

## Advanced Macroeconomics Problem Set 3

### Exercise 1 (Baxter and King)

#### 3. Deterministic vs. stochastic model

If Willi is not sure if he wants to simulate the deterministic or the stochastic model he should consider whether he has information about future shocks or not. He should use the deterministic simulation if future shocks are fully anticipated and there is no uncertainty around shocks. Therefore it does not depend on whether the shock hit today or at any known time in the future nor if it lasts for one or several periods. It is useful to use this simulation to get a first glance. Stochastic simulation therefore is more useful for further analysis. In this case shocks hit in the current period and were not anticipated at all. After the shock hit the economy there is no more expectation on future ones.

#### 5. Permanent shocks on public consumption and investment

**An unanticipated shock on public consumption** is financed by reduced lump-sum transfers and therefore lowers private consumption and investment. The reduced investment leads to less private capital during the shock period. To compensate the reduction of available income, households increase their labor supply leading to reduced real wages. That high increase in labor input is the dominant factor in the output increase.

As the shock is only temporary at the end of the shock period public consumption falls again leading to the old steady state of lump-sum transfers. Labor supply decreases again leading to an even lower output than before the shock period since there is less private capital left. But investment is now above its long run level to restore the initial capital stock. During this adaptation phase private consumption rises slowly as well as labor supply only reduces slowly.

When the long run capital stock is accumulated again, all other variables adapt and the initial steady state is reached again. The increase in government consumption therefore affects the real economy even longer than the shock period. But there is no effect in the very long run.

**An unanticipated temporary shock on public investment** also reduces lump-sum transfers and lowers private consumption and investment, too. Reduced investment leads to less private capital but its effect on output is compensated through higher public investment causing a higher public capital stock and since the consumption level has lowered, more labor supply is offered which leads to a far higher output than the initial one. Another effect of the high labor supply is reduced real wages. After the shock there is also an adaptation phase. Since public investment went back to its initial value, the public capital stock lowers too even if it takes some time to reach its long run steady state. Consumption now rises since households start to receive higher transfers again but since they supply less labor their consumption opportunities become less, leading to the old steady state. Since households receive the same level of lump-sum transfers they also use their budget to increase investment again, reaching a higher level than the initial one to restore private capital.

Increasing the productivity of public capital affects the reaction of the economy on a public investment shock. After the shock the economy reacts more sensitive leading to increased values of output, consumption, investment, labor supply, real wages, real interest rate, private capital and lower lump-sum transfers during the shock period and the adaptation periods.

## 6. Permanent increase in taxes

In this model increasing the tax rate does not affect public consumption or public investment as the tax revenues will only be spend for lump-sum transfers. Since increasing taxes make work less affordable, private individuals offer less labor. As a result of this output decreases, so that tax revenues also reduce and the government has to reduce its lump-sum payments as well. Another reaction of higher tax rate and lower labor supply is a decreasing investment activities which start raising again when privates increase their labor supply. This reaction slows down the fall in private capital and output.

## 7. Fiscal policy and real economy

The crowding out effects from public consumption on private consumption and public investment on private investment do not exceed the positive effects that occur by fiscal policy. These positive effects are caused by the fact that private individuals react to their lower consumption possibility by increasing their labor supply which itself increases output. Therefore, in this model, fiscal policy has positive effects on the real economy and Willis conclusion is wrong.

Under public capital we understand that kind of capital which is used to increase the efficiency of private capital, e.g. infrastructure as streets that increase efficiency of logistics companies or schools that provide an economy with human capital. In contrast to public capital, private capital is that kind of capital which is directly used for production, e.g. trucks, machines, factories and other means of production.