Danmarks Statistik
MODELGRUPPEN

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Foreign price shock and the public budget

Resume:

We investigate the effect of a foreign price shock on the public debt and budget balance. As explained in chapter 11 of the new ADAM book, the foreign price shock is comparable to a temporary wage shock. However, in the long run, the foreign price shock leaves a permanent negative impact on the public primary budget and an accumulating impact on public debt while the wage shock only leaves a permanent impact on public debt. These relating issues concerning public finances are only touched upon in the ADAM-book. In this paper we take up the issues and supplement the price shock by a permanent change in public transfers to abroad in order to make the long-term impact on public debt constant.

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Key words: public budget, foreign price and transfers

1. Introduction

In two previous papers on ADAM calculations (experiment with wage relation and experiment with public purchase of goods and services), there was no attempt to counteract the deterioration of public budget, which follows both from an increase in public purchase of goods and services (demand shock) and from a permanent upward shift in wage relation (negative supply shocks).

In this paper, foreign prices are decreased by 1% in one experiment, and wages are temporarily shocked by 1% in another experiment. The experiments have a long baseline that starts in 2011 and ends in 2110, and the basic idea of the experiments is to illustrate the dichotomy between quantities and prices cf. the ADAM-book. The results confirm the nice long-run properties of ADAM and indicate that the foreign price shock works like a monetary shock.

ADAM does not jump to its nice equilibrium. The fall in foreign prices triggers a cyclical downturn and an increase in public debt. Actually, the impact on public debt continues after the economy has returned to full employment. To stop the accumulating effect on public debt, we decrease public transfer to the rest of the world permanently. The remaining constant long-run effect on public debt may be removed by a temporary tax increase.

For the temporary wage shock, a temporary tax increase is sufficient to remove the complete effect on public debt.

2. Effects of foreign price shock

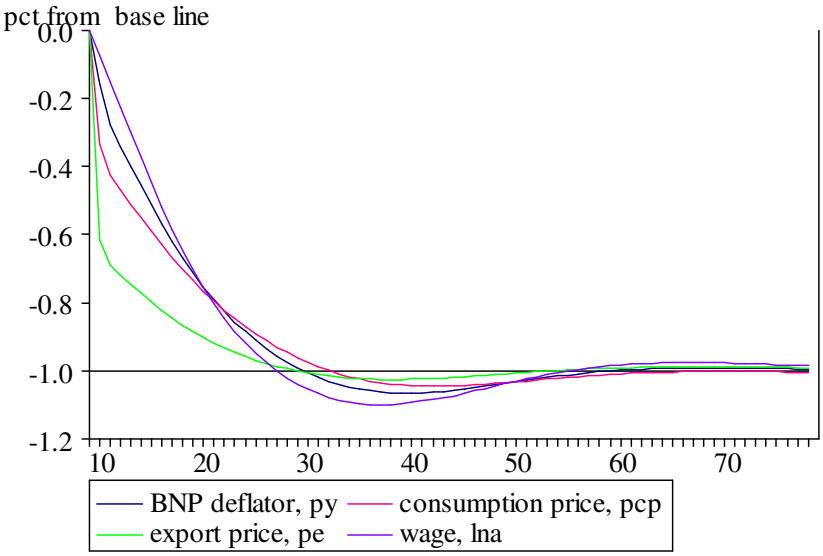
ADAM has 14 exogenous foreign prices, which we reduce by 1%. Thus, in all years, these prices are 1% lower than the baseline.

The 14 exogenous foreign prices used in the experiment are: Import prices pm01, pm02, pm59, pm7b and pm7y, which respectively denote the import price for agricultural products, raw materials, manufactured goods, cars, ships and air crafts. The export price pe01 concerns agricultural commodities while pee2, pee59, peet are competitor prices for raw materials, manufactures and tourist services. Prices pmt and pms relate to tourist spending and to other imported services. Prices pxqs, peesq and boil respectively indicate the price on sea transport, competitor price on service exports and oil price. In addition, we decrease the exogenous capital tax (sk_h_o) and wages from abroad (ywn_e) by 1%. The two energy prices (pm3k and pm3q) are exogenized and reduced by 1%. With the input mentioned so far we reproduce the similar calculation in the ADAM-book.

As shown in figure 1, all domestic prices, i.e. wages, consumption prices, GDP deflator, export prices etc., decrease by 1% in the long run, implying that the relative prices of domestic goods and services are unaffected by the uniform 1

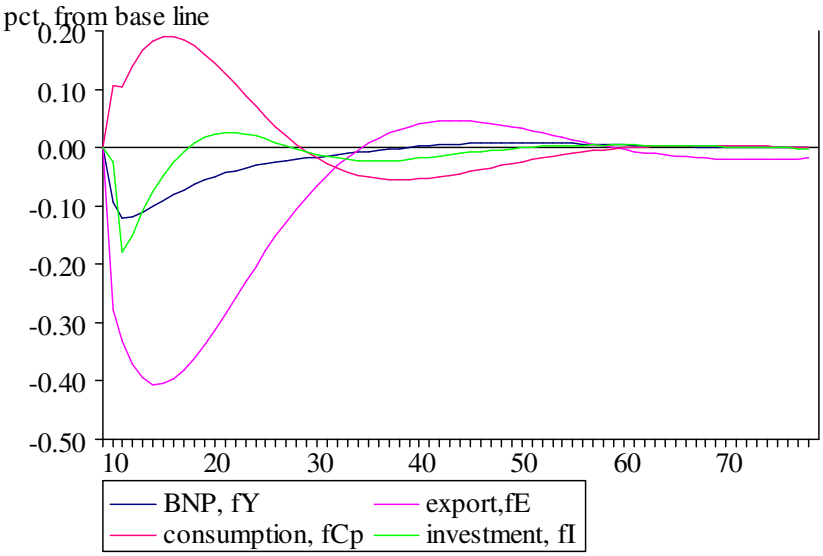
per cent change in the foreign prices. Thus, the general foreign price fall seems to work like a monetary shock leaving relative prices and also quantities unaffected in the long run.

Figure 1: Domestic price effects, 1 % lower foreign prices



In a situation with unchanged relative prices and unchanged tax level, domestic production and consumption will remain unchanged in the long run, which is what we observe in figure 2.

Figure 2: Consumption, GDP, export and investment, 1 % lower foreign prices

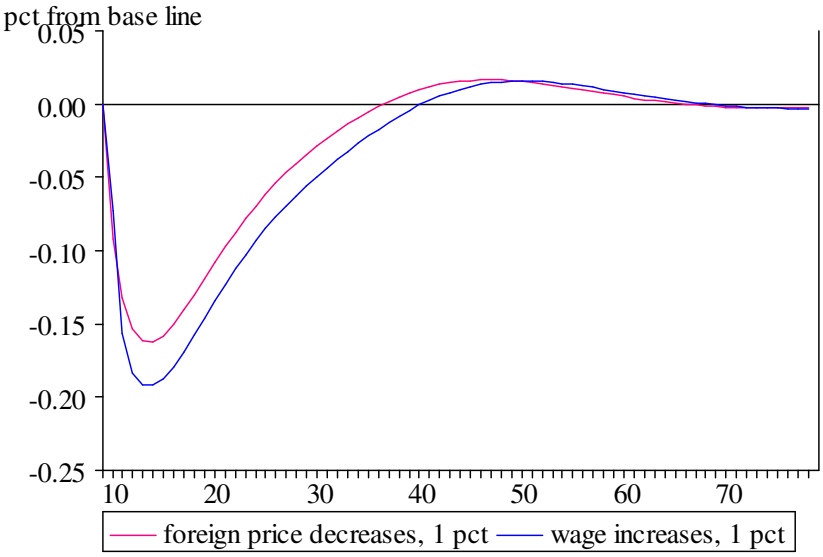


The fall in import prices does stimulate private consumption in the short run, but the loss in market share dominates and reduces production, which makes employment decrease in the first years of the experiment. The higher unemployment rate makes the wage fall below the baseline.

In the long run, wages have fallen by 1 per cent. One per cent lower wage costs and one per cent lower import prices plus a constant indirect tax level make all domestic prices fall 1 per cent. Thus, the initial negative impact on exports disappears because the negative impact on competitiveness disappears.

In the long run, employment returns to the baseline cf. figure 3, which reflects that production returns to the base line in the long run as wages and domestic prices fall 1% relative to base, leaving competitiveness and also all relative factor prices unchanged.

Figure 3: Effect on employment, foreign prices -1 % or wages shocked +1% in year 1

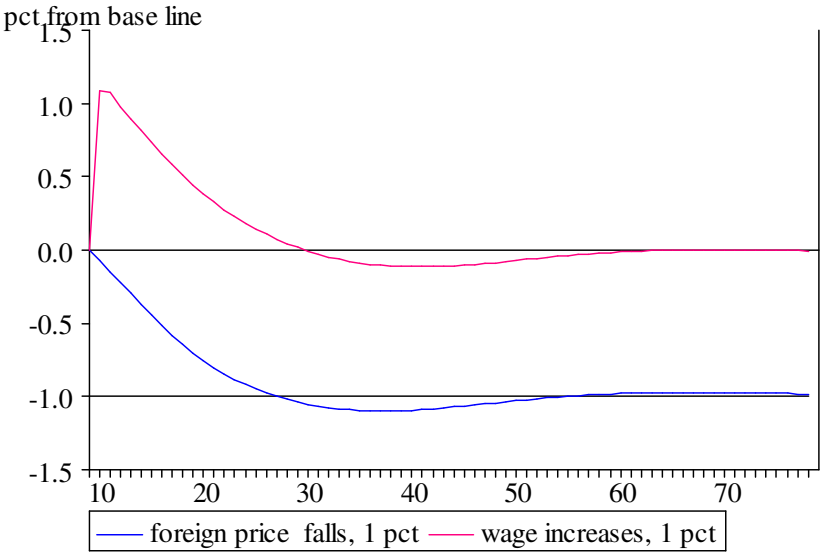


3. Effects of temporary wage shock

Now, the adjustment term in the wage relation is increased by 1% in year 1 only. This makes the wage level increase by 1.1% in year 1, reflecting a moderate wage-price cycle. This first year hike in wages does not have a long-term effect on wages cf. figure 4. The competitiveness is deteriorated by the temporary wage shock, so unemployment will increase. This will reduce wage growth and eventually wages plus prices and quantities will return to the baseline after a transition period with a small negative business cycle. As figures 3 and 4 illustrate, employment and wages adjust faster to equilibrium after the foreign price shock, because the foreign prices appear in the relative price terms of foreign trade relations. The wage shock affects the same relative

price terms but with a delay caused by the price formation. However, the long-term effects look symmetrical for the two experiments, as one would expect.

Figure 4: Effect on wages, foreign prices -1 % or wages shocked +1% in year 1



4. Impact on public debt

The effect of the foreign price fall on public debt is illustrated in figure 5 as share of GDP. Figure 6 illustrates the impact of a temporary wage shock on public debt. Actually, the two figures do not show the debt but the public financial net asset, Wn_o, which corresponds to minus public debt:

Both figures confirm the long-term deterioration of public finances. Even if there is no long-term quantity effect from the wage and foreign price shocks, public debt will have increased because of the negative cyclical impact in the transition period.

The main difference between figure 5 and 6 is that the impact on the public net asset remains downward sloping in the long run for the foreign price shock in figure 5. For the temporary wage shock in figure 6, the impact on the public net asset turns into a horizontal curve in the long run, as one would expect.

Making the long-term effect on the public net asset zero for the temporary wage shock requires an increase in e.g. capital taxes, by 1.95% of GDP in year 1. This one-off increase in capital tax does not affect the long-term slope but shifts the net asset curve up to its base line as the higher capital tax offsets the increase in public debt cf. figure 7 below. Nor does the temporary tax hike have long-term effects on consumption and, consequently, it does not affect the long-run neutrality of the shock.

Figure 5: Effect on public net assets over GDP, foreign prices + 1%

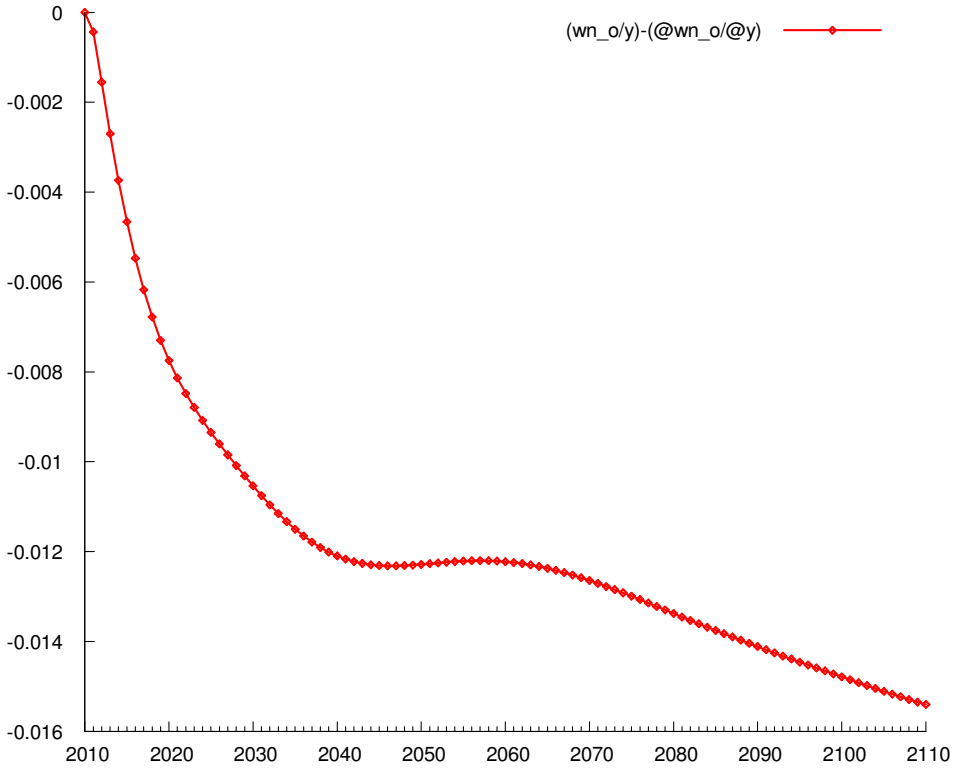


Figure 6: Effect on public net assets over GDP, wages temporarily shocked 1 %

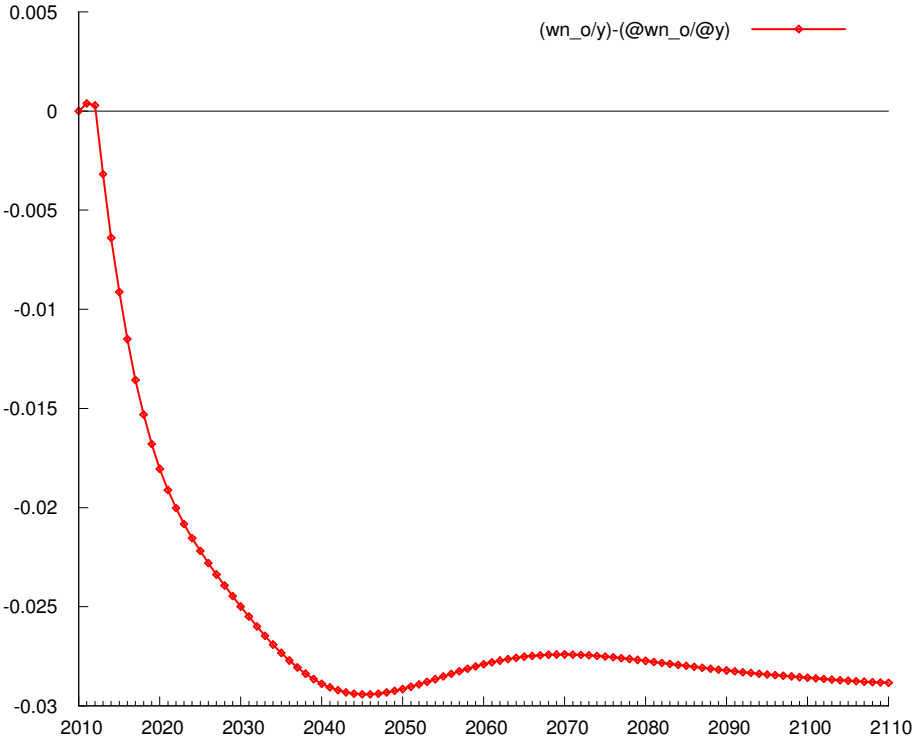
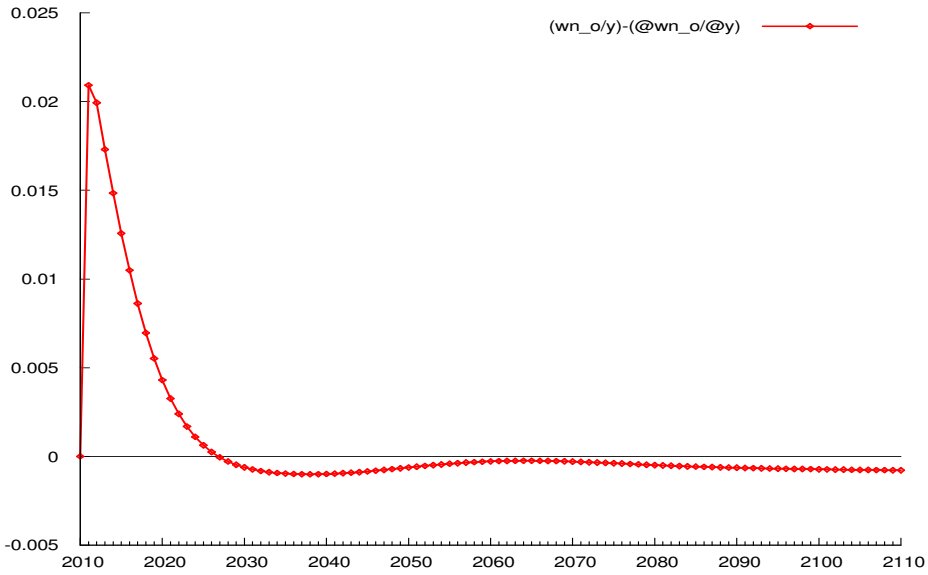


Figure 7: Effect on public net assets over GDP, wages temporarily shocked 1 % plus temporary tax increase



Making the long-term effect on the public net asset zero for the foreign price shock requires more than a temporary tax change. More specifically, we must increase capital taxes by 1.26 % of GDP in year 1 and supplement this temporary tax increase by a permanent increase in, say, income tax. Thus, the income tax brackets (tysp1- and tsyp2-related) are increased by 0.135%, which removes the long-term downward sloping of the public net asset curve in figure 5. The necessary one-off increase in capital tax shifts up the net asset curve to the baseline cf. figure 8 below.

In this way, we have managed to remove the long-term effect on public debt, but there is a problem. The higher income tax makes private consumption, fcp, permanently lower than the baseline cf. figure 9. Thus, this way of removing the impact on public debt also destroys the nice dichotomy of the foreign price shock so we must find another instrument.

Figure 8: Effect on public net assets over GDP, foreign prices + 1 % plus permanent and temporary tax increases

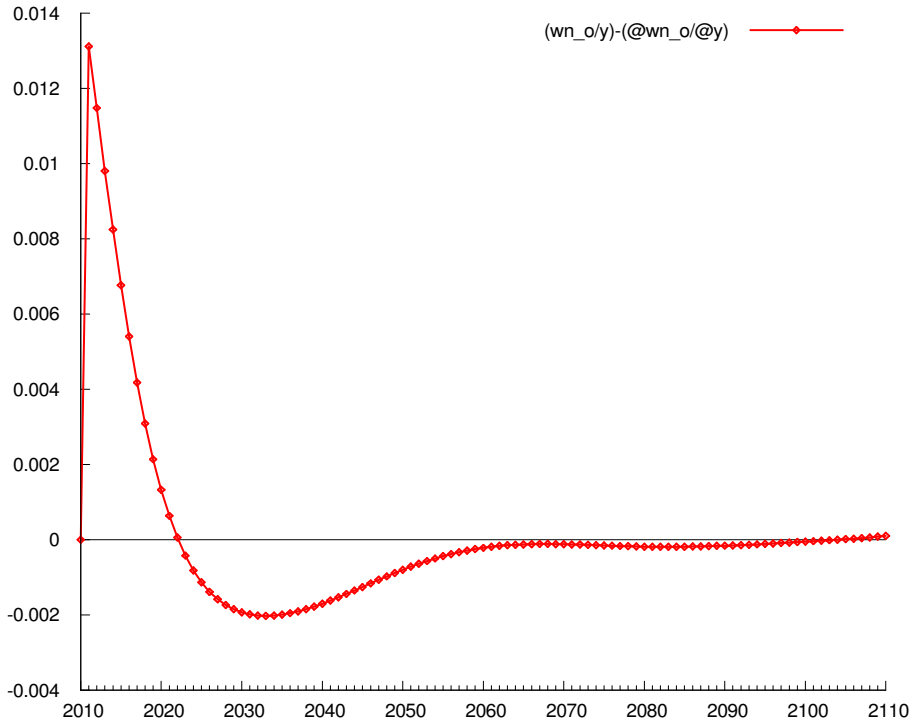
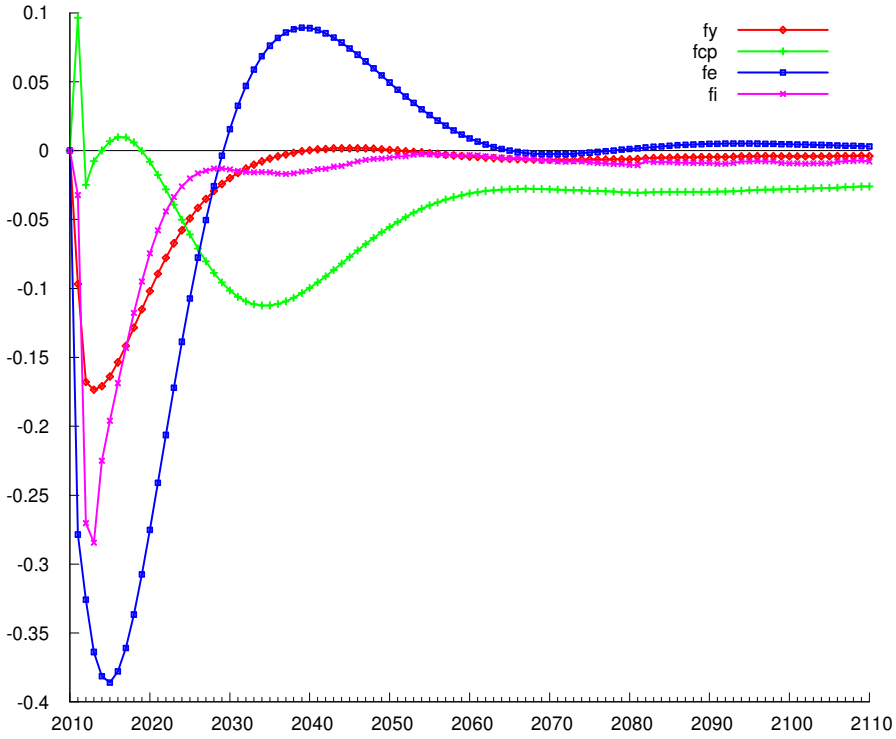


Figure 9: Demand and GDP effects, foreign prices + 1% plus permanent and temporary tax increases

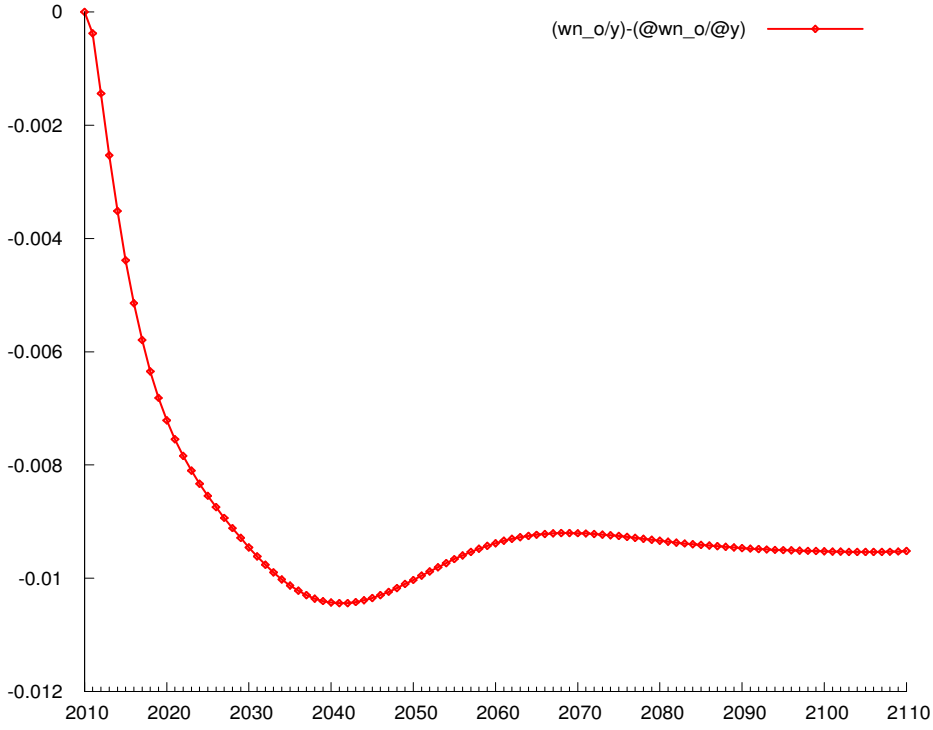


Instead of using the income tax as instrument, we can use the transfers between public and foreign sectors as the instrument to remove the downward slope of the public net asset effect and make the net asset effect follow a horizontal curve. The exogenous transfers between the public and foreign sector comprise contribution to EU, transfers to the Faroe islands; transfers to Greenland; social contribution from abroad and net transfers from EU and the they are respectively denoted by trr_o_eu; tr_o_ef ; tr_o_eg; tpn_e and tr_eu_o. These transfers are permanently decreased by 2 %.

We use public transfers to abroad as instrument because they do not affect private disposable income and private consumption. Actually, it seems natural to reduce these exogenous variables by 1 per cent in the foreign price experiment, but we find that they need to be reduced by 2 per cent to make the public net asset effect curve horizontal.

The joint effect of the fall in foreign prices and the 2 per cent decrease in public transfers is illustrated in figure 10 with the public net asset. The net asset curve becomes horizontal and shifts up toward the base line compared to the net asset curve that is produced by the foreign price shock alone. The basic challenge is to make this curve horizontal reflecting a constant effect on the public debt. It is not a problem to make the curve coincide with the x-axis by a temporary increase in some public revenue.

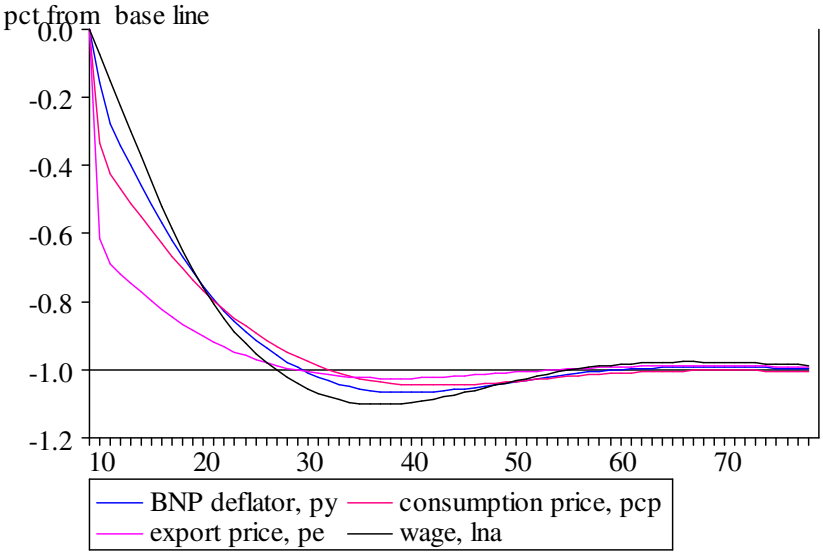
Figure 10: Effect on public net assets over GDP, foreign prices + 1 % plus permanent decrease of public transfers to abroad



5. Price and quantity reactions to foreign price shock

We now examine what happens to the long-run dichotomy and the transition pattern when the 1% fall in foreign prices is accompanied by a 2% fall in public transfers to abroad. Figure 11 reports the impact on four key prices and can be compared to the previously shown figure 1.

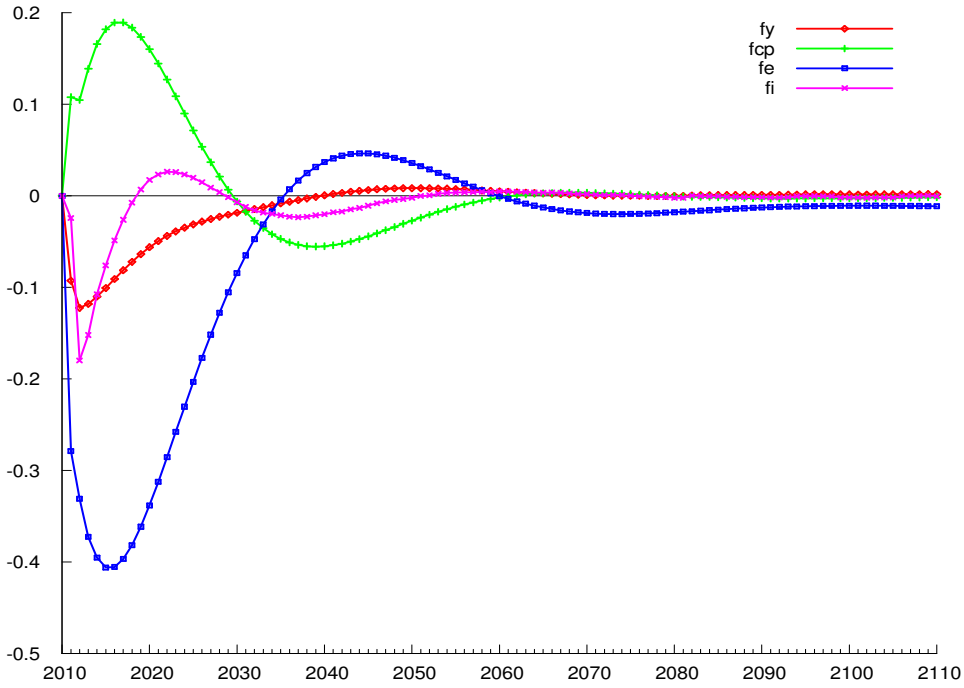
Figure 11: Domestic price effects, 1 % lower foreign prices plus lower public transfers to abroad



The price effects in the two figures look alike because transfers between the public and foreign sectors do not affect the private economy. Also the quantitative effects on output and demand are also quite similar for the two experiments. Specifically, we end with zero long-term effect on consumption when public transfers to abroad are 2 per cent lower. Thus, instead of figure 9, where permanently higher income taxes reduces private consumption in the long term, we get figure 12 below.

We note that there may be a problem with exports which seems to stay slightly below baseline. It is peculiar if only export deviates from the baseline, but the deviation is quite small, and will not be investigated here. The big picture is that exogenous changes in transfers between the public and foreign sector only influence the public budget balance and the balance of payments.

Figure 12: Demand and GDP effects, foreign prices + 1% plus permanent and temporary tax increases

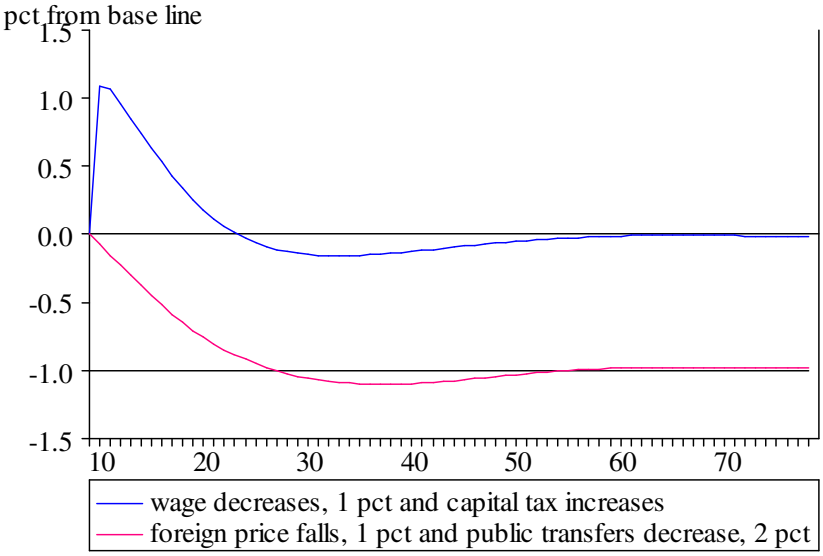


6. Reaction of wages with and without debt financing shocks

The speed of adjustment of wages to equilibrium is quite similar with and without public debt financing. For instance, the temporary wage shock alone on the one hand and the temporary wage shock plus higher capital taxes on the other hand produce virtually the same adjustment of wages to equilibrium cf. figure 4 previously shown compared to figure 13 below.

This similarity is also observed for the foreign price shock alone and with lower public transfers, compare again figure 4 previously shown to figure 13 below.

Figure 13: Effect on wages, foreign prices -1 % or wages shocked +1% in year 1, public debt unchanged in the long term



7. Conclusion

A general foreign price change has no long-term effect on relative prices nor on volumes, and this conclusion is maintained if the foreign price change is supplemented by lower public transfers to abroad in order to remove the accumulating long-run effect on public debt. Moreover, a temporary increase in wages does not have long term price and quantity effect, and this conclusion can be maintained if it is supplemented by a temporary tax increase in order to remove the constant long-run effect on public debt.

In case of an accumulating impact on public debt we need a permanent revenue instrument. The rationale for using public transfers to abroad instead of income tax as permanent instrument is that the former does not affect the private sector and private consumption. Thus, we can keep the nice long-run classical dichotomy of foreign price shocks.

There is a need to investigate further the size of the necessary change in public transfers to abroad. We may also try to eliminate completely the small effect of these transfers on the real economy.