Danmarks Statistik
MODELGRUPPEN

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22. marts 2012

Housing demand experiment and public debt restriction

Resumé:

The paper investigates the effects of a permanent increase in housing demand on the whole economy putting emphasis on long-term housing and non-housing consumption and on the public budget. The results seem to confirm the steady state consumption equation derived from the dynamic wealth equation. The calculation supplements box 3.6 of the ADAM book by introducing a tax change to balance the effect on taxes paid by the private sector.

SEY22312

Key words: housing demand, consumption, simulation

1. Introduction

The paper investigates the impacts of a 1 % permanent increase in housing demand. We analyse the long-run and dynamic results of the experiment, mainly for housing and non-housing consumption and for the public budget.

2. The housing model and implementation of the shock

The housing model contains a house price and a housing volume equation. The house price is determined in an error correction equation, where the change in the house price is influenced by the lagged difference between wanted and actual housing quantity; change in private consumption and in the user cost rate. The wanted stock of houses is explained by private consumption excluding housing and by the price of housing consumption relative to the price of other goods. The price index on housing consumption is the house price times a user cost rate.

The shock implies that the wanted stock of houses, fkbhw is permanently increased by 1% with 2011 and 2110 as respectively the first and last year of the experiment period. In ADAM, the wanted housing capital or stock of houses can be shocked directly by using the adjustment term jrfkbhw. The endogenous expression for fkbhw is presented as follow excluding the logistic trend, which is constant in the experiment period.

fkbhw = ((exp(log(cpuxh/pcpuxh) +0.30000*log(pcpuxh/(buibhx*phk))

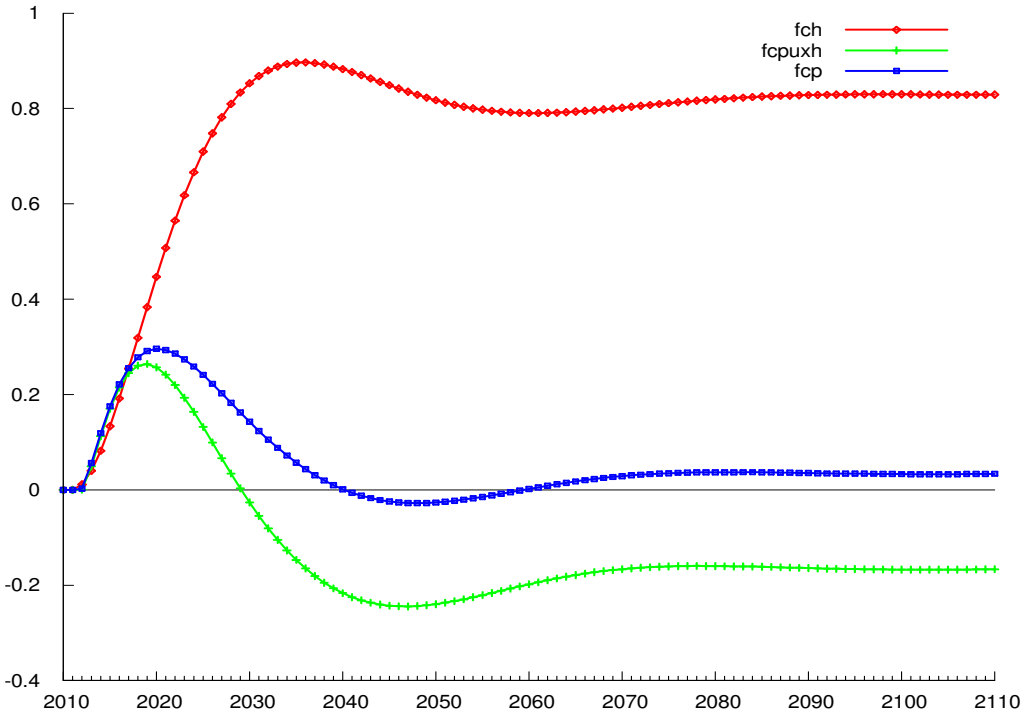
+kfkbhw))*(1.0+jrfkbhw))*(1.0-dfkbhw)+ dfkbhw*zfkbhw

fkbhw= wanted level of housing capital
cpuxh = private consumption excluding housing
pcpuxh= price index for private consumption excluding housing
buibhx= user cost rate on housing capital
phk= house price
Setting the dummy dfkbhw to zero and increasing the term jrfkbhw by 0.01 throughout the experiment period lifts the wanted housing capital stock by 1% ceteris paribus, i.e. at given prices and consumption, as 1+jrfkbhw rises 1%.

3. The effect of higher housing demand on consumption

We can now examine the impacts of permanent upward shift in housing demand on private consumption excluding housing, housing consumption and total private consumption. As shown in figure 1, housing consumption increases permanently while private consumption excluding housing increases in the first years but falls below the base line in the steady state. Total consumption increases in the short run and remains almost unchanged in the long run. The reaction in consumption excluding housing is basically explained by the house price reaction, which via housing wealth impacts the wealth variable in the consumption function.

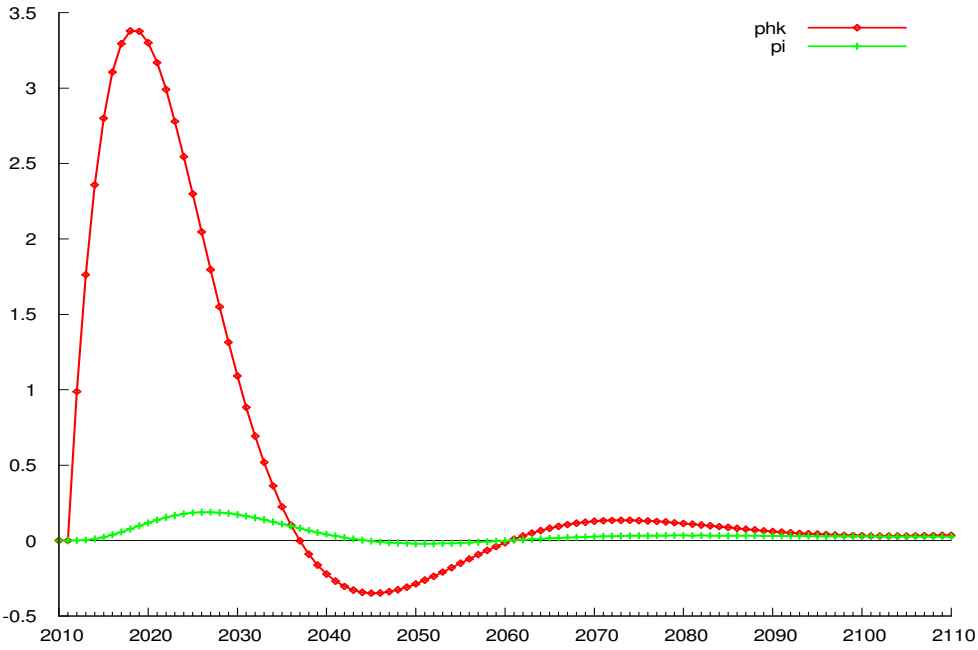
Figure 1: Consumption effects, 1% higher housing demand



4. Effects of higher housing demand on prices and investment

Higher housing demand makes the house price increase relative to the baseline in year 2, where the house price starts to react to the change in house demand cf. figure 2.

Figure 2: House and investment price effect, 1% higher housing demand



The lag structure in the house price equation explains that it takes a year before the house price reacts to the higher housing demand. The lag reflects the estimated expectation formation, which implies that consumers do not fully understand the working of the housing model. Alternatively, the short-term dynamics of the house price equation could have been shocked as well. However, we are focusing on the long-term effects, so 1st year effects are not important.

When the house price increases it will also increase relative to the price of housing investment, i.e. Tobin's q will increase. As long as Tobin's q is above baseline, the increase in housing stock will be above baseline, and the implied increase in capital stock relative to the baseline will tend to dampen the reaction in house prices. In the long run, ADAM reaches a new equilibrium where the house price is unchanged relative to the investment price and with a permanent 0.8% increase in the housing capital and consequently also in housing investment as both reinvestment and net investment need to be 0.8% higher in steady state when the stock is 0.8% higher cf. figure 3 with housing capital and figure 4 with investment.

Figure 3: Effect on housing capital, 1% higher housing demand

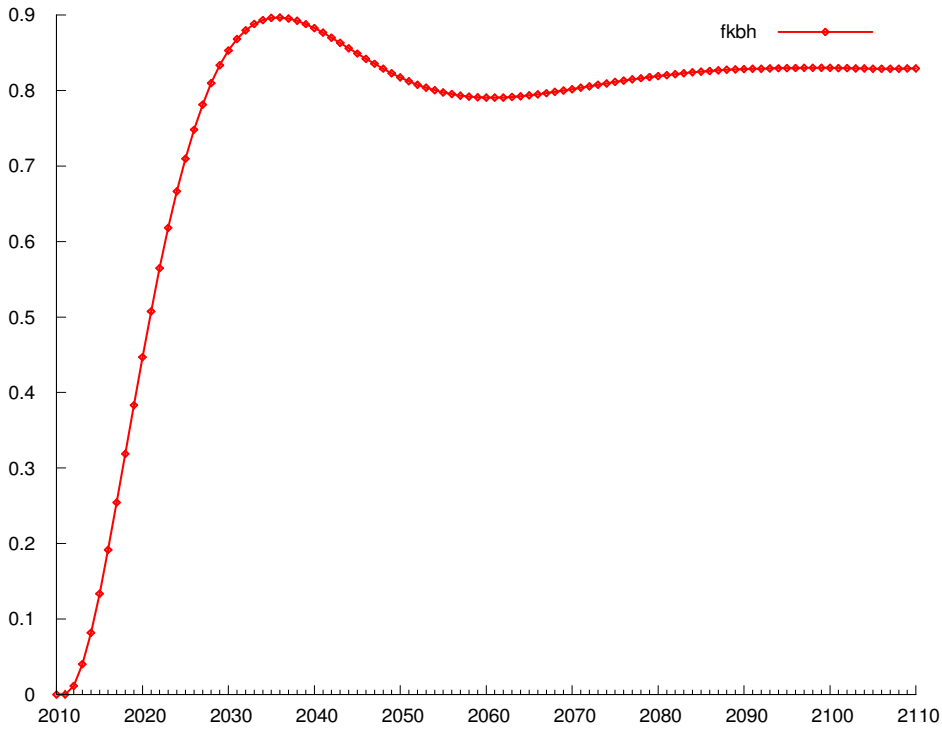
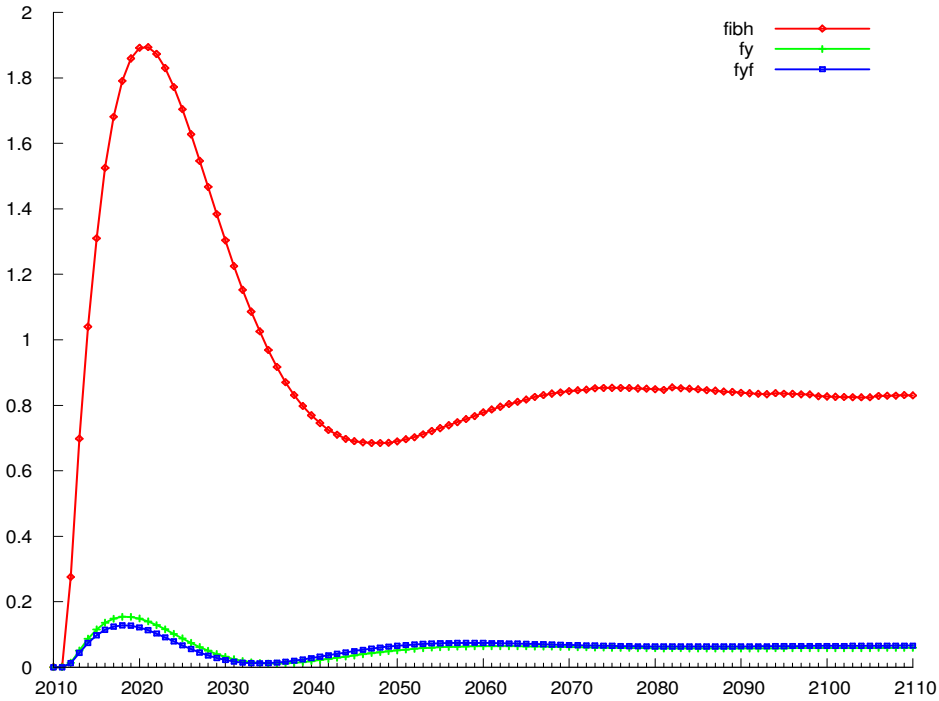


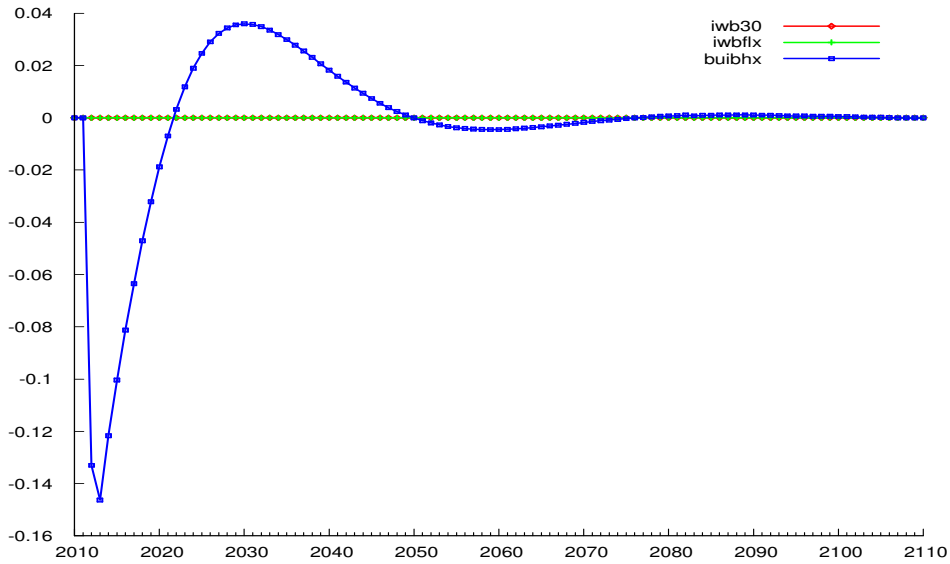
Figure 4: Effect on housing investment and GDP, 1% higher housing demand



As also shown in figure 4, the long-run effects on value added and GDP are almost identical suggesting that there is no composition effect via indirect taxes. Instead, the resulting increase in total GDP above the base line can be explained by a composition effect as the production industries concerned differ. The housing industry, which becomes 0.8% larger, has a very high output per man hour as most of the output is produced by the stock of dwellings.

The reaction in the house price phk can be explained by the initial shock to the housing demand plus the accompanying wealth effect, which lifts consumption and also housing demand. Moreover, there is a temporary dynamic effect as the initial rise in the house price lowers the tax rate and hence the user cost rate. This effect is, however, only modest and temporary and not important for the final result on consumption. The interest rates are exogenous and unaffected by the shock cf. figure 5 below.

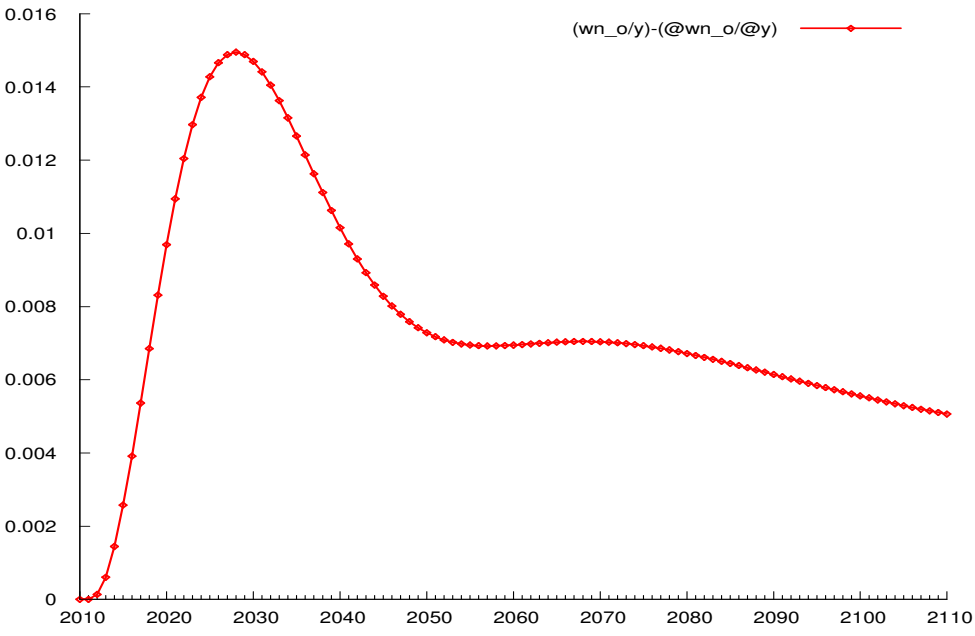
Figure 5: Temporary effect on user cost rate, 1% higher housing demand



5. Effect of higher housing demand on public finances

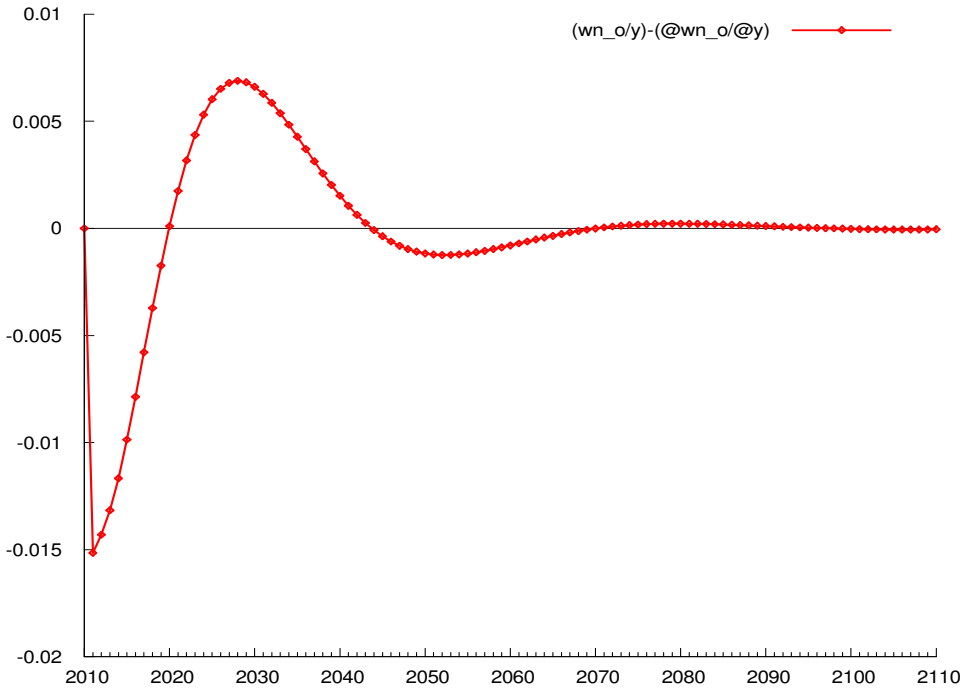
A permanent increase in house demand produces a long-lasting reduction in public debt during the initial period of higher house prices cf. figure 8. However, in the long run, the positive impact on the public net asset (net asset equals minus net debt) evaporates due to the tax rebate on interest outlays and in steady state a permanent increase in income tax is needed to avoid a permanent effect on the public net asset.

Figure 8: Effect on public net asset as share of GDP, 1% higher housing demand



To avoid the effect on public debt, the increase in housing demand is accompanied by a permanent increase in income tax to make the long-term downward sloping effect on the public net asset horizontal. For this purpose, the central government tax rates are permanently increased by 1%. Besides, we need a temporary decrease in capital tax (1.4% of GDP) to shift the public net asset down into the base line value cf. figure 9. With these tax changes, the public net asset remains unchanged in the steady state and it becomes easier to interpret the long term impact on consumption.

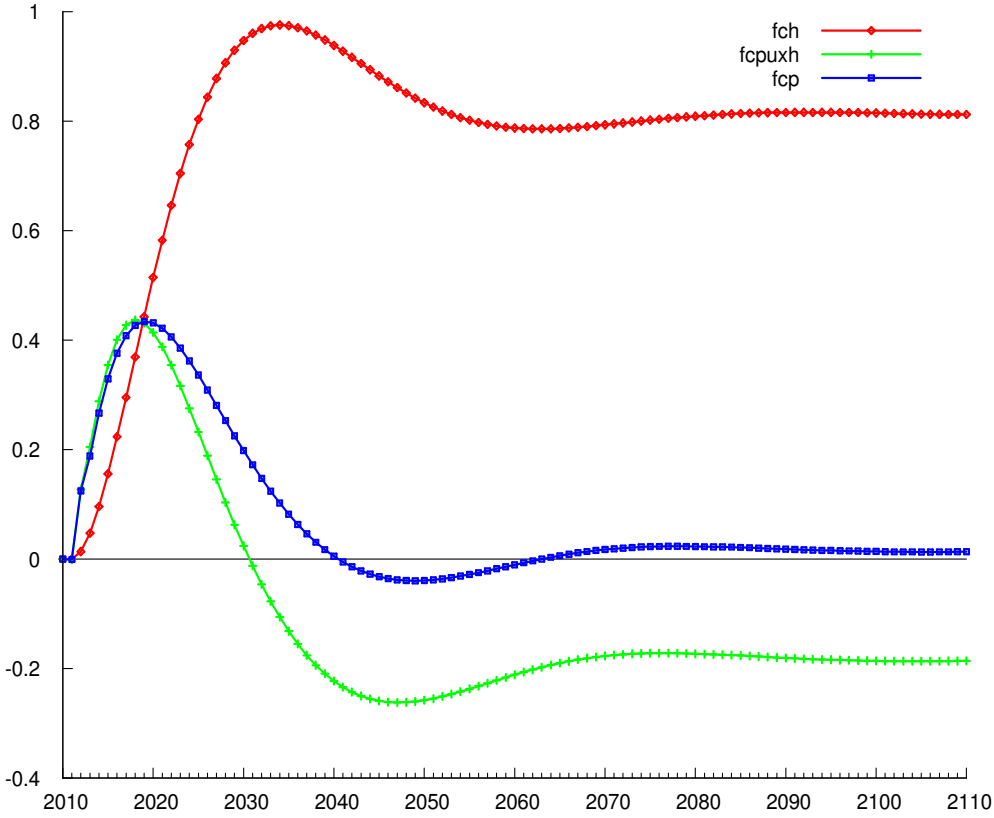
Figure 9: Effect on public net asset, +1% housing demand, income tax permanently up and capital tax temporarily down



6. **Consumption effect of higher housing demand and income tax**

Supplementing the increase in housing demand with an increase in income tax and a temporary decrease in capital tax does not change the long-term effects on housing and non-housing consumption much, and there is no crucial difference between the consumption effects depicted below in figure 10 and the effects depicted in figure 1 above.

Figure 10: Consumption effects, 1% higher housing demand, income tax permanently up and capital tax temporarily down



Nevertheless, supplementing the increase in housing demand with the two tax shocks does bring the long-term total private consumption a bit closer to the baseline compared with the steady state total private consumption effect of an increase in housing demand alone. The long-term housing consumption increases by 0.81 while private consumption excluding housing decreases by 0.19 in the long term, and the combined effect on total consumption comes close to zero as illustrated in figure 10.

As suggested in the ADAM-book, the long-term impact of the housing demand shock on consumption can be examined by formulating an expression for the dynamics of wealth and analyzing its steady state properties. The dynamic wealth equation that includes the housing market is written as:

$w=w_{-1}+(y-ch-cpuxh-ibh)+dif(w_h)$

Where w is the consumption-determining wealth consisting of financial wealth and housing capital (w_h). Thus, dif(w) is the sum of the savings surplus (income minus total consumption plus housing investment) and dif(w_h). The variable ibh is housing investment and y is income. Income can be split into interest income on the financial wealth, $r\cdot(w_{-1}-w_{h-1})$ and total income excluding interest, $y_{exrente}$. Now, the steady state change in financial wealth may be

written as $g \cdot (w_{-1} - w_{h-1)}$, where g represents the steady-state growth rate. Thus, the following consumption relation will hold in steady state.

$$cpuxh+ch = y_{exrente-} ibh+(r-g)*(w-1-wh-1)= y_{exrente}-ibh$$

We assume that the interest rate r equals the growth rate g in steady state. Consequently, financial wealth has no long–term consumption effect and disappears from the equation leaving only primary income minus investment.

In the long run, the relative price of house (buibhx*phk/pcpuxh) is not significantly affected, indicating that there is be no long-term substitution effect on housing consumption. Thus, in steady state, housing consumption increases by 1% relative to consumption excluding housing. If the long run effect on private consumption excluding housing is x percent, a 1% increase in housing demand yields a 1+x percent long-run increase in housing consumption. Housing investment also increases by 1+x percent and so does the return to housing capital, which is value added minus wages in the ADAM housing industry, yfh-ywh. This capital return is included in $y_{exrente}$ and assuming that the rest of $y_{exrente}$ is unaffected implies that cpuxh+ch-(yfh-ywh)+ibh is unaffected as this entity equals $y_{exrente}$-(yfh-ywh). Consumption excluding housing makes up 81% of the total entity in baseline while the housing related variables make up the rest. Consequently, x can be found from the equation.

$$0.81x+0.19\ (1+x) = 0$$

Solving x from this equation entails that x=-0.19%. This means that private consumption excluding housing permanently declines by 0.19% while housing consumption permanently increases by 0.81 % (1+x=0.81%.) As already mentioned in connection with figure 10, the ADAM-calculated changes in housing consumption and in consumption excluding housing correspond to these changes.

The combines housing demand and tax shock has a small long-term effect on total private consumption corresponding to a 0.01% rise relative to the baseline. This number reflects the effect of a 0.81% increase in housing capital income (yfh-ywh) minus a 0.81% increase in investment (ibh). If housing capital income equaled housing investment in the baseline, the resulting long-term change in total consumption would be even closer to zero.

7. Conclusion

In the short term, a permanent lift in housing demand gives stimulates the house price and the higher house price is accompanies by higher private consumption and higher housing investment. In the long-term, a permanent lift in housing demand creates a permanent shift in the composition of consumption. Housing consumption increases and housing investment

increases while non-housing consumption decreases. This impact on consumption comes out when the effect on public debt is neutralized. However, the shift in the composition of consumption can still be accompanied by a small rise in total consumption if the necessary rise in the housing capital increases total return to capital by more than it increases investment. Thus, the housing demand shock seems to confirm the steady-state consumption equation derived from the dynamic wealth equation.