DREAM
Danish Research Institute for
Economic Analysis and Modelling

MAKRO

Macroeconomic Effects of Export shocks in MAKRO

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Shock analysis
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1 Introduction

This note is motivated by tariffs imposed by the United States on Denmark. We use MAKRO to evaluate the macroeconomic effects under a scenario in which Danish exports to the United States fall to zero. In the experiments below, we capture this by shocking foreign demand for Danish exports, rather than modeling tariffs directly. Throughout, we hold other foreign macroeconomic conditions fixed (interest rates, foreign prices, equity markets, etc.), so the exercises isolate the transmission of the export-demand shock. We assume that tax rates are constant at the levels from the baseline model, so they do not change in response to any fiscal deficits caused by the shock. We consider the following variations of an export demand shock:

1. A shock to the demand for all Danish exports (goods and services)
2. A shock to the demand for Danish exports, distinguishing between goods and services
3. A shock to the demand for Danish exports of goods, excluding merchanting and processing

2 Broad decline in Danish exports

We first consider a broad shock, where all exports to the US cease. In 2024 the average share of Danish exports that went to the US was 17%. To mimic this in MAKRO we shock the demand for exports in all sectors by a 17% decrease relative to the baseline model. The shock is permanent, and arrives unexpectedly in 2027.[1]

Figure 2.0.1 summarizes the macroeconomic effects of a broad decline in Danish export demand on national accounts (consumption, investment, output, exports, and imports), as well as on wages and prices, employment, and public finances. In the short run, GDP declines by roughly 5%, with the reduction in exports accounting for the majority of this decline, as overall exports fall by 12% in the short run. Investment and private consumption also decline significantly. However, due to the higher import content of these demand components, imports fall as well. The shock generates a short-run decline in real wages of around 7% and an decline in employment of 90.000 persons. This is accompanied by a deterioration of public finances, where the primary balance (in shares of baseline GDP) falls by 2.5 p.p. Private consumption also decline significantly, and would fall more in the case where tax rates adjust to reduce the increase in fiscal deficits.

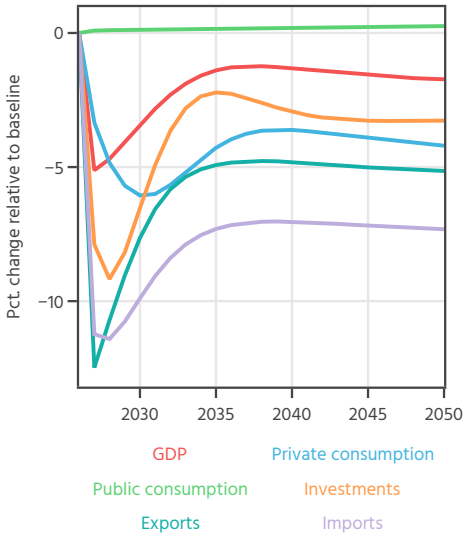
Note that even though the decline in demand for Danish exports is very large (a decline of 17%), the long run decline in exports is only around $4\% - 5\%$. This dampening effect comes from a decline in domestic export prices (around 2% in the long run), which makes Danish goods more

[1] We note here that this is relatively large shock, and as such maybe induce non-linearities which MAKRO is not specifically build to match empirically. For the export shocks in this analysis the non-linearities are typically small for the long run effects, but do influence the short run magnitudes, especially for employment and wages.

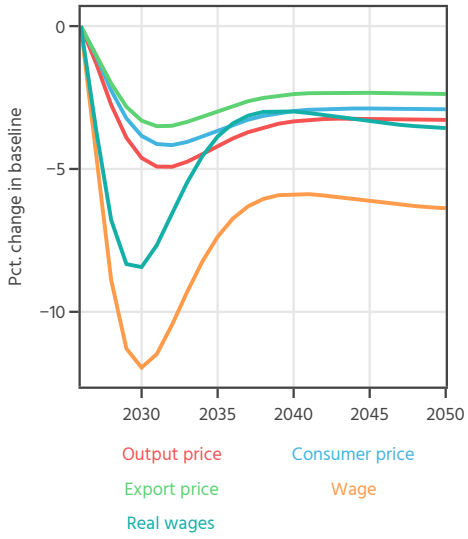
competitive compared to foreign goods. This has a positive effect on exports, and the size of the effect is governed by the trade elasticity, which is typically relatively large in the long run.[2]

Figure 2.0.1
Supply balances and prices

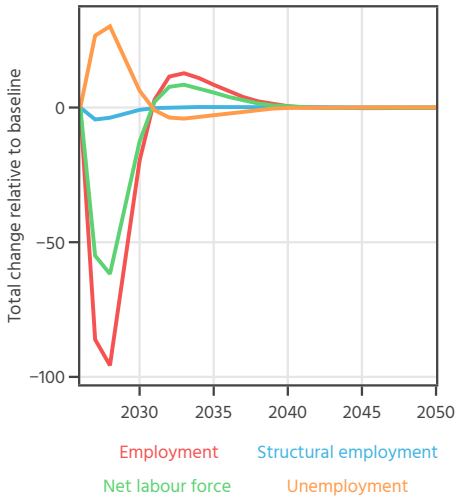
a) National accounts (C, I, G, Y, X, M)



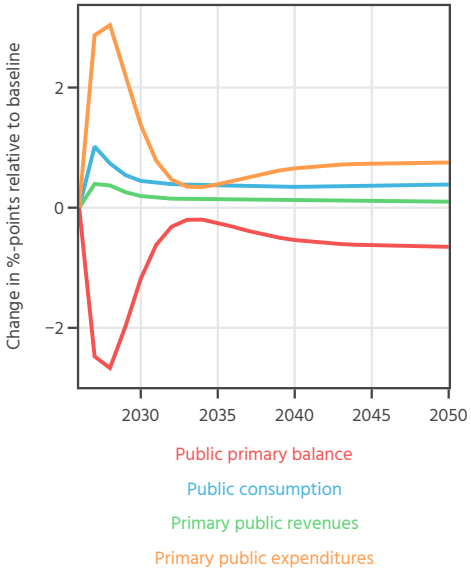
b) Prices and wages



c) Employment



d) Public finances



Note: Effects on aggregate variables following a decline in demand for danish exports across all sectors.
Source: MAKRO simulations.

[2] In MAKRO the long run trade elasticity is 5.

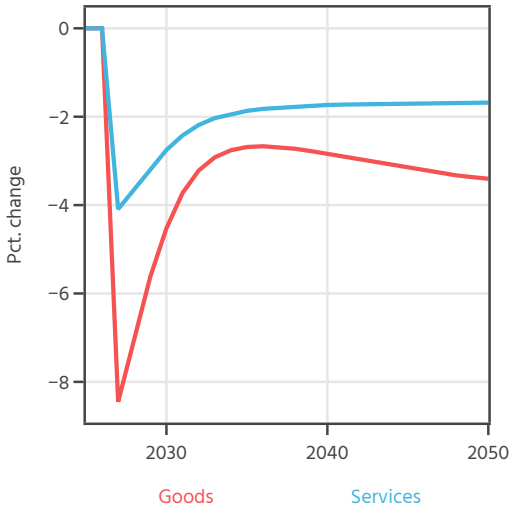
3 Exports of goods vs. services

We next consider the case where the trade shock has heterogeneous effects across sectors. We consider a shock to exports of Danish goods, scaled to match 12% of total exports, which was the share of goods exports to the US in 2024. Similarly, we shock demand for exports of services with $17\% - 12\% = 5\%$ of total exports (i.e. the non-goods share to the US). Here we define services broadly as including core services, shipping and tourism. Figure 3.0.1 shows the responses for exports, GDP, employment, and hourly wages. The responses to the goods-specific shock are generally larger in MAKRO (almost twice as large as the shock to services), because exports of goods account for a significantly larger share of total exports than services. Additionally, employees in the goods sector are also more productive than their counterparts in the service sector, so a decline in employment have a larger effect on production in this sector. The shock to demand for goods general a long run recline in real wages of 3%, whereas the service specific shock generates a 1% loss.

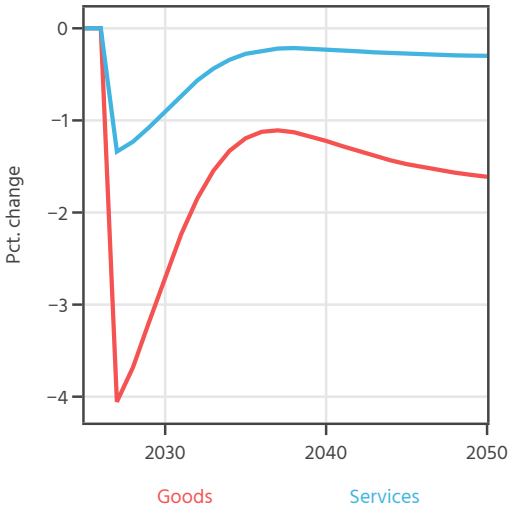
Figure 3.0.1

Shock to demand for Danish exported goods and services

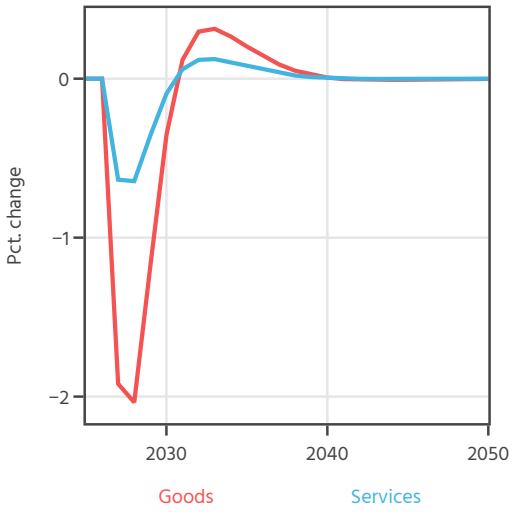
a) Total exports



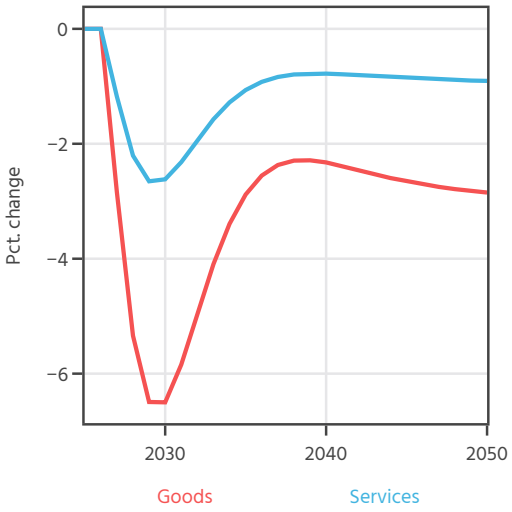
b) GDP



c) Aggregate employment



d) Hourly wages



Note: Effects on aggregate variables following a decline in demand for danish exports of goods and services respectively.
Source: MAKRO simulations.

4 Excluding merchanting and processing

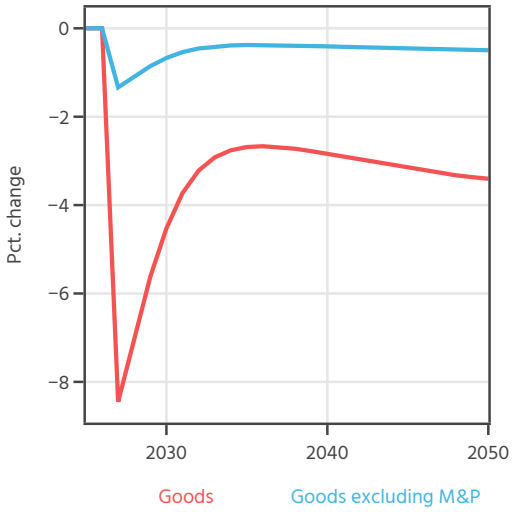
Finally, we examine the implications of accounting for merchanting and processing (M&P). MAKRO does not currently include an explicit modeling of M&P, and we therefore cannot separate M&P-related exports from non-M&P exports within the model. Using data on M&P exports, however, we can perform a back-of-the-envelope calculation outside of MAKRO to obtain an estimate of the effects of an export demand shock that does not affect M&P-related trade, see Appendix A.1.

Using data on M&P exports from Denmark to the US, we perform a back-of-the-envelope calculation outside of MAKRO to estimate the effect of an export demand shock that does not affect M&P-related trade (see Appendix A.1 for the data). Focusing on goods trade only, total Danish goods exports to the US account for 12% of total Danish exports. In contrast, only 3% of total exports corresponds to direct cross-border goods trade, while the remaining 9% reflects M&P-related exports. Thus, 75% of US-bound goods exports are M&P-related and therefore insulated from the shock, while 25% are directly exposed. Assuming a 12% negative export demand shock that applies only to the exposed component, the implied reduction in total Danish goods exports is $0.12 \times 0.25 \times 100 = 3\%$ as a fraction of total Danish exports. Figure 4.0.1 displays the impulse responses when including and excluding M&P, respectively. Omitting for M&P related exports drastically reduced the effects of the shock, with the long run effect on GDP dropping to -0.25%, and the real wage effect dropping to -0.4%. Note that, because this exercise only changes the size of the shock, the endogenous transmission mechanisms in MAKRO are identical to those of the goods shock in Section 3.

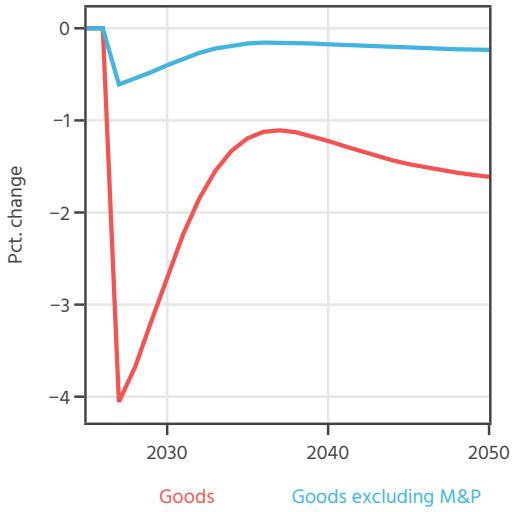
Figure 4.0.1

Shock to demand for Danish goods export including and excluding M&P

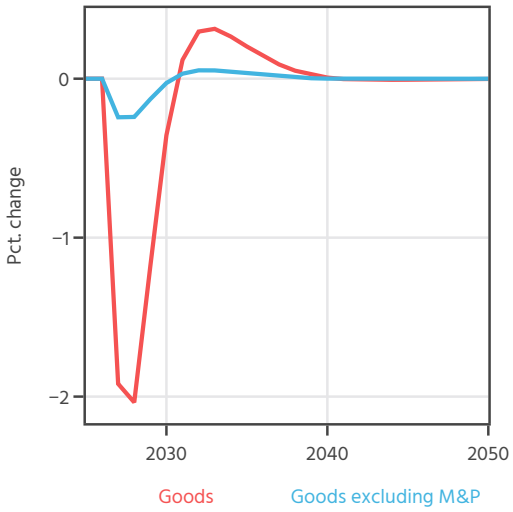
a) Total exports



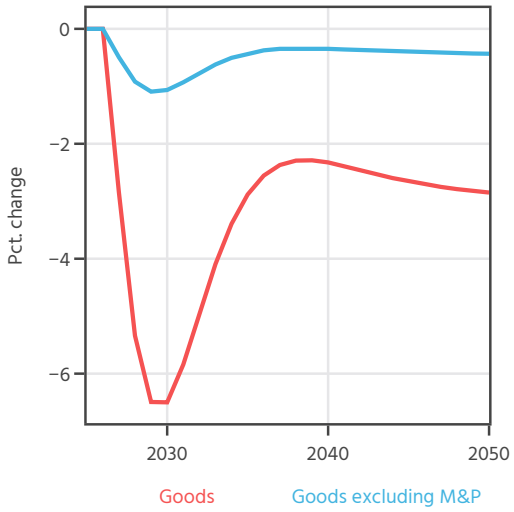
b) GDP



c) Aggregate employment



d) Hourly wage



Note: Effects on aggregate variables following a decline in demand for danish exports of goods including and excluding trade related to M&P respectively.
Source: MAKRO simulations.

5 Fiscal sustainability

Table 5.0.1 presents the effect on fiscal sustainability as measured by the fiscal sustainability indicator (HBI) of the 4 different shocks considered so far. The table decomposes the overall effect (measured as percentage points difference to the baseline) into contributions from public revenues, public expenditures, other expenditures and GDP (the denominator effect). For all shock the change in fiscal sustainability reflect two opposing forces, namely a decline in revenue, primarily driven by lower direct taxes, and a decline in expenditures coming from lower government consumption and transfers. Additionally there is a small denominator-effect due to declines in GDP. For the shock which affect all goods and services, the decline is -0.76 percentage points. This is mainly driven by the effect on goods trade, as the change in fiscal sustainability declines by -0.59 in the goods-only scenario.

Table 5.0.1
Effect on fiscal sustainability indicator (HBI)

Component	All goods & services	Goods	Services	Goods excl. M&P
△ Fiscal Sustainability Indicator	**−0.76**	**−0.59**	**−0.19**	**−0.09**
Primary public revenues	−3.30	−2.66	−0.84	−0.41
Direct taxes	−2.11	−1.78	−0.50	−0.27
Indirect taxes	−1.02	−0.75	−0.29	−0.12
Other public revenues	−0.17	−0.14	−0.04	−0.02
Primary public expenditures	+2.38	+1.93	+0.60	+0.30
Government consumption	+1.26	+1.02	+0.32	+0.16
Income transfers	+0.92	+0.74	+0.23	+0.11
Other primary expenditures	+0.21	+0.17	+0.05	+0.03
Other expenditures	−0.01	−0.01	−0.00	−0.00
GDP	+0.17	+0.15	+0.05	+0.03

Note: Decomposition of the change in the fiscal sustainability indicator (rHBI) for each export shock. All values are percentage points of the NPV of baseline GDP, evaluated in 2026.
Source: MAKRO simulations.

6 Conclusion

An increase in US tarrifs which dampens danish exports can potentially have large effects on the danish economy, though they become significantly smaller once we account for the fact

that they mainly affect non-M&P goods trade. The above exercises focus only on the transmission of a tariff shock through reduced foreign demand for Danish goods. In practice, large macroeconomic shocks also transmit to the Danish economy through other channels, such as interest rates, prices, and uncertainty, among others. There are several ways to capture these additional effects in MAKRO. One approach is to use empirical estimates of US tariffs on the US economy (Besten et al. 2026, Barnichon and Singh 2025) to obtain estimates of the joint co-movement of US imports, interest rates, and prices, which can then be used as shocks in MAKRO. A more structural approach is to conduct a tariff shock in a simpler model of the US economy and obtain impulse responses for the foreign variables needed in MAKRO. This can, for instance, be done in the satellite model of the US economy that is part of MAKRO. The current analysis also abstracts from indirect export exposure, such as when Denmark exports to Germany, which in turn exports to the United States. Capturing these indirect trade linkages would require a global input-output framework that accounts for trade relationships across countries.

References

Barnichon, Régis and Aayush Singh (2025). What Is a Tariff Shock? Insights from 150 years of Tariff Policy. Tech. rep.

Besten, Tamar den et al. (2026). The Macroeconomic Effects of Tariffs: Insights from 180 Years of US Trade Policy. Tech. rep. National Bureau of Economic Research.

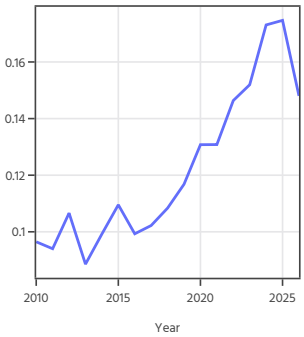
A Appendix

A.1 Danish exports to the US

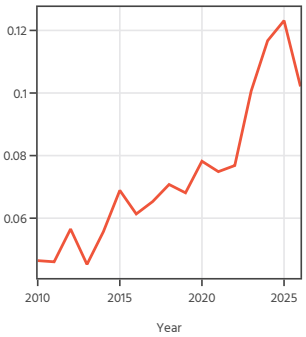
Figure A.1 shows various measures of the share of Danish exports going to the US. Panel (a) displays the share of total Danish exports going to the US. This has been steadily growing over time, and peaked in 2025 at 22%. Panel (b) shows the same statistic, but counts only exports of goods. This amounts to roughly 16% in 2025, and thus constitutes the majority of Danish exports to the US. Finally, panel (c) displays the estimated share of Danish exports to the US which constitute M&P. We calculate this as the share of goods exports to the US, which did not cross borders. In 2025 this was roughly around $85\% - 90\%$.

Figure A.1
Statistics on DK-US exports

a) US Share of total Danish exports



b) US goods share of total Danish exports



c) M&P share of Danish goods exported to the US

