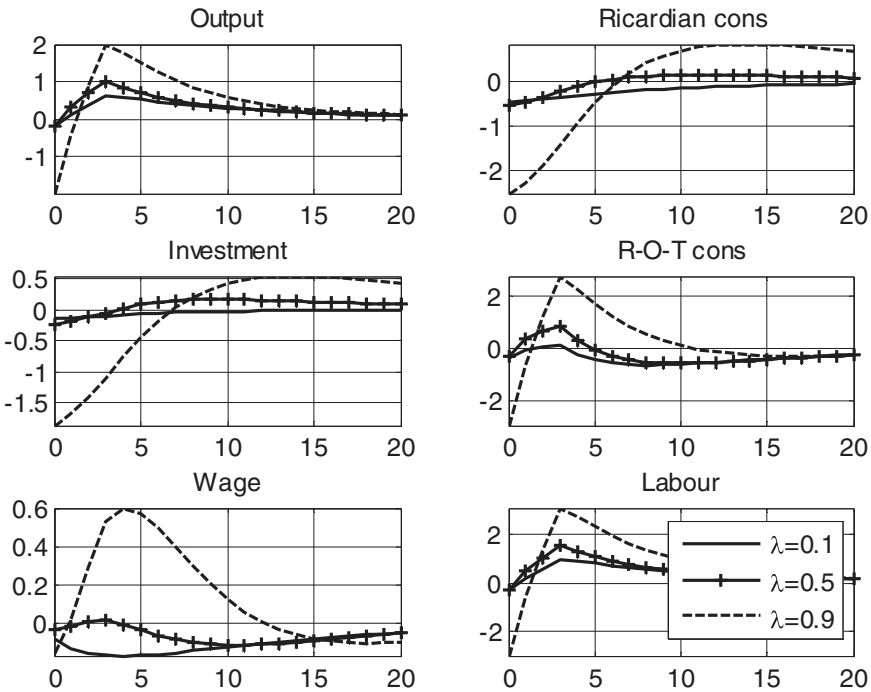

Figure 6. Sticky wage model (high foresight) – different λ

Gali *et al.* (2007) and Furlanetto (2011). However, Fig. 2 shows that the negative effects of foresight on consumption is outweighed when $\lambda > 0.8$, *i.e.* the positive consumption and high output multipliers are preserved despite foresight.

4.2 Dynamic Responses under Different Degrees of Foresight

In this section, we argue that the strength of the foresight news is important in determining how consumption and output responds. The strength of the news is governed by the size of the parameters in the MA components of equations (2) and (3). High foresight implies that consumers discount the news of a fiscal spending shock more versus the case

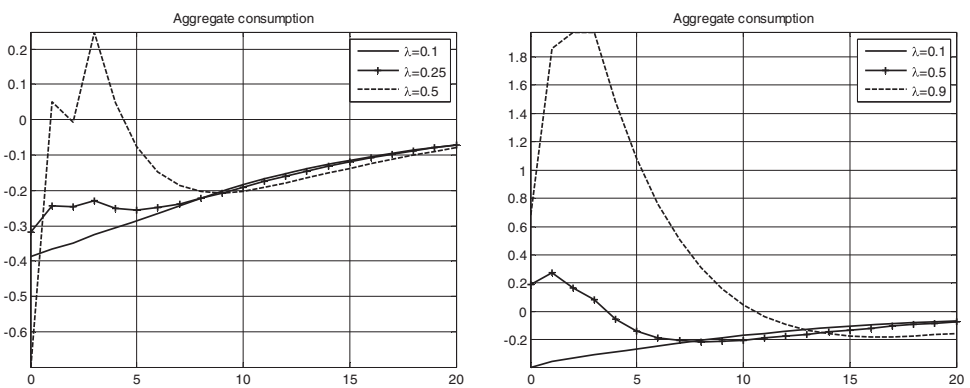

Figure 7. Non-competitive (first) vs. sticky wages (second): Medium foresight – different λ

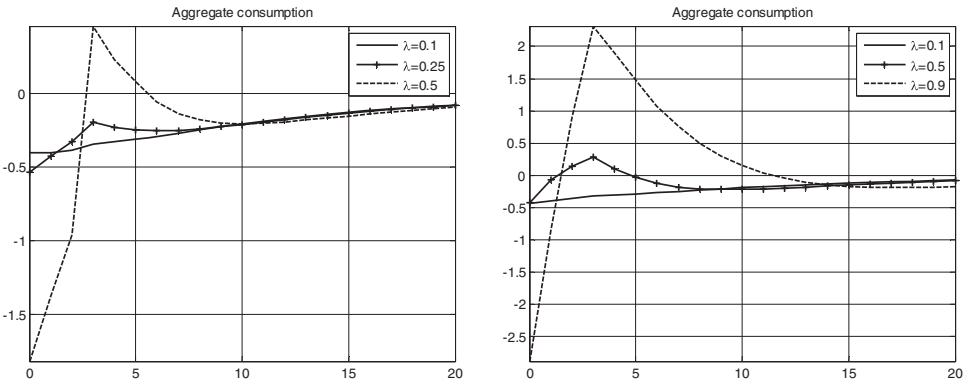

Figure 8. Non-competitive (first) vs. sticky wages (second): High foresight – different λ

of medium foresight. Under the high foresight case contemporaneous fiscal spending shocks are lower. The government financing constraint will lead to an increase in lump sum taxes that reduces output and hence the supply of labour. As a consequence, consumption falls as optimising households' consumption declines and output falls. This affects wages – as the economy contracts in response to lower consumption, so too does the demand for labour. The decrease in labour demanded leads to a decrease in wages and as a consequence leads to further decline in rule-of-thumb consumption.

We test how high and medium foresight impacts the model economy under different labour supply elasticities and under different rule-of-thumb shares. We compare the

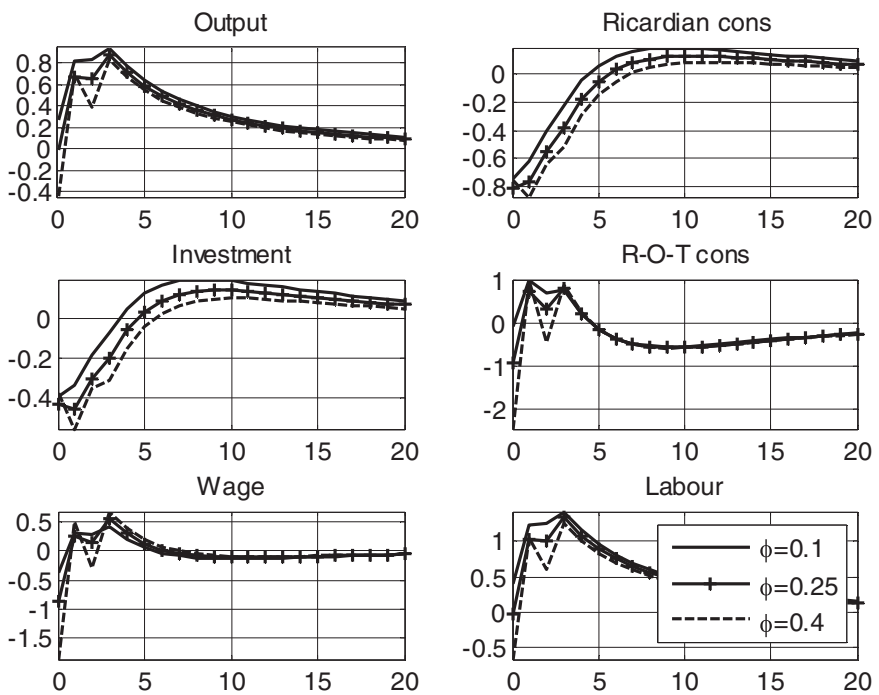

Figure 9. Non-competitive labour market (medium foresight) – different ϕ

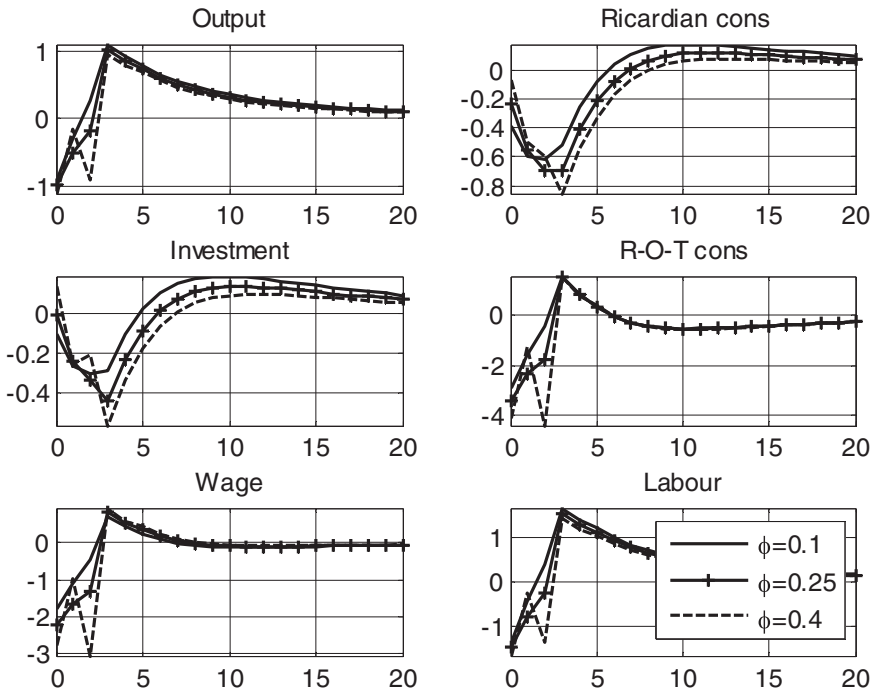

Figure 10. Non-competitive labour market (high foresight) – different ϕ

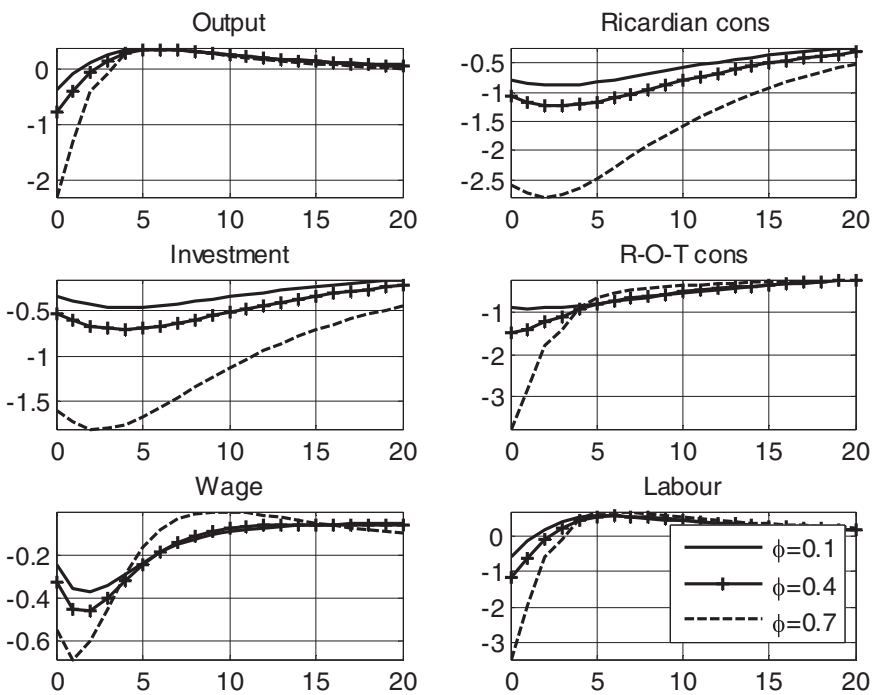

Figure 11. Sticky wage model (medium foresight) – different ϕ

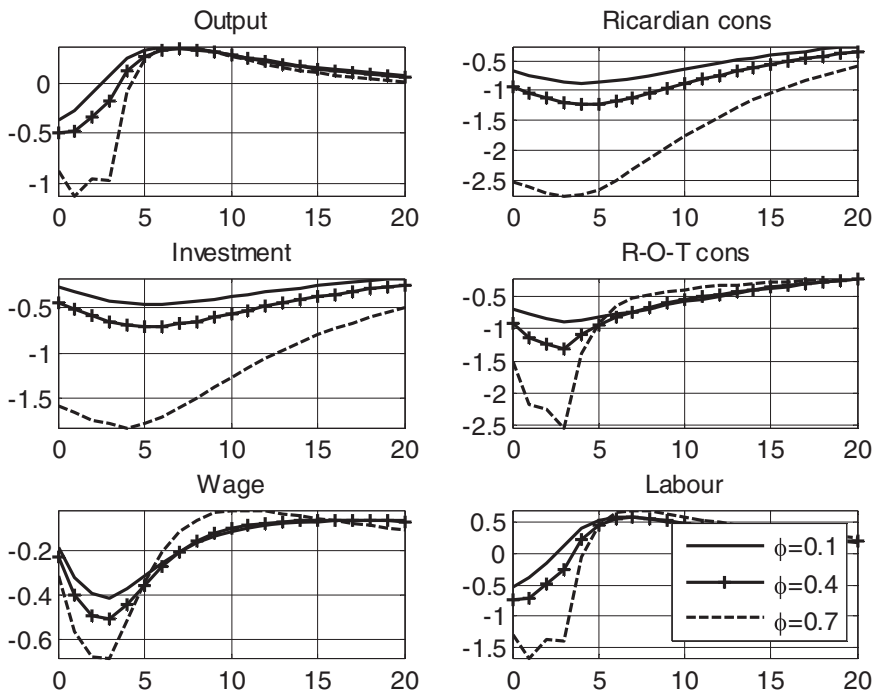

Figure 12. *Sticky wage model (high foresight) – different ϕ*

dynamic responses of the various models – one where the labour market is non-competitive and the other where furthermore, wages are sticky. It is important to note that the figures are generated using different parameters for each model. As an example, the size of λ and ϕ in the non-competitive labour market model is bounded as larger values lead to indeterminacy. This is an important aspect of the analysis since the results of the two models are not completely comparable. However, addition sticky wages relax the bounds for λ and ϕ.

(i) The Role of λ Figs. 3 and 4 compare the dynamic responses of the non-competitive labour market under medium foresight to the dynamic responses of the non-competitive labour market under high foresight. The results reveal a consistent story regarding the impact under increasing shares of rule-of-thumb consumers, namely that output and rule-of-thumb consumption increase with a higher share of λ. Under high foresight, output and consumption decline following a fiscal shock but quickly recovers after two periods as shown in Fig. 4.

While the effects of medium foresight in Fig. 3 lowers output and consumption response to fiscal shocks compared to Gali *et al.* (2007), it does not create a dramatic decrease. Employment still increases (negative wealth effects are still at play while labour demand increases in line with higher output) while wages do not contract too much. Two reasons for such a news shock might be: *(i)* that agents do not believe the government's communication and as such only discount announced spending weakly. Or that *(ii)* not all agents care/know about the effects of fiscal spending and such discount planned spending weakly. In contrast, Fig. 4 shows that high foresight reduces overall employment. There is a shift backwards for both labour demand and

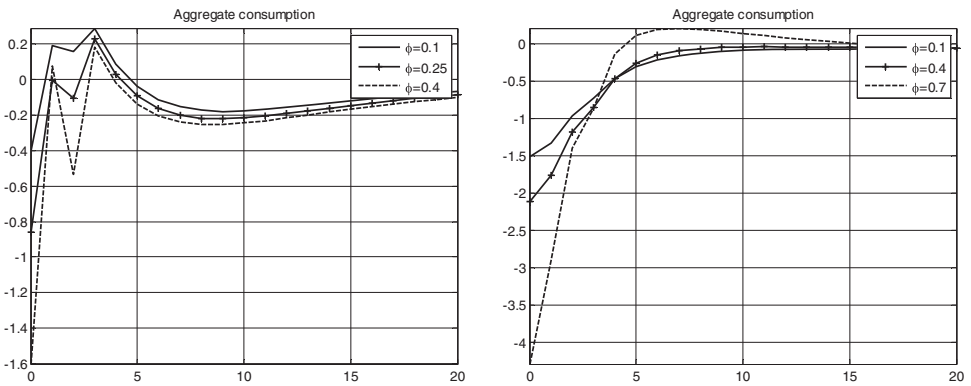

Figure 13. Non-competitive (first) vs. sticky wages (second): Medium foresight – different ϕ

supply. Although both types of households are willing to meet the firm's labour demand schedule at the prevailing wage rate, equilibrium condition remains similar to that of the usual labour supply equation (see Gali *et al.,* 2007:263). The reduction in the real wage is now much stronger. This increases the disutility of labour even more. The decline in real wages and employment causes a reduction in rule-of-thumb consumption.

The results change markedly in the sticky wage model. The share of rule-of-thumb consumption in generating both positive output multipliers and positive consumption becomes very important. The degree of foresight has less of an impact on reducing output and consumption when the share of rule-of-thumb consumption is high (see Figs. 5 and 6). Sticky wages ensure that the real wage does not decrease too much while also dampening the effects of inflation and interest rates – here Ricardian consumption does not fall as much as in Gali *et al.* (2007). The key channel, yet again, occurs through the real wage. The sticky response of real wages does not lower rule-of-thumb consumption dramatically. Negative wealth effects are still active, causing an increase in the supply of labour at a slightly lower wage. Employment increases while investment is less responsive compared to Gali *et al.* (2007). Aggregate consumption is now only positive in the sticky wage model with medium foresight (see Figs. 7 and 8).

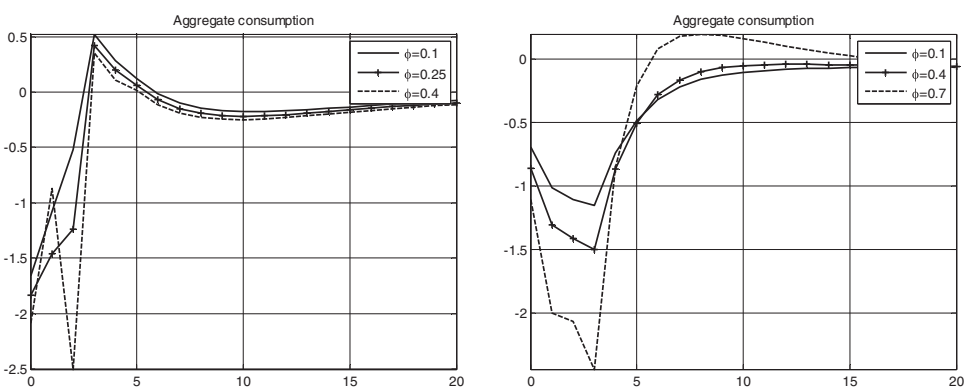

Figure 14. Non-competitive (first) vs. sticky wages (second): High foresight – different ϕ

(ii) The Role of ϕ High foresight offsets a high Frisch elasticity (assuming that the share of Ricardian consumption is equally split with rule-of-thumb consumers). Under a low inverse, Frisch elasticity of labour supply with no foresight, one would expect Ricardian consumers to supply more labour at a given wage to offset the negative wealth effects. This is consistent in the model with foresight too (see Figs. 9 and 10 where we vary the parameter ϕ, the inverse of the Frisch elasticity of labour supply). However, the real wage decreases in response to the fiscal shock. Both Ricardian and rule-of-thumb consumption decreases, which is in line with RBC literature. With foresight, fiscal spending shocks can create bust-boom cycles in output. Fiscal spending under high foresight reduces output for approximately three periods. What is clear from the analysis, however, is that small inverse Frisch parameters dampen the reduction of consumption for Ricardian households since the higher response in their labour cushions the negative wealth effects to some extent.

Interestingly, the sticky wage model along with a small inverse Frisch parameter reduces the effects of foresight significantly compared to the non-competitive labour market model. With medium foresight one is still able to generate positive output multipliers. However, under high foresight the same bust-boom relationship exists as in the non-competitive labour market case (see Figs. 11 and 12). As in the non-competitive case, the increase in labour supply, due to negative wealth effects from government spending, still preserves some labour income. This effect, combined with sticky wages, is able to create positive output multipliers. This outcome is overturned when there is high foresight. Here the decline in real wages is more material and results in a steeper decline in rule-of-thumb consumption. Regardless of the size in the Frisch parameter, aggregate consumption still declines with any degree of foresight (see Figs. 13 and 14).

These results compare favourably to Leeper *et al.* (2011) – investment and consumption fall while output increases. The labour response in the non-competitive labour market model is also similar – decreasing. However, the size of rule-of-thumb consumers and the size of the Frisch elasticity can offset the consequences of foresight. Thus, in an economy characterised by high elasticity of labour supply, sticky wages and where consumption is made up of rule-of-thumb households, foresight does little to change the results from an economy with no foresight. This has an important implication for empirical analysis – one can still obtain Keynesian effects even under foresight despite certain claims.

5. CONCLUSION

This paper analyses the effects of fiscal spending shocks when economic agents anticipate the shock. Anticipation arises due to news, mainly fiscal announcements, that precede the actual spending. Rational optimising households discount the fiscal shock and as a consequence change their consumption behaviour. If government spending is financed via taxes or debt, then consumption decreases – Ricardian equivalence holds. We show, however, that an economy characterised by a large share of rule-of-thumb consumption (consumption based on current income and not lifetime income) and elastic labour supply is able to generate an increase in household consumption. The inclusion of sticky wages is an important channel. An exogenous wage mark-up is required along with a large share in rule-of-thumb consumers to generate an increase in aggregate household consumption in the seminal paper by Gali *et al.* (2007). However, when agents discount fiscal spending shocks the exogenous wage mark-up is not sufficient to increase aggregate consumption. The inclusion of sticky wages as in Furlanetto (2011), however, helps to revive the aggregate consumption response.

The importance of key parameters drives the overall results. The model's response is contingent on the values of the labour supply elasticity, the share of rule-of-thumb consumers and the degree of sticky wages. We calibrate our model to the South African economy, estimating and borrowing parameters from the literature. The evidence is in favour of a high degree of wage stickiness and a large share of rule-of-thumb consumption. Most DSGE models in South Africa use a very elastic labour supply elasticity to match the data. Our results show that household consumption does increase when fiscal spending increases; this happens despite transparent fiscal policy.

Our results depend on some crucial assumptions. Alternative methods of financing government spending (such as seignorage), or a different functional form for household's utility may materially change the results. One might also be sceptical regarding the value of discounting future spending by government. While it is outside the scope of this study, it would be interesting to measure how an informed consumer thinks about fiscal policy and spending plans. A fully rational consumer might purposefully increase his spending if higher government spending translates into higher output and higher output increases revenue collection automatically (so called automatic stabilisers) without fear of facing a higher tax rate in the future.

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APPENDIX: LOG-LINEARISED EQUATIONS

$$c_t^0 = E_t\{c_{t+1}^0\} - (r_t - E_t\{\pi_{t+1}\})$$

$$c_r^r = \frac{WN}{PC}\left(c_t^r + (1+\phi)n_t^r\right) - \frac{Y}{C}t_t$$

$$c_t = \lambda c_t^r + (1-\lambda)c_t^o$$

$$i_t - k_t = \eta q_t$$

$$k_{t+1} = \delta i_t + (1-\delta)k_t$$

$$q_t = \beta E_t\{q_{t+1}\} + [1-\beta(1-\delta)]E_t\{r_{t+1}^k - p_{t+1}\} - \{r_t - E_t\{\pi_{t+1}\}\}$$

$$w_t - p_t = \phi n_t^i + \sigma c_t^i$$

$$\pi_t^w = \left(\frac{\varepsilon_w - 1}{\phi_w}\right)(c_t + \phi n_t - (w_t - p_t)) + \beta E_t \pi_{t+1}^w$$

$$\pi_t = \left(\frac{(1-\theta)(1-\omega\theta)}{\theta}\right) mc_t + \beta E_t \pi_{t+1}$$

$$\pi_t^w = (w_t - w_{t-1}) + \pi_t$$

$$t_t = \phi_b b_t + \phi_g g_t$$

$$b_{t+1} = (1+\rho)(b_t + g_t)$$

$$r_t = r + \phi_\pi \pi_t$$

$$g_t = \rho_g g_t + \varepsilon_g$$

$$\text{Medium} = 0.59\varepsilon_t + 0.24\varepsilon_{t-1} + 0.09\varepsilon_{t-2} + 0.08\varepsilon_{t-3}$$

$$\text{High} = 0.11\varepsilon_t + 0.31\varepsilon_{t-1} + 0.27\varepsilon_{t-2} + 0.28\varepsilon_{t-3} + 0.02\varepsilon_{t-4} + 0.01\varepsilon_{t-5}$$

$$y_t = \gamma_c c_t + \gamma_i i_t + g_t$$