Foreign demand shock and the public debt restriction

Resumé:

We examine how an increase in import demand from Denmark's trading partners will affect the dynamics of key variables in ADAM with and without public financing.

In a previous paper titled' Crowding out mechanism in OECD's new global model', we noted a slower crowding out in response to an increase in non-OECD's domestic demand. It requires only 5 years to crowd out the GDP effect of a fiscal shock in OECD model whereas the GDP effect of foreign demand shock peaks 5 years after the shock. This difference in crowding out seems mainly related to the fiscal policy reaction function in new OECD's model. A positive foreign demand shock improves the public budget, which changes the sign of the reaction in fiscal policy compared to the fiscal policy reaction to higher public expenditures.

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Key words: demand shock, balanced budget

1. **Introduction**

Foreign trade is essential for the business cycle, crowding out and balance of payment, and foreign trade is e.g. able to pull the economy out of recession. The Danish economy depends heavily on foreign trade. Exports, which play a significant role in the growth and development of Danish economy, are a key demand component. The share of exports in total demand is 22 and 22.4% in 2009 and 2010 respectively, indicating that foreign demand accounts for more than one fifth of the total use.

Expansion of foreign export markets due to higher import demand among Danish trading partners implies an increase in Danish export. Especially, the size of estimated foreign trade elasticties is crucial to determine how the growth in partners' income is converted into domestic growth. The objective of this paper is to see how a 1% permanent increase in export markets will affect the key macro variables, and what difference it will make if we maintain the baseline public debt as a share of GDP through different public revenue instruments.

2. Effects of foreign demand shock on selected macro-variables

In this paper, we increase the exogenous foreign demand on 5 markets, namely fee59, feesq, feet, fess and fee2, which are made 1% higher relative to the base in all years, where 2011 and 2110 are the first and last years of the experiment period. ADAM's export equations suggest a lag in the adjustment to market changes. However, we increase the adjustment term in 2011 by 0.36% to mimic a simple first-year foreign demand elasticity of 1 in the export relations.

In ADAM, export is determined on the basis of foreign demand and price of exports relative to competitor's price. As displayed in figure 1, a 1% permanent increase in foreign demand of Danish export products has a permanent and positive impact on private consumption, GDP and export. The first year effect on total export is only 0.86% due to the dead weight of exogenous export components. Export increases by 0.82% in the second year: that is a little less than the first-year increase of 0.86% and the crowding out accelerates in the following years.

Figure 1: Effects of foreign demand shock on GDP, consumption, export, import and investment
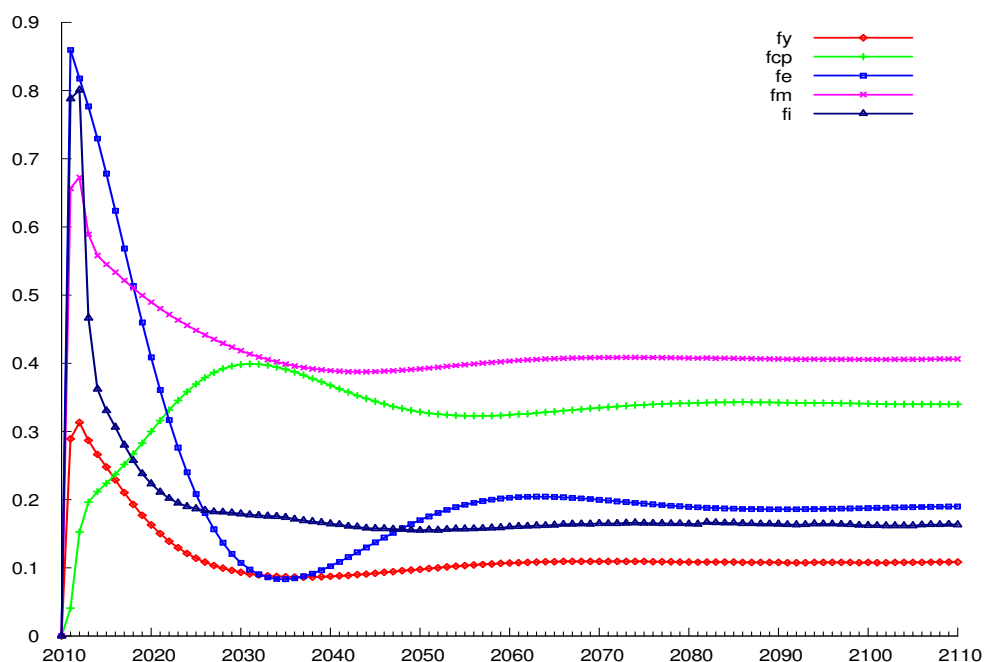
The increase in export demand motivates exporters to produce more, which will affect the overall production in the economy. Consequently, the increased production in manufacturing export sectors stimulates the demand for factors of production. As the wage rate increases, the export sector loses competitiveness, which will crowd out the initial increase in exports. The dynamics of export and the speed of adjustment will be determined by the underlying elasticities and other parameters. The export price elasticities determine to what extent the higher foreign demand is translated into higher export. Had the price of export been exogenous, long-term export would have increased exactly by 1% as the long-run elasticity of export with respect to foreign demand is unity. However, with ADAM's endogenous export prices and estimated export price elasticities, the initial jump in export is crowded out and as a result, export increases only by 0.19 % in the steady state.

The volume of Danish import is affected by domestic prices and demand. At the beginning, export increases and this creates domestic demand and imports. Exporting firms and domestic demand require more imported inputs to meet domestic production. Imports are made relatively cheaper due to the rise in

domestic price following the upward pressure on wages. The increase in export and domestic price tends to push imports permanently above the baseline. Because of this, the long-run effect on import is larger than the effect on export.

The increase in foreign demand enhances the demand for labor and as a result, the hourly wage rate is permanently higher in the steady state, cf. figure 3. The permanent lift in the real wage causes a long-term increase in private consumption, cf. figure1. Private consumption increases by 0.04% in 2011 and 0.34 % in the steady state, where the annual growth in private consumption equals the baseline growth rate of 1.5%. Consumption seems to adapt to its steady state more quickly than export. The dynamics of value added resembles the dynamics of GDP but the latter remains slightly higher in the steady state owing to an increase in the indirect tax component, which reflects the positive consumption effect. GDP increases by 0.29% in 2011 and is close to its equilibrium 20 years. For the rest of the period, the increase in GDP relative to the baseline remains unchanged. The permanent increase in real wages increases the demand for capital relative to labor, which in turn raises value added per employees and the latter effect explains why value added lies above the baseline.

We see that expansionary foreign demand shock has a significant but not a permanent effect on employment and a permanent impact on the composition of demand. This resembles the outcome of a permanent fiscal shock, and we can have a closer look at the differences and similarities between an positive shock to foreign demand and a positive shock to say the public purchase of goods and services, which can be taken from a previous paper titled 'financing an increase in public purchase of goods and services'. We note that the size of the two shocks is different and this makes it difficult to compare the effects directly. However, we observe that the pattern and dynamics of the main variables between the two shocks are quite similar; suggesting that the crowding out effect is mainly determined by the underlying estimated foreign trade parameters and by the fiscal rules, which can be switched on in both experiments.

The speed of crowding out may not be higher in OECD's new global model than in ADAM when it comes to foreign demand shocks. For instance, the GDP effect of a foreign demand shock peaks after 1 and 5 years respectively for ADAM and OECD's model.

The fiscal shock is crowded out much faster in OECD's model than in ADAM. In OECD's model, the output gab is almost closed after 5 years while in ADAM, it takes close to 20 years to reach the long-run GDP-effect.

As displayed in figure 1, we get a long-run GDP effect of about 0.11%. ADAM's GDP effect is not quite output gap effect. Output gap is defined as the difference between actual and potential output, where the latter is a summary measure of the capacity of the economy. Output gap and potential output are not directly observed and must be estimated using information about economic aggregates, which can be observed. We will not go deeper into this but just assume that the GDP gap in ADAM is closed when the GDP impact reaches its permanent value of 0.11%, which must correspond to the permanent effect on GDP-capacity.

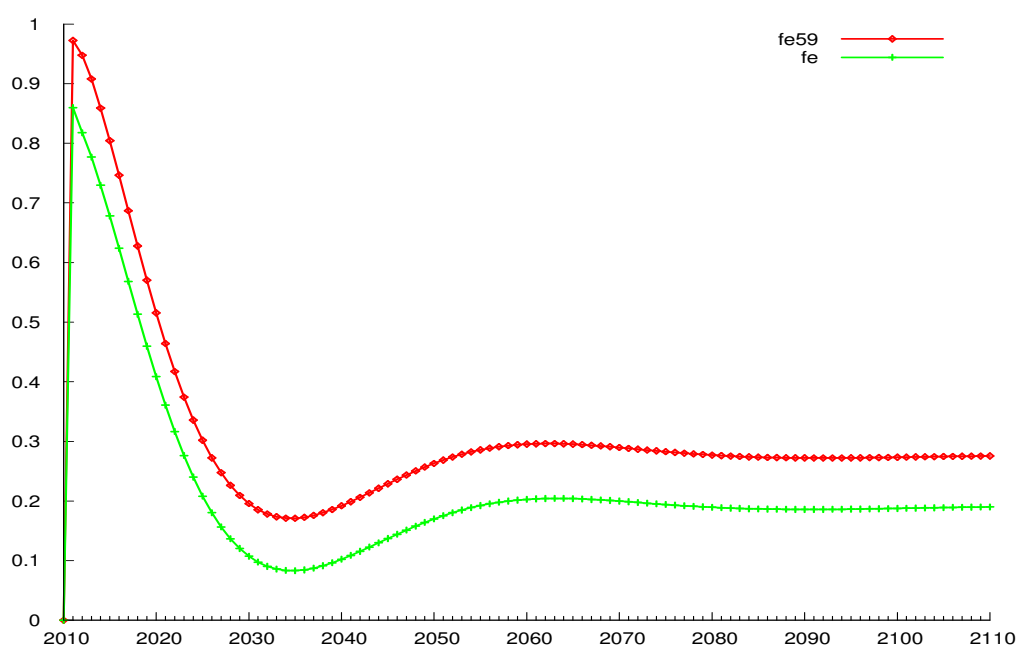**Table 2: Manufacturing export vs. total export**

Figure 2 shows that the dynamics of manufacturing export, SITC 5 to 9, and total export is very similar. We see a higher long term effect on manufacturing export compared to the effect on total export. With endogenous export price both total and manufacturing export increase by a less than 1% in the long run. Total export is less price-sensitive as it comprises exogenous export components like energy and sea transport.

Figure 3 displays the domestic and export price response to the positive external demand shock. Had foreign demand been left unchanged and had instead the exogenous foreign prices been reduced as in a paper titled 'Foreign price shock and the public budget', we would get the same change in domestic and foreign prices in the long run, implying that all volumes and relative prices remain unchanged in the steady state. This is not the case with a positive foreign demand shock, where only the domestic prices are affected and where we accordingly have discernible real effects in the long run as already portrayed in figure 1, and we also have permanent effects on relative prices.

Figure 3: Response of domestic and export price to the foreign demand shock
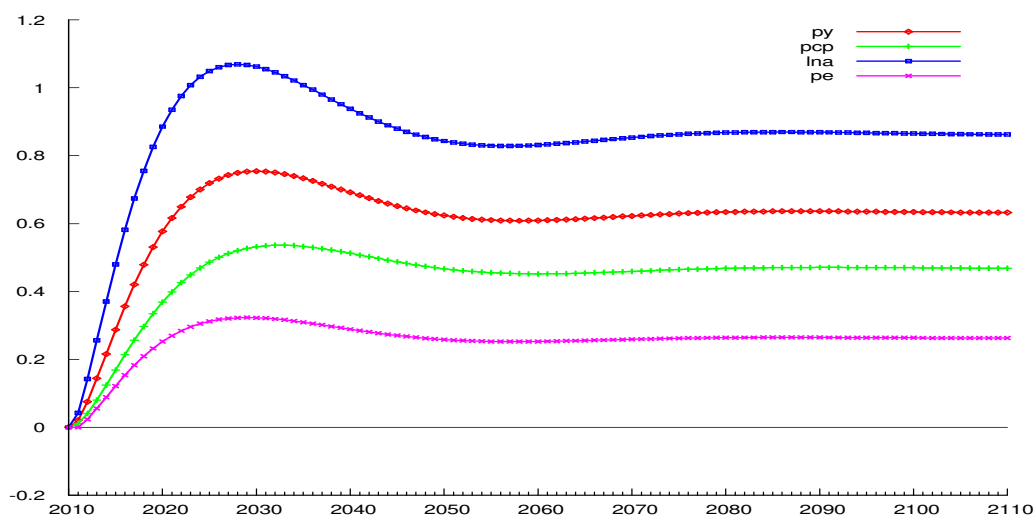
As to the effect on public debt as share of GDP, we observe a permanent lift in the public net asset as a result of lower public debt. The public net asset and government bond debt, wn_o and wbd_os_z as per cent of GDP, increases/ decreases respectively by 0.87 and 0.83 in the steady state, indicating that these numbers are numerically almost the same. A higher public net asset implies a

higher foreign asset and room for higher domestic consumption. As shown in figure 4, the level of public debt and debt service costs are significantly reduced as the positive foreign demand shock improves public finances. But, we want to see the effect when public debt is maintained at its baseline as share of GDP. Thus, we need a fiscal policy instrument to supplement the positive external demand shock.

Table 4: Effect on public net wealth as a share of GDP
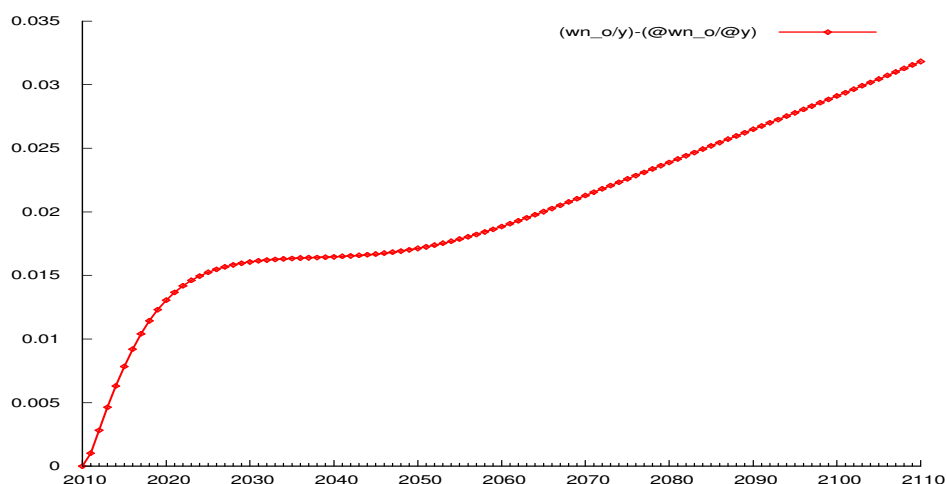
## 2. **Maintaining public net wealth**

To keep the long-term public debt as a share of GDP at the baseline level, we need two fiscal instruments, a permanent and a temporary say revenue instrument. A permanent revenue instrument is required to make the long term effect on public debt constant and we need a one–off revenue shock as well to make the long-term debt effect zero. In the following, we consider two fiscal instruments namely, value added tax (VAT) and income tax to remove the upward sloping of public net asset as share of GDP in figure 4. Capital tax is used as a one–off revenue instrument to remove the long-term effect on public debt. In section 3, we shall compare and contrast the outcomes of non-financed and financed foreign demand shocks.

2.1 **Value added tax**

VAT is one of the fiscal revenue instruments that the government can use to put public net asset, wn_o/y, at a desired level. The positive external demand shock takes the public net asset as a share of GDP to a higher level. We seek to hold wn_o/y at the baseline level with a permanent and a temporary shock to

VAT rate, tg. First, we find that a 0.36% decrease in tg, from 0.25 in the baseline to 0.249 in the experiment, is sufficient to remove the upward sloping of wn_o/y and produce a horizontal curve in the long run, cf. figure 5. Second, a one off decrease in capital tax at 1.14 % of GDP in 2011 makes the long-term impact on the net asset ratio zero.

Figure 5: Effect on public net asset when higher foreign demand is supplemented by lower VAT and capital tax
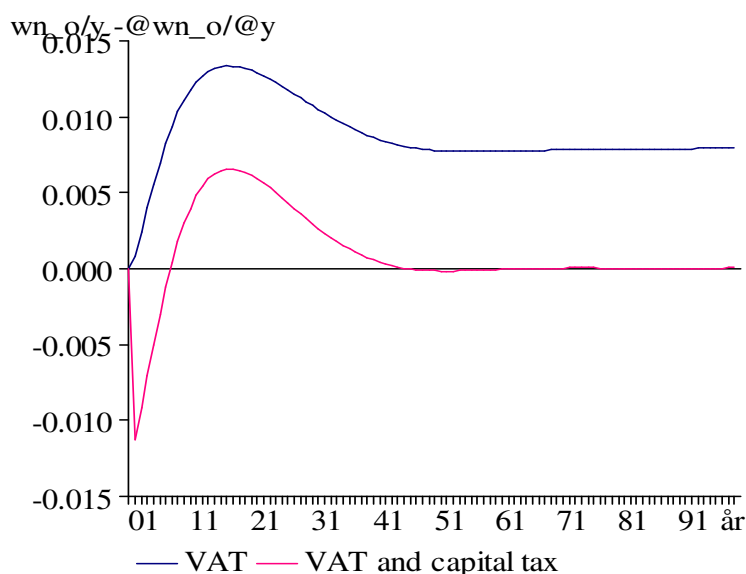

2.2 Income tax

Using a similar procedure as for VAT, we calculate the necessary income tax changes to put the debt effect at a required level. Income tax rates, tsysp1 and tsysp2, should be 0.5% lower in all years to make the increasing impact on debt ratio horizontal. We use a one-off decrease in capital tax at 1.04% of GDP in 2011, to neutralize the long-term effect on public debt, cf. figure 6. In this way, we make the trended curve in figure 4 coincide with the x-axis.

With both financing methods VAT and income tax, we note that the necessary permanent tax changes are small while the one-off change in taxes is slightly higher than 1% of GDP. As indicated by figure 4, the impact on public net asset is relatively flat. Thus, the impact of the foreign demand shock on public finances is mainly of a one-off nature stemming from the economic upturn that is created in the first years following the foreign demand shock.

Figure 6: Effect on public net asset when higher foreign demand is supplemented by lower income tax and capital tax

wn_o/y-@wn_o/@y
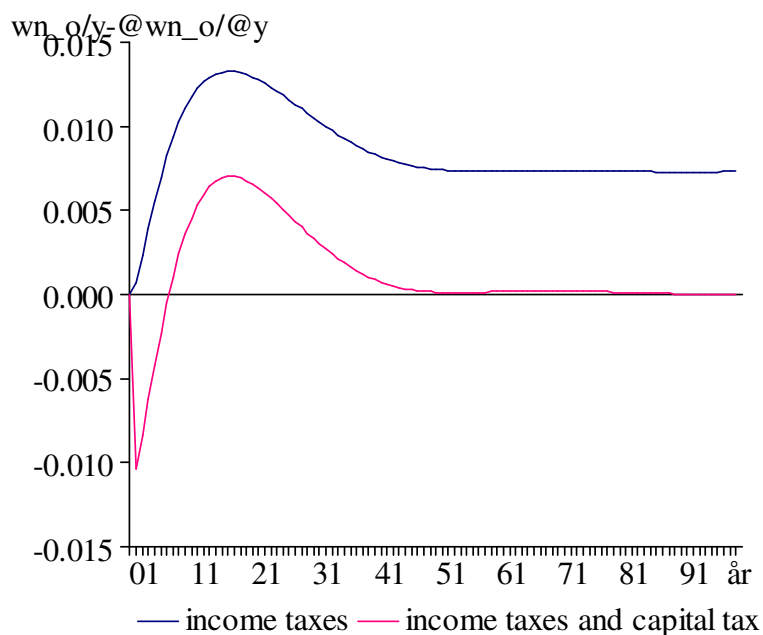
3. Comparing main effects

In the previous section, we have reviewed how the external positive demand shock affects key variables in ADAM. We saw that the strength of linkage between the Danish economy and its trading partners depends on the foreign trade parameters, which determine the crowding out of export via the wage and price formation. We now illustrate how financed effects, i.e. effects with restriction on public debt, differ from unfinanced effects in terms of adjustment pattern and speed of crowding out. We look at some main variables in ADAM and investigate the impact of tax financing. The previously shown figure 1 illustrates a simple unfinanced shock while figure 7 and 8 below illustrate financed shocks.

There are several ways of tax-financing a demand shock. Figure 7 illustrates the 1 % foreign demand shock when a lower VAT rate is used to neutralize the impact on public debt. Figure 8 illustrates the same shock accompanied by a lower income tax in order to neutralize the debt impact. In both financed and unfinanced shocks, cf. figure 1, 7 and 8, we get a long-run effect on the demand variables, but there are distinct differences between, on the one hand,

figure 1 illustrating the simple unfinanced foreign demand shock, and on the other hand figure 7 and 8 illustrating the tax-financed shocks.

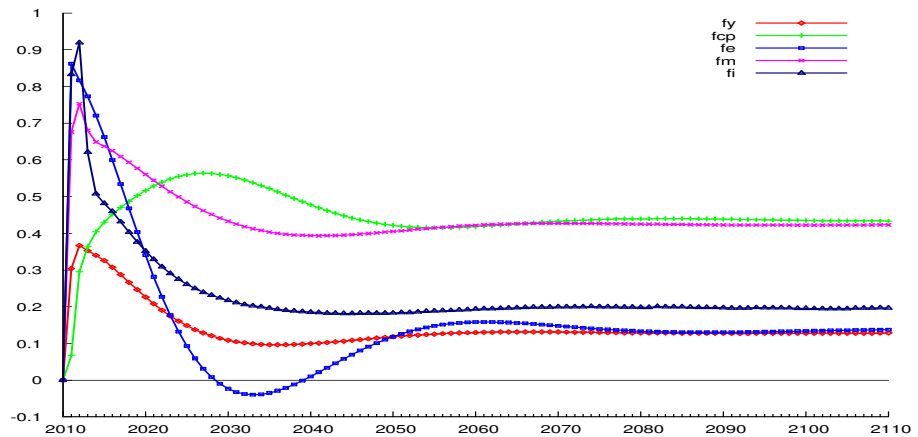**Figure 7: Higher foreign demand plus lower VAT and capital tax, effect on key variables.**
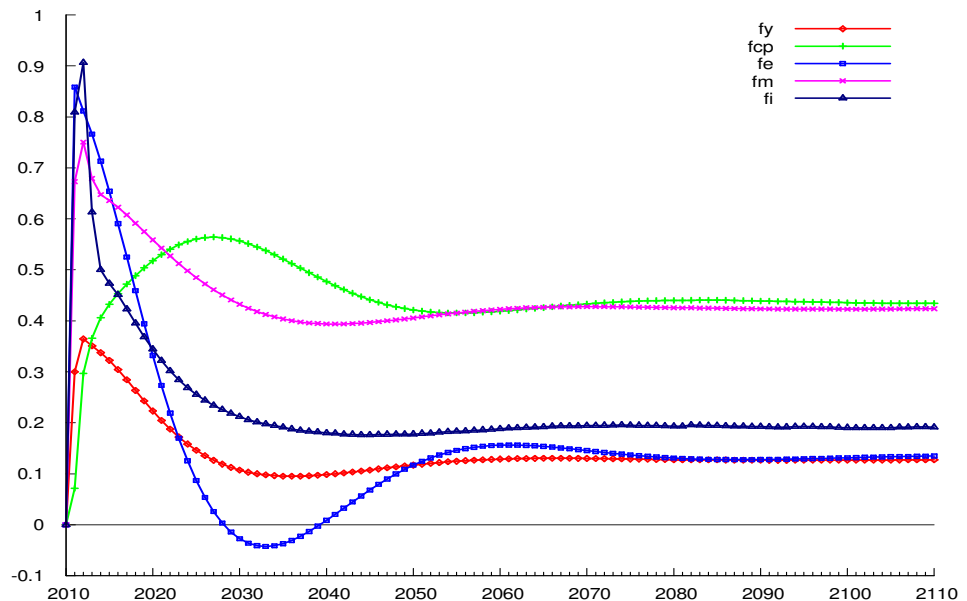

Figure 8: Higher foreign demand plus lower income and capital tax, effect on key variables


In particular the effects on export and private consumption are different with and without tax financing. Lower taxes raises private consumption and higher consumption will crowd out exports in the long run via higher wages and prices. Thus, we get higher consumption and lower exports if we transform the lower public debt into lower taxes. You may also note that a financed shock creates a slightly larger long-run GDP effect. This reflects that the higher wage makes industries use less labor per unit produced. Moreover, the higher private

consumption increases the content of indirect taxes in GDP, which also adds to the size of GDP per the employed. The higher GDP is per employed, the more GDP can be produced by the same labor force.

In figure 9 we focus on the consumption effect with a simple unfinanced 1% increase in foreign demand and with the same shock accompanied by lower VAT and a temporary drop in capital tax in order to keep public debt unchanged.

Figure 9: Private consumption effect, 1% higher foreign demand pure and accompanied by lower VAT and capital tax
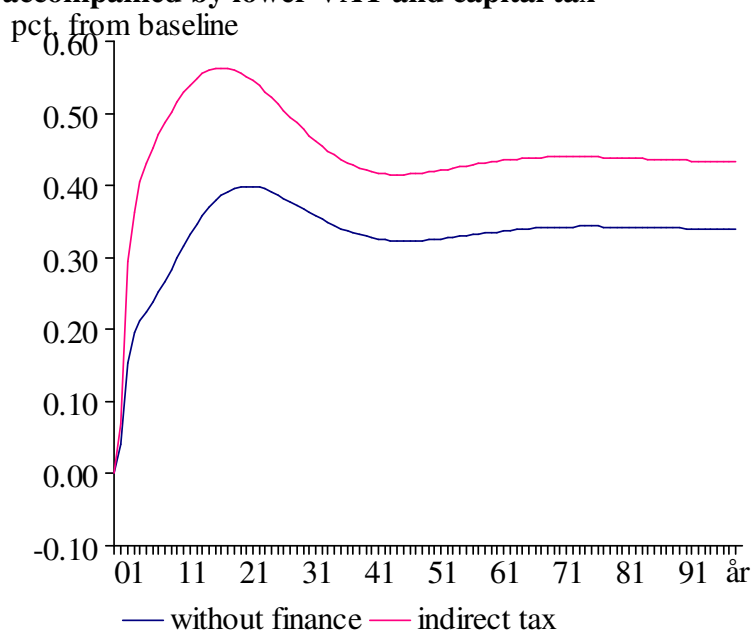
In figure 10 we illustrate the export effect of the same two shocks. With lower tax and higher domestic demand we get a higher wage rate and a lower export in the long run. It may be added that lower exports and higher domestic demand remove the improvement on the balance of payments just like the lower tax removes the improvement on the public budget balance.

Figure 10: Export effect, 1% higher foreign demand pure and accompanied by lower VAT and capital tax

pct. from baseline
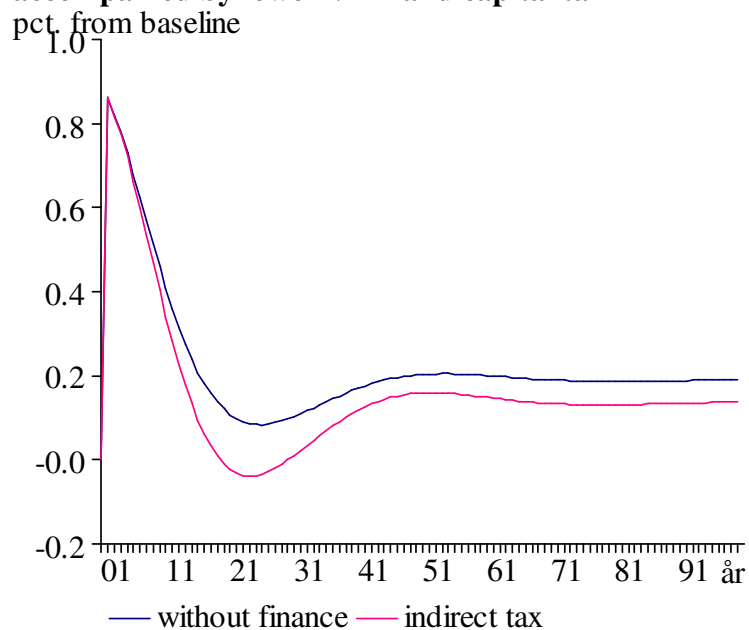
Finally, we can compare the effects when using respectively VAT and income tax as instruments. The difference seems small. Figure 7 and 8 indicate similar effects for all variables in several dimensions, including the short-term dynamics and the size of the long-run effect.

However, we can detect a different impact on tourist revenues. Tourist revenues, fEt, are higher when the indirect tax instrument VAT is lowered than when the direct tax rates are lowered, cf., figure 11. The difference reflects that a lower VAT reduces the prices that foreign tourists pay for Danish consumer goods.

Figure 11: Tourist revenue effect, 1% higher foreign demand pure and accompanied by lower indirect or lower direct taxes

pct. from baseline

— indirect tax — without finance — direct taxes
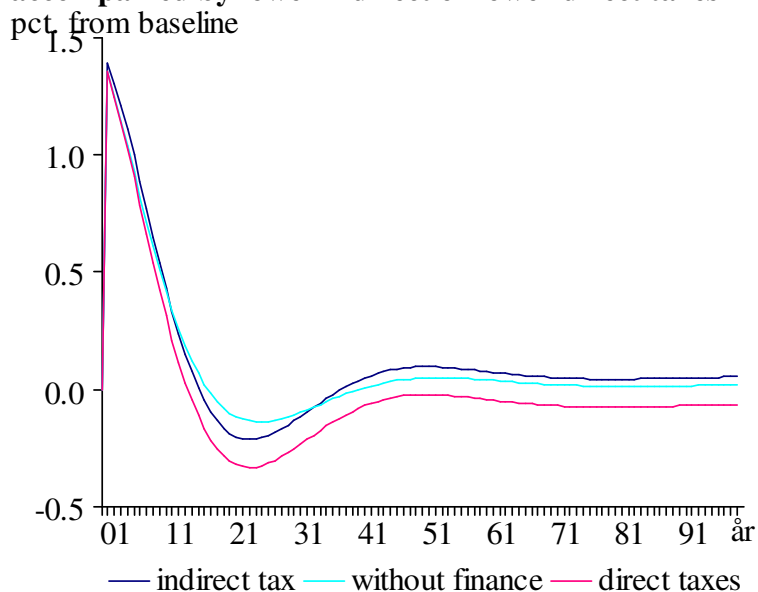
The last variable to discuss is employment, so we take a closer look at the employment effect of a financed and an unfinanced shock. None of the foreign demand shocks, with or without public debt restriction, has a permanent effect on employment, but there is some difference in the dynamics of employment between financed and unfinanced shocks cf. figure 12, which compares the VAT-financed and the unfinanced 1% foreign demand shock.

Figure 12 Employment effect of financed and unfinanced shocks to foreign demand

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— without finance — indirect tax
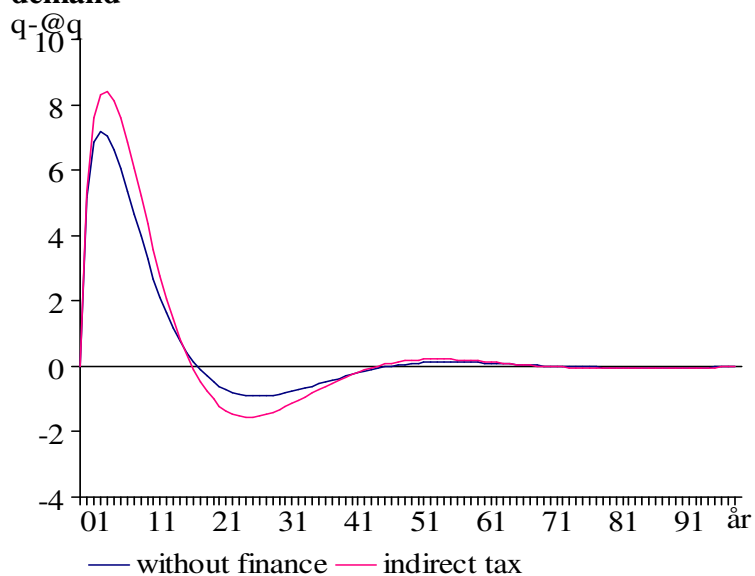
The simple unfinanced shock peaks a bit earlier and at a lower level than the financed shock where employment is lifted in the short run by lower VAT and the temporary drop in capital tax. More specifically, the employment effect peaks after 3 years if the shock is financed, and the employment effect peaks after 2 years if the shock is unfinanced. This can be compared to the apparent peak after 5 or perhaps 6 years in the OECD model.

4. **Conclusion**

The paper scrutinizes how a 1% increase of the export markets affects the dynamic and long–term effects of the main variables in ADAM, with and without a restriction on public debt. The positive foreign demand shock tends to improve public finances so the public debt restriction entails a tax cut. We have seen that a simple fiscal shock is crowded out much faster in OECD's model than in ADAM due to the fiscal reaction function in OECD's model. However, for a foreign demand shock, the fiscal reaction function does not add to the crowding out mechanism of OECD's model, and it is no longer obvious that OECD's model has the fastest crowding out.