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ADAM multipliers - ADAM June 2019

Resumé:

The paper presents a series of multiplier analysis that illustrate the properties of ADAM. The calculations are made with the model version ADAM June 2019 using the baseline lang19. Adam June 2019 beta build 127

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Modelgruppepapirer er interne arbejdsrapporter. De konklusioner, der drages i papirerne, er ikke endelige og kan være ændret inden opstillingen af nye modelversioner. Det henstilles derfor, at der kun citeres fra modelgruppepapirerne efter aftale med Danmarks Statistik

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Introduction

A series of multiplier analysis that illustrate the properties of ADAM are presented below. The calculations are made with the model version ADAM June 2019 – hereafter in short Jun19 – using the baseline Lang19. The model uses national accounts data from June 2019. A number of papers – for example on estimation, data construction or model analysis – can be found on the homepage www.dst.dk/adam.

The major change in the recent versions of ADAM is the introduction of supply effects in the export relations. In earlier model versions, exports were described as a function of relative prices and foreign demand, i.e. a classic Armington model. Now the Armington model has been expanded so that exports are in addition related to supply factors, i.e. exports expand if domestic output grows in real terms without changes in the terms of trade; cf. the papers dsi08aug16, dsi11nov16 and dsi01mar17. This is in line with the traditional gravity equations where trade flows are related to domestic output (a measure for supply effects) and foreign output (a measure for demand effects). The export equations are setup in a way such that a user can choose to activate the supply effects through a switch dummy. In general, the difference in the multiplier properties of the new model and the previous model is greatly attributed to the supply effects included in the export relations.

The multiplier analyses are based on a baseline. The baseline represents a solution with respect to the endogenous variables given a stylized projection of the exogenous variables. The present baseline, Lang19, is based on the historical data bank from June 2019 that contains annual historical data up to and including 2018. The baseline is based on a scenario with steady-state growth driven by domestic growth in productivity.

The chosen growth rates reflect historical growth rates in the Danish economy. But demography and labor supply are assumed to be unchanged. So that the number and structure of the population is assumed to be unchanged. Productivity growth in the Danish economy is assumed to be 1.5 percent per annum. The growth in the market for Danish exports is likewise assumed to be 1.5 percent. Import prices and competitive prices in the export market are assumed to grow by 2 percent annually. In steady-state the domestic prices and costs will grow by 2 percent like foreign prices, and the Danish GDP will grow by 1.5 percent reflecting the annual productivity growth.

This development in output is achieved by assigning the growth in productivity to labor and this is reflected by a corresponding increase in real wages of 1.5 percent. The real interest rate is constant and fixed at 1.5 percent, like the growth rate of labor productivity. Thus, the Danish economy can grow in steady-state with unchanged demand structure, unchanged composition of output and income, unchanged economic policy, unchanged tax and public expense burden, and unchanged sectoral composition etc. The replacement rate of unemployment insurance is also unchanged and the equilibrium level of unemployment is approximately 4 percent (close to 100.000 persons).

Overall, it is a baseline of the Danish economy repeating itself into the future roughly as we know it today with a real growth of 1.5 percent and an inflation rate of 2 percent. In the short term, it is necessary to allow for deviations while variables are adjusting to steady-state but the equilibrium scenario is achieved within a short time frame. For a discussion of the structure and construction of the baseline scenario see chapter 10 in the ADAM book, which is also available for [download](#).

The multiplier experiments are carried out by changing one or a few of the exogenous variables. Then the model is simulated to calculate the effect on the endogenous variables and this creates a new solution called an alternative scenario. The multipliers for the endogenous variables are calculated as the difference between the values in the alternative scenario and the baseline scenario. The multipliers reported in graphs and tables are calculated either as a simple or relative differences depending on the nature of the variables. A word of caution is necessary when reading the text, when a certain endogenous variable is said to increase or decrease following a given shock it should be interpreted as an increase or a decrease compared to the baseline values.

The purpose is to illustrate the properties of ADAM. There is no provision for possible ties between the exogenous variables. This means that one has to be careful in the interpretation of the experiments as real

world economic events are rarely confined to changes in one exogenous variable. For example, in the interest rate experiment in section 15 below, the potential effect of interest rate changes on foreign demand are not taken into account, see [grh12912](#) for more.

It is worth noting the premise that before we introduce a shock to the model, the economy is following a baseline, which ends up in steady-state equilibrium. Economic policy-induced shocks to ADAM may be directed against short-run deviations from the steady-state, i.e. stimulating the economy if the present unemployment is above its long-run equilibrium; or the shocks may try to change the steady-state, for example, increasing the labor supply in order to expand the scope for private and public consumption or increasing energy taxes to reduce the input of energy in output and consumption.

In this paper each of the experiments is presented briefly and the analysis of the multiplier is kept short. A detailed discussion of the key mechanisms in ADAM can be found in chapter 11 in the ADAM book.

The experiments concern the following exogenous variables or groups of variables:

1. [General government purchase of goods](#)
2. [General government employment](#)
3. [General government investment in buildings](#)
4. [General government investment in machinery](#)
5. [Foreign demand](#)
6. [Income tax rates](#)
7. [Indirect tax rates](#)
8. [Foreign prices](#)
9. [Oil prices](#)
10. [Labor supply - number of workers](#)
11. [Labor supply - working hours](#)
12. [Productivity - labor efficiency](#)
13. [Productivity - machinery efficiency](#)
14. [Productivity - efficiency of labor and capital](#)
15. [Interest rates](#)
16. [Private consumption](#)
17. [Hourly wages](#)

All experiments are chosen to be expansionary in order to facilitate comparison. In some of the experiments, the positive effect on economic activity is temporary and in others the effect is permanent. In general, a demand shock in ADAM e.g. an additional public purchase of goods affects production and employment in the short run. However, in the long run a pure demand shock has no or little effect on employment and production. A long-term employment effect of zero is a general result for models of a small open economy with fixed exchange rate and a Phillips curve. In contrast, a supply shock, such as an increase in the labor force, has a permanent effect on employment and output, and an increase in efficiency has also a permanent effect on output.

The standard version of ADAM has no fiscal reaction function which would automatically ensure the sustainability of public finances. Without a reaction function the government budget balance can become permanently negative or positive depending on the experiment. Accordingly, we present some of the experiments listed above in two sections: a section where each experiment is presented without any consideration for public finances, and another section where the experiment is accompanied by changes in income tax rates so that the public budget is balanced.

In the first half of the analysis, the shocks expand aggregate demand. In most cases policy instruments are used to stimulate domestic demand, and in other cases foreign variables and interest rates change. Experiment 1-5 affect the volume of aggregate demand directly and the short-term impact on GDP is significant. In experiment 6, demand increases indirectly due to the increase in disposable income and the short-term impact on GDP is somewhat smaller than the previous cases. In experiment 7-9 aggregate demand also expands indirectly through the effect on prices and real income, and the effect on output is also smaller compared to experiment 1-5. Experiment 1-4 and 6-7 present a shock to fiscal policy instrument variables. In all cases the shock is calibrated to have a direct impact of the equivalent of 0.1 percent of GDP on public budget in the first year. Experiment 5 and 8-9 shock foreign demand and prices.

Experiment 10-15 present supply shocks. Experiment 10-12 are different but comparable shocks to the labor supply, cf. [rbj14512](#). Experiment 12 concerns labor productivity and can also be compared with expe-

riment 13-14 that shock the efficiency of other production factors. Experiment 15 describes a shock to interest rates.

The final two experiment, number 16 and 17, are somewhat different from the other experiments. They present the effect of a temporary shock to two of the model's central relations, namely private consumption relation and wage relation. Experiment 1 and 10-15 contain a sub-section, where the effect of a budget restriction is presented for public purchase experiment in the former and labor supply shock in the latter.

Finally, we should note that comparison with models from other countries may be difficult, for example due to different budget restrictions. Special Danish conditions (e.g. regulatory mechanisms in taxes and transfers etc) incorporated in ADAM produce distinct multipliers and make comparison with other countries difficult. As mentioned, the interest rate and exchange rates are exogenous in ADAM because the Danish economy is modeled as a credible shadow member of the euro zone. Note also that expectations in ADAM are adaptive or constant, i.e. constant inflationary expectations reflecting the constant exchange rate.

1. General government purchase of goods

Expansion in public expenditure creates higher demand for private output, which leads to expansion in private sector production and employment in the short run. In the long run, there is no effect on private-sector employment.

The consumption equation stabilizes and returns the saving surplus of the private sector to the baseline. However, because of the absence of fiscal reaction function, the public saving deteriorates permanently. If the higher public consumption is financed by higher taxes, there will be no effect on public budget in the long run. In the following, two scenarios are presented: in the first case the public purchase is not financed and in the second case the additional public purchase is financed by higher income taxes.

▼ A. Increase in general government spending

Public expenditure is increased permanently by 0.1 percent of GDP relative to the baseline in 2010 prices.

Table 1a. The effect of a permanent increase in general government spending

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	123	374	551	655	733	1122	1410	1516	1483	1409
Pub. consumption	<i>fCo</i>	2068	2099	2133	2170	2209	2411	2622	2846	3082	3329
Investment	<i>fi</i>	561	872	747	683	659	546	417	293	203	176
Export	<i>fE</i>	-66	-146	-257	-394	-553	-1557	-2575	-3282	-3596	-3612
Import	<i>fIM</i>	963	1226	1216	1192	1182	1102	944	785	696	716
GDP	<i>fY</i>	1714	1986	1972	1935	1881	1447	972	637	519	618
		<i>1000 Persons</i>									
Employment	<i>Q</i>	1.45	1.90	2.02	2.03	1.97	1.12	0.21	-0.37	-0.56	-0.46
Unemployment	<i>Ul</i>	-0.77	-0.94	-0.99	-0.99	-0.96	-0.54	-0.09	0.18	0.27	0.22
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.06	-0.06	-0.05	-0.06	-0.06	-0.09	-0.12	-0.14	-0.16	-0.18
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Balance of payments	<i>Enl/Y</i>	-0.06	-0.07	-0.07	-0.07	-0.07	-0.09	-0.12	-0.15	-0.17	-0.18
Foreign receivables	<i>Wnnb_e/Y</i>	-0.11	-0.19	-0.26	-0.33	-0.40	-0.76	-1.17	-1.60	-2.06	-2.50
Bond debt	<i>Wbd_os_z/Y</i>	0.01	0.05	0.09	0.13	0.18	0.45	0.83	1.27	1.73	2.18
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.12	-0.12	-0.11	-0.09	-0.08	-0.03	0.01	0.03	0.03	0.02
Labour intensity	<i>hq/fX</i>	-0.08	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06
User cost	<i>uim</i>	0.01	0.02	0.03	0.04	0.05	0.11	0.14	0.15	0.14	0.13
Wage	<i>lna</i>	0.01	0.04	0.07	0.10	0.13	0.26	0.31	0.31	0.27	0.23
Consumption price	<i>pcp</i>	0.00	0.01	0.02	0.03	0.04	0.10	0.13	0.14	0.14	0.13
Terms of trade	<i>bpe</i>	0.00	0.01	0.02	0.02	0.03	0.07	0.09	0.09	0.09	0.08
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.03	-0.02	-0.01	-0.01	0.00	0.00	0.01	0.02	0.02	0.02
Wage share	<i>byw</i>	-0.01	0.00	0.01	0.02	0.03	0.05	0.05	0.04	0.02	0.01

The immediate effect of an increase in government purchase of goods and services is that total demand rises. The increased demand is met partly through domestic production and partly through imports. The expansion in domestic economic activity raises private sector employment and lowers unemployment. The lower unemployment rate pushes prices and wages upward and reduces competitiveness. The lower competitiveness makes the market share of exports fall and the market share of imports rise, which reduces the positive effect on domestic production. Eventually, the effect on employment disappears and employment returns to its baseline. The long run effect on unemployment is also zero reflecting that the permanent increase in wages and prices deteriorates competitiveness and crowds out any impact on employment. This is the *wage-driven crowding out* process in ADAM.

The short run effect is closely related with the Keynesian income multiplier. The *income multiplier* refers to the final change in income as compared to the injection of capital deposits or investments which originally fueled the growth. It is usually used as a measurement of the effects of government spending on income. In the present experiment, the income multiplier can be seen as the ratio between the effects on final demand and the change in government purchase of goods and services. In a closed economy, the multiplier for domestic demand is larger than one because the exogenous increase in government purchase of goods and services creates additional domestic demand in the form of more private invest-

ment and larger private consumption. However, the ADAM multiplier for GDP remains less than one because higher demand triggers not only GDP but also imports, see ADAM book for further discussion.

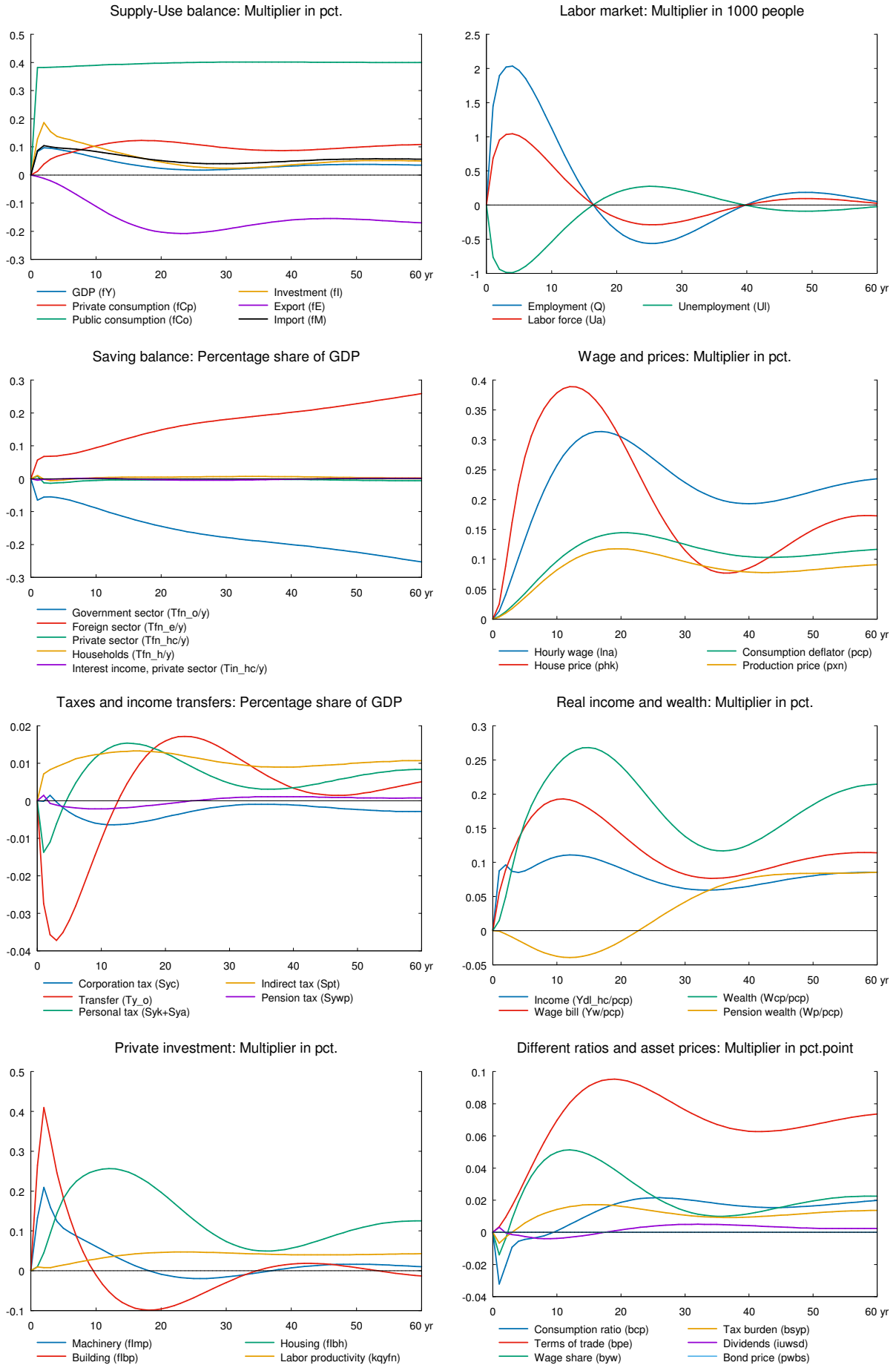
Wages and domestic prices increase in the medium and long run. But not equally. Prices adjust gradually to total production costs, which includes more than wages. Imported goods and services are for instance part of production costs. As the prices of imported goods are unchanged, prices increase less than wages. This results in a permanent positive effect on real wages, real income and private consumption. The long-term macro-consumption function in ADAM relates consumption to income and wealth and ensures that private consumption, real income and real wealth attain the same growth rate in the long run. Whenever real wages and real disposable income change permanently, private consumption changes, henceforth referred as a *real wage effect*.

The real wage effect also translates into a long-run effect on the *terms of trade*. In the new equilibrium employment returns to its baseline while wages and prices increase permanently, which results in a permanent change in the long-run terms of trade.

The composition of GDP changes permanently towards higher public and private consumption and lower net exports relative to the baseline. That is, the composition of aggregate demand shifts from exports toward domestic consumption and investment and the composition of aggregate supply shifts from domestic production to imports.

The experiment also creates a permanent change in the distribution of income. There is a permanent increase in the wage share defined as the share of value added which is payed out to workers. This is because wages have increased permanently higher than capital costs or more appropriately user costs. The effect on user costs is smaller because interest rates are fixed and investment prices change less than wages.

Figure 1a. The effect of a permanent increase in general government spending



▼ B. Increase in general government spending - balanced budget

In the following, the public expenditure is financed by a corresponding increase in income tax rates. The public purchase of goods and services is increased by 0.1 percent of GDP, in 2010 prices. The central government income tax rates are permanently raised by 1.5 percent and the capital tax is temporarily raised by a lump sum of 0.5 percent of GDP in the first year only.

Table 1b. The effect of a permanent increase in public spending, balanced budget

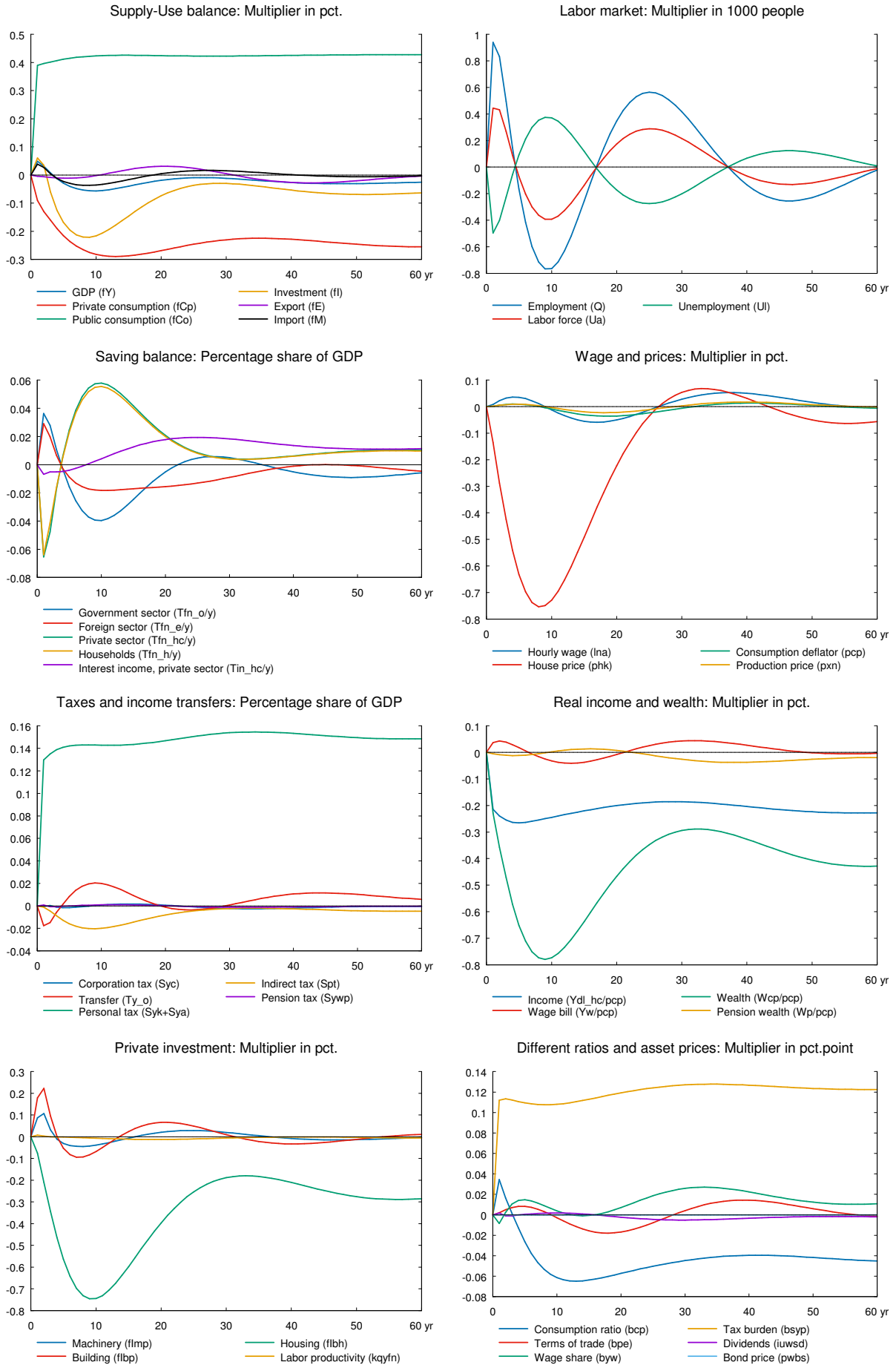
		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	-859	-1247	-1562	-1882	-2163	-3049	-3350	-3374	-3328	-3355
Pub. consumption	<i>fCo</i>	2108	2176	2240	2302	2362	2617	2830	3036	3259	3508
Investment	<i>fi</i>	265	161	-293	-622	-846	-1177	-857	-469	-250	-220
Export	<i>fE</i>	-49	-80	-107	-129	-144	-30	293	505	419	87
Import	<i>fM</i>	425	311	51	-149	-283	-469	-232	70	251	269
GDP	<i>fY</i>	992	644	151	-274	-613	-1306	-992	-506	-277	-368
						<i>1000 Persons</i>					
Employment	<i>Q</i>	0.94	0.83	0.50	0.14	-0.16	-0.76	-0.26	0.35	0.56	0.42
Unemployment	<i>U</i>	-0.50	-0.40	-0.23	-0.06	0.09	0.37	0.12	-0.17	-0.28	-0.20
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	0.04	0.03	0.01	0.00	-0.02	-0.04	-0.02	-0.01	0.00	0.00
Priv. saving surplus	<i>Tfn_hc/Y</i>	-0.07	-0.05	-0.02	0.01	0.02	0.06	0.04	0.02	0.01	0.00
Balance of payments	<i>Enl/Y</i>	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.02	0.01	0.01
Foreign receivables	<i>Wnnb_e/Y</i>	-0.09	-0.10	-0.09	-0.07	-0.04	0.07	0.15	0.19	0.20	0.20
Bond debt	<i>Wbd_os_z/Y</i>	-0.04	-0.06	-0.07	-0.06	-0.04	0.14	0.26	0.27	0.21	0.15
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.10	-0.08	-0.06	-0.05	-0.05	-0.09	-0.15	-0.18	-0.18	-0.17
Labour intensity	<i>hq/fX</i>	-0.07	-0.06	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
User cost	<i>uim</i>	0.01	0.01	0.02	0.02	0.03	0.02	0.01	0.01	0.02	0.04
Wage	<i>lna</i>	0.01	0.02	0.03	0.04	0.04	-0.01	-0.06	-0.05	-0.01	0.03
Consumption price	<i>pcp</i>	0.00	0.01	0.01	0.01	0.01	-0.01	-0.03	-0.04	-0.02	-0.01
Terms of trade	<i>bpe</i>	0.00	0.01	0.01	0.01	0.01	0.00	-0.02	-0.02	-0.01	0.00
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.03	0.02	0.00	-0.01	-0.03	-0.06	-0.06	-0.06	-0.05	-0.04
Wage share	<i>byw</i>	-0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.03

In contrast to the unfinanced experiment in section 1A, the long-term effect on government debt is now zero. There are two opposing effects - expansionary and contractionary effects. The former is due to the increase in public expenditures that increases domestic demand, production and employment. The contractionary effect is due to the increase in income tax rates which reduces disposable income and there by private consumption. In the very short term the expansionary effects are stronger so production and employment expand. Investments also expand reflecting the increase in business investments in machinery and buildings.

The overall positive effect in year 1 occurs because private consumption reacts to the tax increase with a delay. In the following year, the tax increase reduces consumption further as disposable income falls. As a result, employment falls. With a financed public purchase, it takes only 4 years for the improved budget to disappear and it takes almost the same number of years for employment to return to the baseline. The fall in private consumption reduces the demand for housing, and investment in housing and house prices fall. In the long run, private consumption and investment fall due to the permanent fall in disposable income. Investments also fall permanently due to the fall in residential investment.

The effect on unemployment oscillates before reaching equilibrium reflecting the fluctuation in the housing market and labor market. In general, with an unfinanced increase in public purchase it is exports that fall and make room for the public purchase of goods and services. With a tax-financed public purchase increase, it is the private domestic demand that falls to make room for the public purchase of goods and services. The public budget can be financed in various ways, and the outcome depends on the choice of financing instrument. For example, the outcome of the unfinanced shock in section 1A is equivalent to the outcome of an increase in public purchase financed by reduced public transfers to abroad. Public transfer vis-a-vis the foreign sector has no impact on the private sector in ADAM.

Figure 1b. The effect of a permanent increase in public spending, balanced budget



2. General government employment

Salaries paid to wage and salary earners constitute one of the major parts of general government expenditures. In this experiment, general government employment is raised permanently. Higher employment increases income and leads to higher consumption.

The payroll in the public sector is increased permanently by 0.1 percent of GDP in 2010 prices, which provides an additional permanent employment in the public sector of 4280 people, approximately equal to 0.15 percent of the total employment.

Table 2. The effect of an increase in general government employment

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	323	677	1006	1333	1647	3184	4261	4671	4572	4288
Pub. consumption	<i>fCo</i>	3158	3209	3261	3314	3368	3650	3967	4322	4704	5100
Investment	<i>fi</i>	478	750	720	730	770	872	675	262	-149	-385
Export	<i>fE</i>	-162	-433	-778	-1187	-1655	-4538	-7481	-9634	-10682	-10809
Import	<i>fM</i>	702	959	1017	1061	1096	1021	540	-104	-630	-865
GDP	<i>fY</i>	3050	3235	3207	3154	3068	2246	1038	-94	-756	-806
		<i>1000 Persons</i>									
Employment	<i>Q</i>	5.75	5.90	5.79	5.58	5.29	3.15	0.82	-0.90	-1.63	-1.48
Unemployment	<i>U</i>	-3.04	-2.88	-2.81	-2.71	-2.56	-1.51	-0.38	0.45	0.80	0.72
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.07	-0.06	-0.06	-0.07	-0.08	-0.13	-0.19	-0.25	-0.30	-0.33
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.03	0.01	0.01	0.01	0.01	0.00	-0.02	-0.02	-0.01	0.00
Balance of payments	<i>Enl/Y</i>	-0.04	-0.05	-0.05	-0.06	-0.07	-0.14	-0.21	-0.27	-0.31	-0.33
Foreign receivables	<i>Wnrb_e/Y</i>	-0.13	-0.22	-0.31	-0.39	-0.47	-1.01	-1.71	-2.54	-3.40	-4.24
Bond debt	<i>Wbd_os_z/Y</i>	-0.02	0.01	0.05	0.09	0.14	0.51	1.10	1.87	2.76	3.65
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.12	-0.11	-0.09	-0.07	-0.05	0.06	0.17	0.23	0.24	0.22
Labour intensity	<i>hq/fX</i>	0.07	0.08	0.08	0.08	0.09	0.09	0.08	0.07	0.07	0.07
User cost	<i>uim</i>	0.03	0.06	0.09	0.12	0.15	0.30	0.39	0.41	0.39	0.35
Wage	<i>lna</i>	0.05	0.15	0.24	0.32	0.41	0.75	0.91	0.92	0.82	0.70
Consumption price	<i>pcp</i>	0.02	0.05	0.07	0.11	0.14	0.29	0.39	0.43	0.42	0.38
Terms of trade	<i>bpe</i>	0.01	0.03	0.06	0.08	0.10	0.20	0.27	0.28	0.27	0.23
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.05	-0.04	-0.03	-0.02	-0.02	0.02	0.06	0.08	0.09	0.09
Wage share	<i>byw</i>	0.05	0.07	0.10	0.12	0.13	0.18	0.18	0.15	0.11	0.08

An increase in public sector employment lifts total employment and the overall wage bill. More personal income creates higher domestic demand. Higher demand expands domestic production and employment further. The income multiplier reinforces itself to create higher demand and higher employment. ▼

Compared to the public purchase of goods experiment, the effect on employment and income is stronger in the present experiment. An increase in public purchases increases imports, and hence part of the public expenditure goes directly into foreign production and foreign employment. In the present shock all initial expenditures go directly into domestic employment. In the short term, the employment effect is approximately twice as large compared to the first experiment. Consequently, short term effects - like the effect on GDP- are also larger in the present experiment.

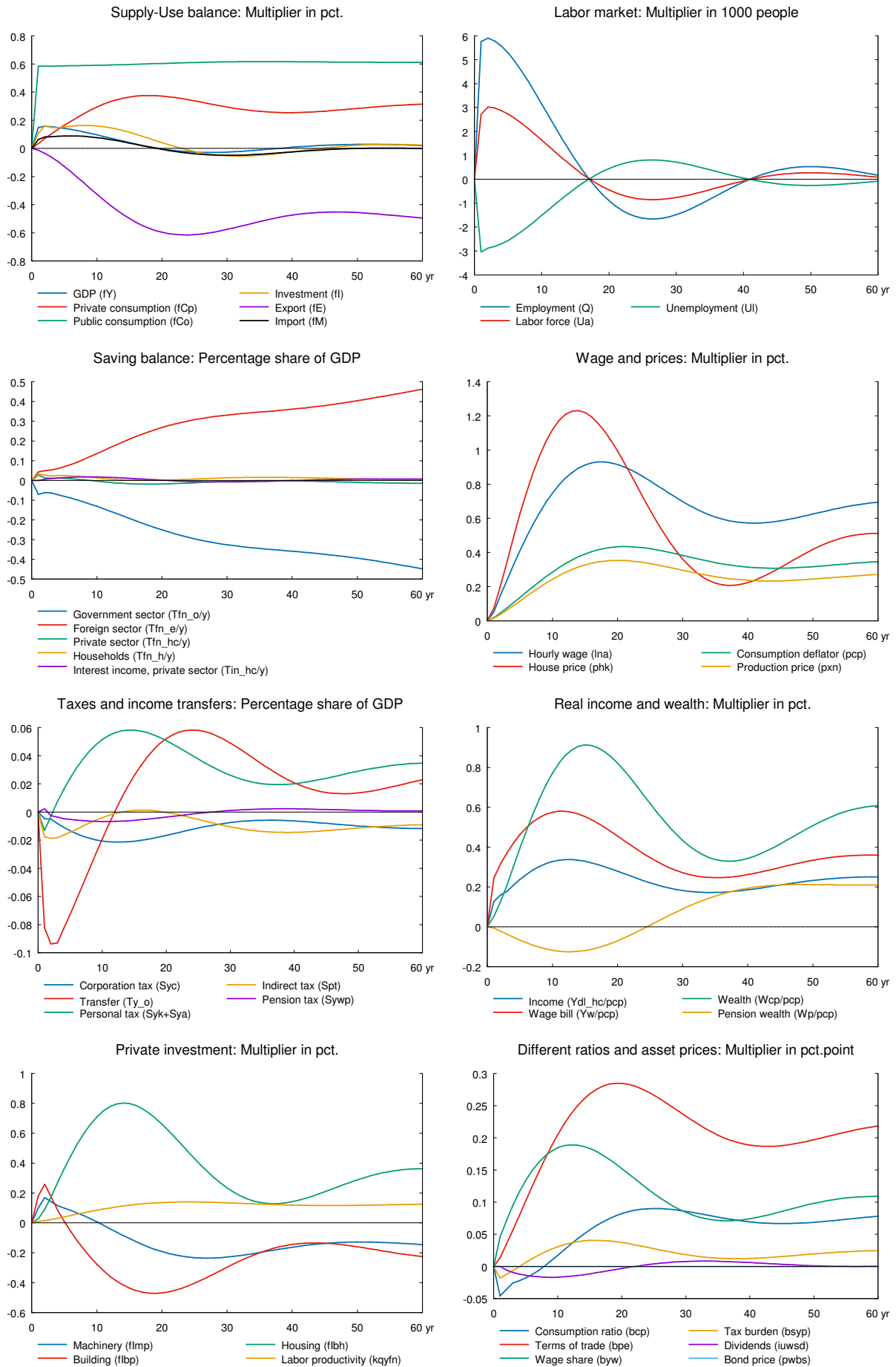
A rapid increase in employment produces a sharp fall in unemployment, which necessitates a strong increase in wages leading to a significant deterioration of competitiveness. As a result, the fall in exports is more pronounced. Thus, the expansionary effect of the shock is stronger in the short run, but the subsequent fall in net-exports is deeper. The fall in exports reduces domestic production over time and the effect on employment is also reduced at a similar rate. Gradually, employment returns to its baseline, as the permanent increase in employment in the public sector is offset by a permanent fall in employment in the private sector. The displacement of private employment by public employment is the original definition of *crowding out*, and in terms of employment, there is full crowding out in ADAM.

The crowding out effect also applies to production and demand. The fall in net exports reduces private production, and the fall roughly corresponds to the increase in government production. The higher government consumption is offset by a reduction in net exports so the increase in total demand is much smaller than the increase in public consumption. Government production displaces private production and government consumption displace other demand. In ADAM there is also crowding out in terms of production and

demand. But crowding out of production and demand is partial because the higher real wage increases productivity.

There is a positive *real wage effect* and real disposable income and private consumption increases permanently. ▼ The consumption equation stabilizes the saving balance of the private sector in the long run, but the public finance deteriorates permanently. ▼

Figure 2. The effect of an increase in general government employment



3. General government investment in buildings

Government investment in buildings, and capital in general, are often used to boost demand in economic slowdowns. The labor content in this investment category is very high. The following two sections demonstrate the effect of unfinanced and financed public investment in buildings.

Government investment in buildings are increased permanently by 0.1 percent of GDP in 2010 prices.

Table 3. The effect of a permanent increase in public investment in buildings

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	129	349	473	566	650	1062	1336	1408	1320	1171
Pub. consumption	<i>fCo</i>	-15	120	255	386	513	1076	1537	1912	2215	2456
Investment	<i>fi</i>	2440	2600	2545	2537	2546	2524	2423	2291	2178	2122
Export	<i>fE</i>	-61	-154	-276	-418	-581	-1571	-2550	-3213	-3465	-3382
Import	<i>fM</i>	778	969	979	983	991	952	793	604	464	419
GDP	<i>fY</i>	1784	2032	2109	2179	2228	2238	2060	1901	1880	2026
		<i>1000 Persons</i>									
Employment	<i>Q</i>	1.58	1.82	1.86	1.85	1.78	1.03	0.18	-0.41	-0.64	-0.58
Unemployment	<i>U</i>	-0.84	-0.90	-0.91	-0.90	-0.86	-0.50	-0.08	0.20	0.31	0.28
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.06	-0.05	-0.05	-0.05	-0.06	-0.08	-0.11	-0.14	-0.15	-0.16
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00
Balance of payments	<i>Enl/Y</i>	-0.05	-0.06	-0.06	-0.06	-0.07	-0.09	-0.12	-0.14	-0.16	-0.16
Foreign receivables	<i>Wnnb_e/Y</i>	-0.09	-0.17	-0.24	-0.30	-0.37	-0.71	-1.10	-1.52	-1.93	-2.32
Bond debt	<i>Wbd_os_z/Y</i>	0.00	0.04	0.07	0.11	0.15	0.42	0.76	1.17	1.60	2.02
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.05	-0.02	0.01	0.04	0.07	0.19	0.28	0.33	0.35	0.34
Labour intensity	<i>hq/fX</i>	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.05	-0.05	-0.05
User cost	<i>uim</i>	0.00	0.01	0.02	0.03	0.04	0.09	0.12	0.13	0.12	0.11
Wage	<i>lna</i>	0.01	0.04	0.07	0.10	0.13	0.24	0.29	0.28	0.24	0.19
Consumption price	<i>pcp</i>	0.01	0.01	0.02	0.03	0.05	0.10	0.13	0.14	0.13	0.11
Terms of trade	<i>bpe</i>	0.00	0.01	0.02	0.03	0.03	0.07	0.09	0.09	0.08	0.07
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.03	-0.02	-0.01	-0.01	-0.01	0.00	0.01	0.02	0.02	0.02
Wage share	<i>byw</i>	-0.01	-0.01	0.00	0.00	0.01	0.02	0.01	-0.01	-0.02	-0.03

The higher public investment raises private sector production and employment in the short run. The *income multiplier* expands final demand more than the initial change in investments. ▼ Compared to the government purchase of goods and services experiment, the effect on the domestic economy is larger because the import content of building investments is low. In the medium term, the higher employment increases wage growth and the *wage-driven crowding out* returns unemployment to its baseline in the long run. ▼

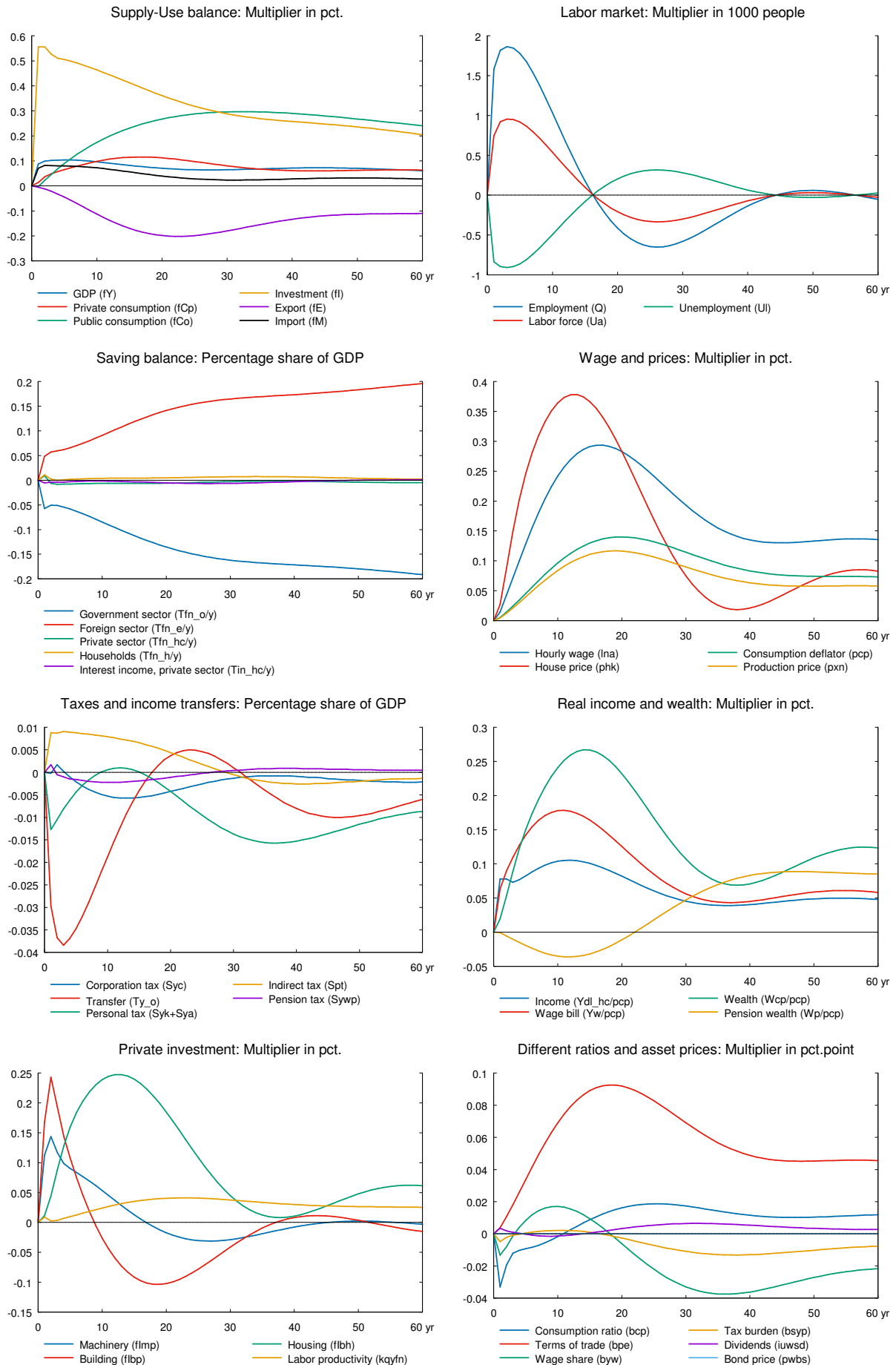
The expansionary nature of public investment raises production in the short run. The higher production requires an equivalent increase in capital. A given change in capital requires a more than proportional change in investment because capital stock is far larger than annual investment. As a result, the impact on investment peaks strongly in the short run. This is the *accelerator effect*.

Private consumption increases permanently relative to the baseline due to the positive *real wage effect*. ▼

There is a small positive effect on production in the long run due to a *substitution effect*. A substitution effect arises when a change in the relative prices of factors induces producers to use more of a relatively cheaper factor and less of a relatively more expensive factor. In the present case, the relative price of capital falls due to the import content in investments. This leads to an increase in the capital intensity of production and hence labor productivity increases. Consequently, the same workforce can produce a higher output. In general, there are some long run effects on production due to factor substitution in most of the demand shocks, usually the substitution effects are smaller. For more about substitution and relative factor prices see the supply side experiments from [section 10](#) onwards.

A permanent increase in public investments can deteriorate the government budget permanently, which may require other fiscal measures, e.g. a tax increase on higher public investment in recession may be financed by lower public investments during economic booms.

Figure 3. The effect of a permanent increase in public investment in buildings



4. General government investment in machinery

Instead of investments in buildings, public investments in machinery can be increased to boost economic activity. The short-term expansionary effect is relatively smaller due to the higher import content of machinery.

Government investment in machinery is increased permanently by 0.1 percent of GDP in 2010 prices.

Table 4. The effect of a permanent increase in public investment in machinery

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	88	321	475	565	636	991	1248	1337	1277	1143
Pub. consumption	<i>fCo</i>	-11	278	542	782	1000	1819	2318	2626	2816	2933
Investment	<i>fi</i>	2378	2598	2514	2505	2517	2468	2329	2178	2053	1983
Export	<i>fE</i>	-25	-74	-148	-243	-358	-1153	-2047	-2714	-3009	-2966
Import	<i>fM</i>	1291	1553	1581	1593	1614	1624	1488	1300	1146	1074
GDP	<i>fY</i>	1225	1663	1891	2099	2264	2582	2447	2213	2070	2084
		<i>1000 Persons</i>									
Employment	<i>Q</i>	0.97	1.33	1.48	1.56	1.59	1.12	0.33	-0.29	-0.59	-0.59
Unemployment	<i>U</i>	-0.51	-0.66	-0.72	-0.76	-0.77	-0.54	-0.15	0.15	0.29	0.28
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.07	-0.07	-0.07	-0.07	-0.08	-0.11	-0.13	-0.16	-0.18	-0.19
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
Balance of payments	<i>Enl/Y</i>	-0.07	-0.08	-0.08	-0.09	-0.09	-0.11	-0.14	-0.16	-0.18	-0.19
Foreign receivables	<i>Wnnb_e/Y</i>	-0.10	-0.20	-0.29	-0.38	-0.47	-0.93	-1.40	-1.87	-2.34	-2.78
Bond debt	<i>Wbd_os_z/Y</i>	0.02	0.08	0.13	0.19	0.25	0.58	1.00	1.47	1.95	2.41
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.02	0.00	0.02	0.04	0.06	0.14	0.19	0.22	0.22	0.20
Labour intensity	<i>hq/fX</i>	-0.02	-0.02	-0.03	-0.03	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05
User cost	<i>uim</i>	0.07	0.15	0.23	0.29	0.35	0.56	0.66	0.69	0.67	0.63
Wage	<i>lna</i>	0.01	0.03	0.05	0.07	0.10	0.21	0.27	0.27	0.23	0.19
Consumption price	<i>pcp</i>	0.00	0.01	0.01	0.02	0.03	0.07	0.11	0.12	0.12	0.10
Terms of trade	<i>bpe</i>	0.00	0.01	0.01	0.02	0.02	0.05	0.07	0.08	0.07	0.06
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.03	-0.02	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02
Wage share	<i>byw</i>	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.00	-0.01	-0.02	-0.03

Like building investments, machinery investments have expansionary effects on the economy in the short run. In the long run, the effect on unemployment is zero due to the *wage-driven crowding out*. ▼ The short-term employment effect of machinery investments is smaller because the import content of machinery investments is higher than that of building investments. The smaller domestic activity effect implies that the pressure on wages and prices is also smaller. The resulting *real wage effect* on consumption is also smaller. ▼

It is also worth noting that the *accelerator effect* on total investment is smaller when investing in machines than when investing in buildings. This is because machines are used for a shorter time periods and the ratio between the stock of machinery and investment is smaller. ▼

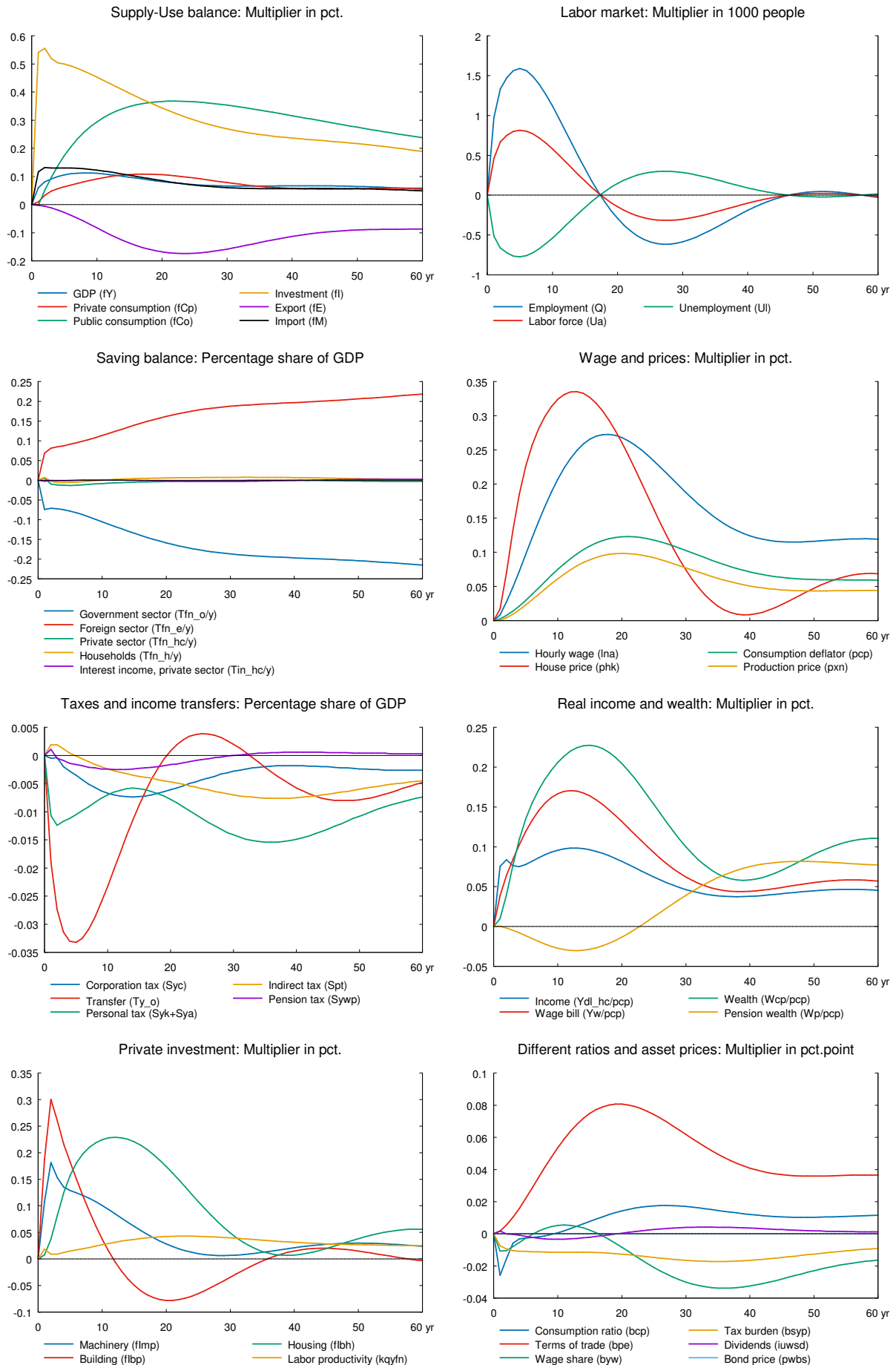
Note that the smaller impact on domestic production and income implies a stronger deterioration of public budget in the short run than when public building investments or the public purchase of goods and services increase. This is, however, not evident from the tables above because the public demand shocks are made comparable in fixed prices, i.e. all shocks are calibrated to have an impact of 0.1 percent of GDP in 2010 prices on the public budget in the first year. ▼ It should also be noted that the modest accompanying increase in government consumption reflects that the higher government stock of capital triggers an increase in depreciation, which is part of government consumption.

The four demand experiments discussed so far have similar effects on the domestic economy but differ in terms of the magnitude of the impact. An increase in government employment has the largest immediate impact on the domestic economy as it has no direct link to imports. An increase in government investment in machinery has the smallest impact on the domestic economy as the import content is high. Similarly, the long-term impact on government budget is the highest in the former and the smallest in the latter.

All the experiments are considered without funding and the public budget balance deteriorates permanently. The public expenditure can be financed by reducing other public expenditures or by increasing revenue-

es. [Section 1](#) below demonstrates financing the public purchase of goods and services by raising income taxes. If income taxes are raised to finance public expenditures the positive effect on private consumption will turn negative as real disposable income permanently falls, consequently competitiveness will not necessarily deteriorate.

Figure 4. The effect of a permanent increase in public investment in machinery



5. Foreign demand

The focus now shifts from the public sector to the foreign sector. Foreign trade is an essential part of the Danish economy. Exports are a key demand component and constitute about 50 percent of GDP. An increase in foreign demand for Danish products makes Danish firms expand production, and creates a positive impact on employment in the short run.

Table 5 presents the effects of a permanent 0.20 percent increase in foreign demand without accompanying effects on foreign prices and foreign interest rates. The shock amounts to 0.1 percent of GDP in 2010 prices in the first year.

Table 5. The effect of a permanent increase in foreign demand

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	114	291	433	522	597	937	1177	1270	1251	1196
Pub. consumption	<i>fCo</i>	-17	-26	-33	-37	-40	-46	-43	-36	-29	-25
Investment	<i>fi</i>	444	662	567	564	561	508	392	277	196	171
Export	<i>fE</i>	1500	1481	1509	1462	1415	898	274	-144	-243	-75
Import	<i>fM</i>	925	1112	1139	1155	1179	1212	1129	1025	976	1016
GDP	<i>fY</i>	1107	1301	1342	1362	1361	1103	701	376	230	272
		<i>1000 Persons</i>									
Employment	<i>Q</i>	1.01	1.36	1.50	1.56	1.55	1.01	0.27	-0.24	-0.44	-0.39
Unemployment	<i>U</i>	-0.53	-0.68	-0.74	-0.76	-0.76	-0.49	-0.13	0.12	0.22	0.19
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	0.02	0.03	0.03	0.04	0.04	0.03	0.02	0.01	0.00	0.01
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00
Balance of payments	<i>Enl/Y</i>	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00
Foreign receivables	<i>Wnnb_e/Y</i>	-0.03	-0.02	0.00	0.02	0.04	0.13	0.19	0.22	0.24	0.26
Bond debt	<i>Wbd_os_z/Y</i>	-0.03	-0.07	-0.11	-0.14	-0.18	-0.33	-0.39	-0.38	-0.35	-0.31
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.06	-0.06	-0.05	-0.04	-0.04	0.01	0.04	0.06	0.06	0.05
Labour intensity	<i>hq/fX</i>	-0.03	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
User cost	<i>uim</i>	0.00	0.00	0.01	0.02	0.02	0.06	0.09	0.09	0.09	0.08
Wage	<i>lna</i>	0.01	0.03	0.05	0.07	0.10	0.20	0.25	0.26	0.23	0.20
Consumption price	<i>pcp</i>	0.00	0.01	0.02	0.02	0.03	0.08	0.11	0.12	0.12	0.11
Terms of trade	<i>bpe</i>	0.00	0.01	0.01	0.02	0.02	0.05	0.07	0.08	0.07	0.06
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.02	-0.02	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Wage share	<i>byw</i>	-0.01	0.00	0.00	0.01	0.02	0.04	0.04	0.03	0.02	0.01

Exports immediately increase relative to the baseline reflecting the positive shock in foreign demand. However, the initial increase in exports is less than 1000 million as the average short run export demand elasticity is less than one. The higher exports make domestic production and employment expand, see more on the *income multiplier* process in [section 1](#). As production expands the demand for capital and other factors of production increases, and hence investment increases relative to the baseline. This is reflected on the higher *accelerator effect* on investment. ▼ Investments increase also due to the *substitution effect*. ▼

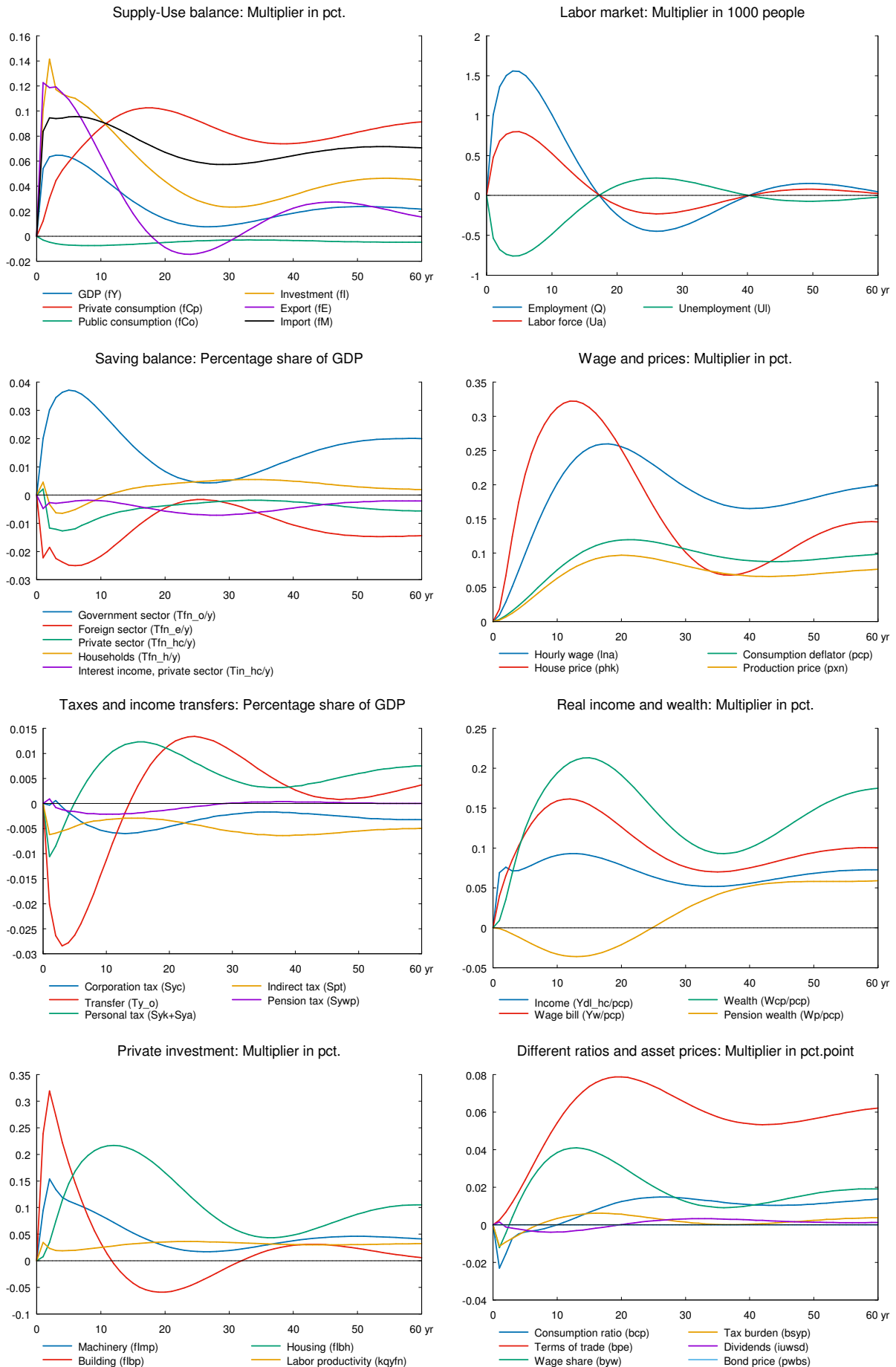
The expansion of the domestic economy increases the export prices relative to the baseline. This is because export prices reflect production cost and the higher employment puts upward pressure on wages and hence on the cost of production. As prices grow relative to the baseline, competitiveness worsens, which dampens exports and stimulates imports. Because of this the long term effect on export volumes is smaller than the initial export demand shock, see more about the crowding out process in [section 2](#). Private consumption increases permanently due to the positive *real wage effect*. ▼

Imports also expand due to an increase in domestic economic activity in the short run. The higher export prices increase earnings from exports, but higher imports have a negative effect on the trade balance. The net result is a small improvement in the trade balance.

The long-term positive effect on the balance of payments is also a result of higher interest income from abroad. In contrast to the previous public demand shocks, it is now the budget balance of the foreign sector that deteriorates permanently while the public budget balance improves in the long term. It is not necessary to consider a tax increase in order to keep public debt unchanged. On the contrary, it is possible to loosen the fiscal policy slightly. In general, higher foreign demand is a demand shock similar to higher govern-

ment purchases, but the shocks differ considerably concerning their long-term effects on public budget sustainability and on the balance of payments.

Figure 5a. The effect of a permanent increase in foreign demand



6. Income tax rates

Income tax rates can be reduced to stimulate economic activity. The expansionary effects arise through the effect on disposable income.

Income tax rates for all income categories are permanently reduced by 1.5 percent. The shock corresponds to an immediate loss in tax revenue of 0.1 percent of GDP in 2010 prices, which corresponds to 0.15 percent of disposable income in the private sector.

Table 6. The effect of a permanent fall in income tax rates

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	1131	1868	2436	2924	3340	4815	5499	5650	5557	5498
Pub. consumption	<i>fCo</i>	-45	-88	-122	-152	-176	-238	-240	-220	-204	-205
Investment	<i>fi</i>	341	819	1197	1501	1732	1986	1474	884	524	454
Export	<i>fE</i>	-19	-76	-173	-305	-471	-1760	-3306	-4370	-4637	-4275
Import	<i>fM</i>	619	1054	1343	1546	1689	1816	1364	831	516	514
GDP	<i>fY</i>	831	1546	2097	2545	2874	3177	2274	1324	918	1130
						<i>1000 Persons</i>					
Employment	<i>Q</i>	0.59	1.23	1.76	2.18	2.46	2.18	0.54	-0.82	-1.30	-1.02
Unemployment	<i>U</i>	-0.31	-0.62	-0.88	-1.08	-1.21	-1.05	-0.25	0.41	0.63	0.49
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.12	-0.10	-0.08	-0.06	-0.05	-0.06	-0.11	-0.16	-0.19	-0.21
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.08	0.04	0.00	-0.02	-0.04	-0.07	-0.05	-0.03	-0.01	-0.01
Balance of payments	<i>Enl/Y</i>	-0.03	-0.06	-0.07	-0.08	-0.09	-0.13	-0.16	-0.19	-0.21	-0.22
Foreign receivables	<i>Wnnb_e/Y</i>	-0.01	-0.10	-0.20	-0.30	-0.41	-0.96	-1.52	-2.06	-2.60	-3.12
Bond debt	<i>Wbd_os_z/Y</i>	0.06	0.13	0.18	0.22	0.25	0.36	0.65	1.15	1.75	2.35
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.03	-0.04	-0.05	-0.05	-0.04	0.08	0.19	0.25	0.25	0.22
Labour intensity	<i>hq/fX</i>	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
User cost	<i>uim</i>	0.00	0.00	0.01	0.02	0.03	0.10	0.15	0.16	0.14	0.10
Wage	<i>lna</i>	0.01	0.02	0.05	0.08	0.11	0.31	0.42	0.41	0.32	0.23
Consumption price	<i>pcp</i>	0.00	0.01	0.02	0.03	0.04	0.12	0.19	0.21	0.19	0.15
Terms of trade	<i>bpe</i>	0.00	0.00	0.01	0.02	0.03	0.08	0.12	0.13	0.11	0.08
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	-0.08	-0.04	-0.01	0.01	0.03	0.07	0.09	0.09	0.08	0.08
Wage share	<i>byw</i>	-0.01	-0.01	0.00	0.01	0.01	0.05	0.06	0.03	0.00	-0.01

The immediate effect of a fall in income taxes is a fall in public revenues and (real) disposable income increases relative to the baseline, which raises private consumption. Domestic demand booms and production and employment increase. The employment effect in the first few years is slower than in the previous experiments. This is because the short-run income elasticity of consumption is lower than 1, so the change in income taxes does not affect demand as directly as a change in government purchases. The effect after a few years is more comparable to the public purchase experiment. In the medium to long term, the *wage-driven crowding out* returns unemployment to its baseline. ▼

Compared to the previous demand shocks, the effect on private consumption is larger. Because the shock directly affects disposable income and hence private consumption. The higher private consumption raises investment in housing and house prices and the impact on housing is strong as the initial impact on consumption is strong. This in turn raises housing wealth, which stimulates private consumption for a longer period. The demand for dwelling increases as the income effect increases. But it takes time to expand the stock of housing. Consequently, the house price of existing houses will remain high for a longer period.

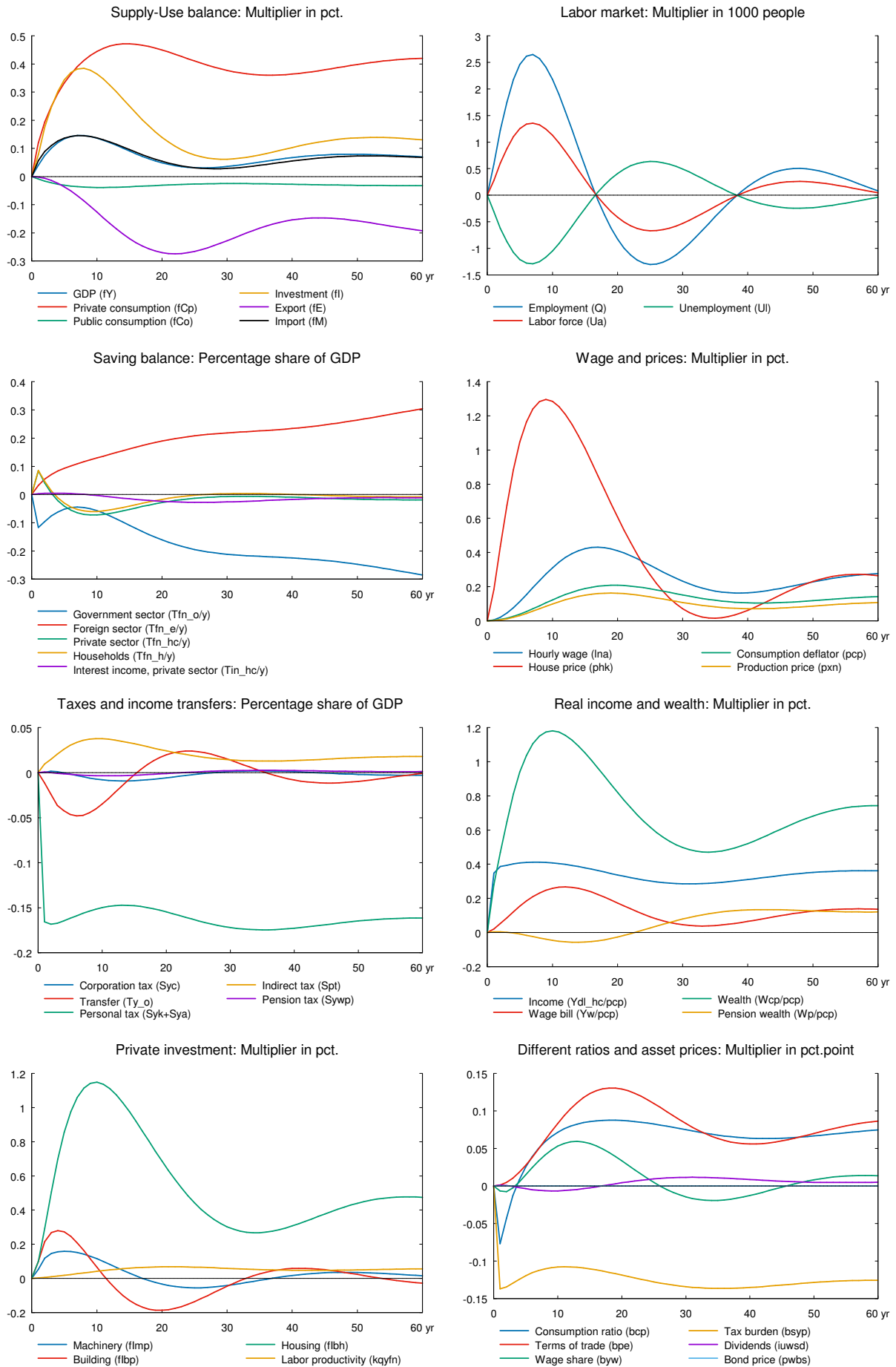
As in the other fiscal experiments, the short-run effect on the public budget is moderated by the short-run reaction in the economy, i.e. the short-run fall in unemployment and unemployment benefits. In the long run, the lower tax income results in a permanent deterioration of the public budget and the balance of payments.

It may be noted that there is a positive composition effect on GDP. This effect is caused by the increase in private consumption as higher private consumption increases the content of indirect taxes in GDP. ▼

Note also that the positive effect on labor supply of a tax reduction is not considered in the present experiment. There is no link between labor supply and income taxes in ADAM. But one can choose to raise labor

supply when reducing income tax rates. An accompanying increase in labor supply would have a positive effect on production and government finances, see the supply side shocks [below](#).

Figure 6. The effect of a permanent fall in income tax rates



7. Indirect taxes

Instead of [direct taxes](#), governments can reduce indirect taxes to create expansionary effects in the economy. The effect on the economy is channelled through reduction in final prices.

Table 7 presents the effect of a permanent reduction in indirect taxes. The VAT rate is reduced by approximately 0.3 percentage points, which corresponds to an immediate loss in revenue of 0.1 percent of GDP in 2010 prices. ([See experiment](#))

Table 7. The effect of a permanent reduction in indirect taxes

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	690	1083	1416	1693	1938	2864	3365	3546	3553	3542
Pub. consumption	<i>fCo</i>	-26	-51	-72	-89	-103	-142	-145	-135	-125	-124
Investment	<i>fi</i>	335	702	902	1073	1205	1367	1091	758	545	494
Export	<i>fE</i>	116	132	116	68	-4	-734	-1730	-2491	-2772	-2633
Import	<i>fM</i>	447	727	891	1005	1093	1197	946	623	411	379
GDP	<i>fY</i>	694	1131	1457	1736	1949	2199	1689	1111	834	928
		<i>1000 Persons</i>									
Employment	<i>Q</i>	0.46	0.91	1.25	1.52	1.70	1.56	0.54	-0.37	-0.75	-0.65
Unemployment	<i>U</i>	-0.24	-0.46	-0.62	-0.75	-0.84	-0.75	-0.25	0.18	0.36	0.31
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.07	-0.06	-0.05	-0.04	-0.03	-0.04	-0.07	-0.10	-0.12	-0.14
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.05	0.02	0.00	-0.01	-0.02	-0.04	-0.03	-0.01	0.00	0.00
Balance of payments	<i>Enl/Y</i>	-0.03	-0.04	-0.05	-0.05	-0.06	-0.07	-0.09	-0.11	-0.13	-0.13
Foreign receivables	<i>Wnrb_e/Y</i>	-0.02	-0.07	-0.13	-0.19	-0.25	-0.58	-0.90	-1.23	-1.55	-1.87
Bond debt	<i>Wbd_os_z/Y</i>	0.07	0.12	0.15	0.18	0.20	0.27	0.45	0.76	1.14	1.52
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.02	-0.03	-0.04	-0.03	-0.03	0.04	0.12	0.15	0.16	0.14
Labour intensity	<i>hq/fX</i>	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02
User cost	<i>uim</i>	-0.06	-0.06	-0.06	-0.06	-0.05	0.00	0.03	0.04	0.03	0.02
Wage	<i>lna</i>	0.00	0.01	0.03	0.05	0.07	0.21	0.29	0.30	0.26	0.20
Consumption price	<i>pcp</i>	-0.13	-0.13	-0.13	-0.13	-0.12	-0.08	-0.04	-0.02	-0.03	-0.05
Terms of trade	<i>bpe</i>	-0.01	-0.01	-0.01	0.00	0.00	0.04	0.07	0.08	0.07	0.05
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.05	-0.04	-0.02	-0.01	-0.01	0.02	0.03	0.03	0.03	0.02
Wage share	<i>byw</i>	-0.01	0.00	0.00	0.01	0.02	0.05	0.05	0.04	0.02	0.01

The cut in VAT immediately reduces prices for final goods and services. This in turn raises real disposable income and thereby private consumption. In the previous income tax experiment, the expansion comes from a direct increase in disposable income. In the present experiment, the expansionary effect arises as the fall in prices increase real income. The short-term effect on private consumption is smaller than the effect in the previous income tax experiment. Fall in income tax directly affects consumption through nominal disposable income, whereas VAT goes through prices and concerns a broader group of goods than just private consumption. The rise in private consumption expands production and employment. It also increases the demand for housing, and house prices and housing investment increase. The fall in unemployment increases wage growth, which in turn raises production costs and producer prices. As a result competitiveness worsens, exports fall and imports rise in the long run. Thus, the positive effect on private consumption and housing investment is counterbalanced by a permanent negative effect on net exports.

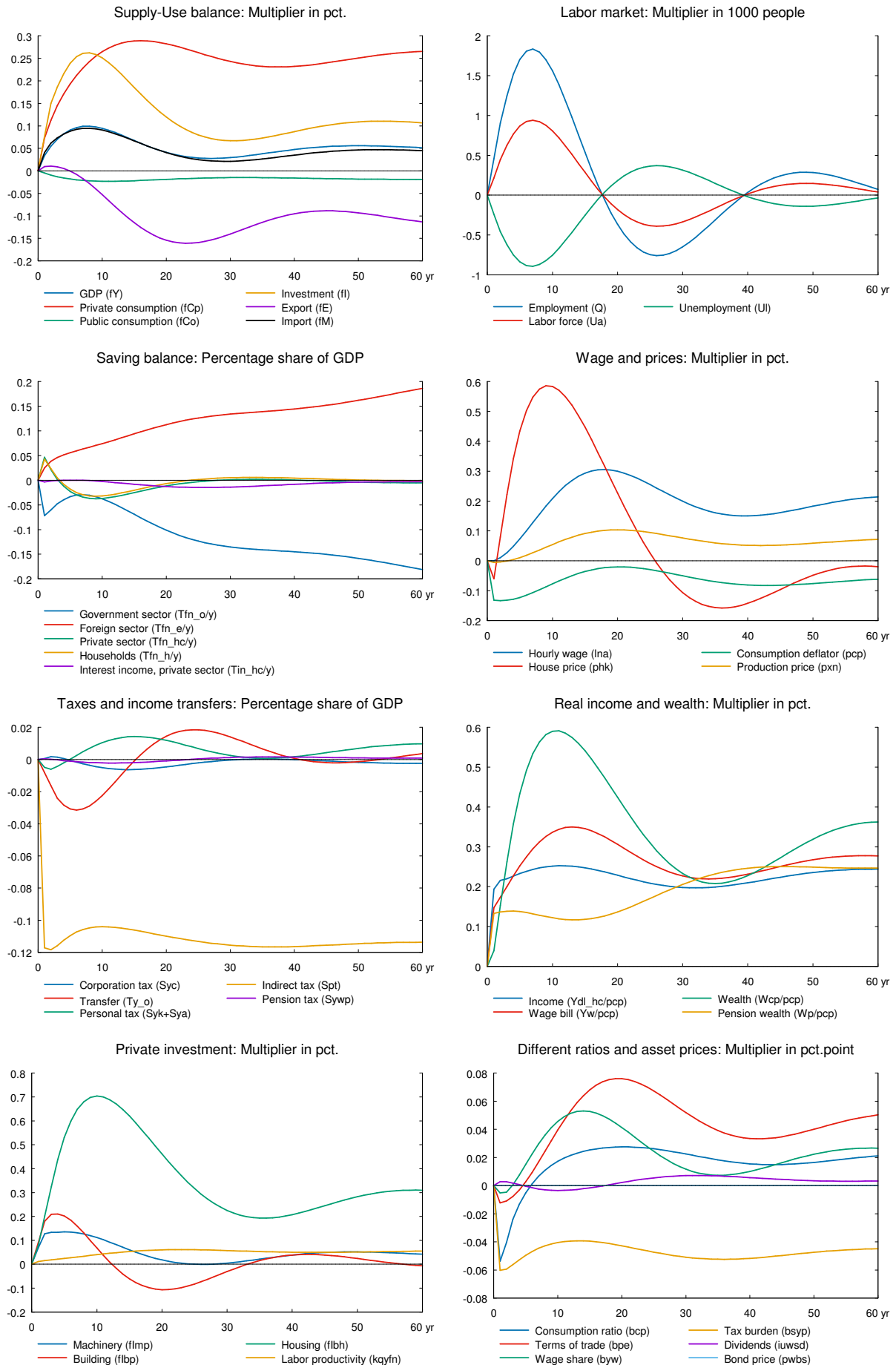
The VAT reduction affects the relationship between production costs and final market prices. Despite the rise in wages and output prices, consumption prices fall when VAT rates are reduced. Like a lower income tax, the lower VAT has a positive long-term effect on real income, which gives rise to a change in the composition of demand.

A fall in indirect taxes has also a positive effect on production. The rise in wages makes capital relatively cheaper and the capital intensity of production increases and makes labor more productive, as a result production increases.

Note that there is no VAT on house price. But, there is a negative first year effect on house price. This is because the house price equation determines the real house price – nominal house price divided by consumption price – and the latter falls as VAT rates fall. In the following years the increased demand stimulates house price but in the long run the house price effect is slightly negative reflecting that the supply price, the housing investment deflator, does include VAT. In general, the VAT experiment resembles the

direct tax experiment, but there are some differences, for example, there is an immediate positive impact on service exports as the lower consumer price stimulates the fixed-price purchases of foreign tourists. Just like the fall in direct taxes, the reduction in VAT deteriorates the public balance permanently.

Figure 7. The effect of a permanent reduction in indirect taxes



8. Foreign prices

The previous sections have focused on various forms of demand shocks, where public expenditures/revenues are changed by 0.1 percent of GDP. Here the focus shifts to foreign prices. The stimulus effect comes from the foreign sector like the case of the foreign demand shock. A rise in foreign prices improves Danish competitiveness and expands exports in the beginning, thus it has the characteristics of a demand shock, and in the long run the employment effect is crowded out.

The table below presents the effect of a permanent 1 percent increase in foreign prices measured in Danish krone.

Table 8. The effect of a permanent increase in foreign prices in Danish krone

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	-812	-945	-1168	-1325	-1388	-971	-171	427	598	407
Pub. consumption	<i>fCo</i>	-42	-34	-32	-30	-29	-28	-31	-29	-17	0
Investment	<i>fi</i>	970	1301	863	670	529	153	113	95	-31	-200
Export	<i>fE</i>	3628	4338	4931	5253	5428	4482	2255	219	-965	-1201
Import	<i>fM</i>	304	532	442	489	580	782	623	250	-174	-492
GDP	<i>fY</i>	3329	3667	3539	3469	3362	2295	1034	-18	-735	-1046
		<i>1000 Persons</i>									
Employment	<i>Q</i>	3.96	5.06	5.46	5.65	5.65	4.07	1.86	0.12	-0.89	-1.18
Unemployment	<i>U</i>	-2.09	-2.51	-2.67	-2.75	-2.75	-1.96	-0.89	-0.05	0.44	0.58
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	0.07	0.11	0.11	0.10	0.09	0.07	0.04	0.03	0.02	0.02
Priv. saving surplus	<i>Tfn_hc/Y</i>	-0.10	-0.12	-0.07	-0.04	-0.01	0.04	0.03	0.01	-0.01	-0.01
Balance of payments	<i>Enl/Y</i>	-0.03	0.00	0.04	0.06	0.08	0.11	0.07	0.04	0.01	0.00
Foreign receivables	<i>Wnrb_e/Y</i>	-0.15	-0.21	-0.19	-0.13	-0.06	0.44	0.86	1.11	1.23	1.30
Bond debt	<i>Wbd_os_z/Y</i>	-0.17	-0.31	-0.43	-0.54	-0.64	-1.00	-1.15	-1.17	-1.12	-1.04
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.19	-0.20	-0.18	-0.17	-0.16	-0.10	-0.03	0.02	0.05	0.05
Labour intensity	<i>hq/fX</i>	-0.06	-0.04	-0.02	-0.01	-0.01	0.01	0.01	0.01	0.01	0.00
User cost	<i>uim</i>	0.54	0.57	0.61	0.64	0.68	0.84	0.96	1.02	1.03	1.01
Wage	<i>lna</i>	0.10	0.18	0.27	0.36	0.45	0.85	1.10	1.19	1.16	1.08
Consumption price	<i>pcp</i>	0.38	0.44	0.48	0.52	0.56	0.76	0.91	1.00	1.03	1.03
Terms of trade	<i>bpe</i>	-0.37	-0.34	-0.31	-0.28	-0.25	-0.11	-0.02	0.02	0.03	0.02
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	0.02	0.03	-0.01	-0.04	-0.05	-0.08	-0.06	-0.02	0.01	0.02
Wage share	<i>byw</i>	-0.06	-0.04	-0.01	0.00	0.02	0.08	0.09	0.08	0.04	0.01

The rise in import and competitive prices improves competitiveness so export and home market shares increase immediately. More exports lead to an expansion of the economy in the same way as described in the first four sections and especially in [section 5](#) on export market expansion. The higher import prices also increase the Danish consumption prices, and this lowers real income and consumption. However, the first-year fall in private consumption does not offset the gain in market share for Danish production. As a result, unemployment begins to fall already in the first year and the lower level of unemployment raises wages relative to the baseline. Eventually, the competitive advantage will be lost and unemployment will return to the baseline. In the long term, Danish wages and prices will increase by approximately 1 percent.

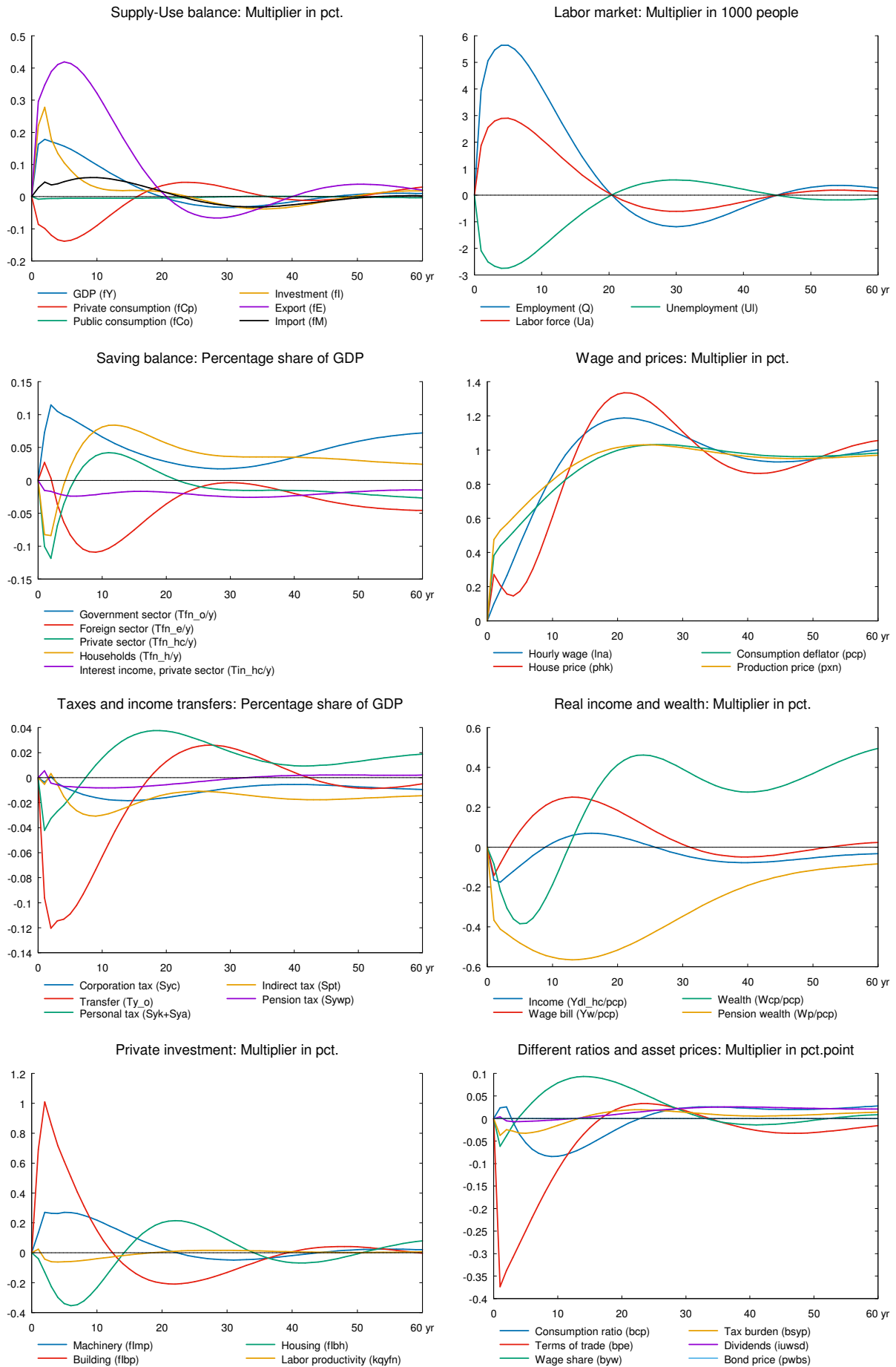
There is an immediate positive impact on imports despite the increase in import prices. The higher import prices reduce imports, but the higher production requires more inputs, which are partly imported. The short-term demand elasticities are relatively high in the import equations. Thus, the positive demand effect dominates and we get a net increase in imports in the short run. The higher production also increases investment in machinery and business buildings in the short run. The immediate effect on housing investment is negative, due to the fall in real income and housing demand. After the initial fall, house price and housing investment start a positive adjustment process as private consumption starts moving back to its baseline.

In the long run, the foreign price increase works like a monetary shock and affects only domestic price levels. Thus, both the foreign and domestic prices increase by 1 percent in relation to the baseline implying that relative prices and hence quantity variables are unaffected in the long run. This property is inherent in the construction of demand equations in ADAM and in the general indexation, which makes public revenues and expenditures react proportionally to nominal changes.

Note that the long-term effect of a permanent change in foreign prices and the long-term effect of a temporary shock to the wage relation, cf. [section 17](#), are similar with respect to the absence of long-run effects on real variables. They are also similar with respect to the long-term effect on public and foreign debt. In both cases there is a long-run effect reflecting the accumulated budget effects in the transition period before equilibrium is reached. They are also quite similar concerning the adjustment process but note that the transitions differ with respect to sign. A temporary positive wage shock triggers a period with unemployment above baseline, while a permanent foreign price increase triggers a period with unemployment below baseline.

The response of exports to the competitive gain peaks gradually, due to among others capacity constraints and lack of inventory. This is captured by an error correction mechanism, and is one of the key features of ADAM. The effect on exports peaks after a few years. This reflects that the short-term price elasticity is lower than the long term price elasticity in the export equations, so that the error correction process makes the initial response in exports less than the response in the following years. After reaching a peak, exports declines as competitiveness deteriorates.

Figure 8. The effect of a permanent increase in foreign prices



9. Oil prices

In this experiment we increase the market prices of oil permanently. The experiment has a lot of similarity with the previous experiment on foreign prices. Change in world oil prices affects all countries in the world and hence foreign markets and foreign prices will be affected. However, the experiment here does not take the international spillover into account.

The experiment presents the effect of a permanent 10 percent increase in world market oil prices.

Table 9. The effect of a permanent increase in world market oil prices

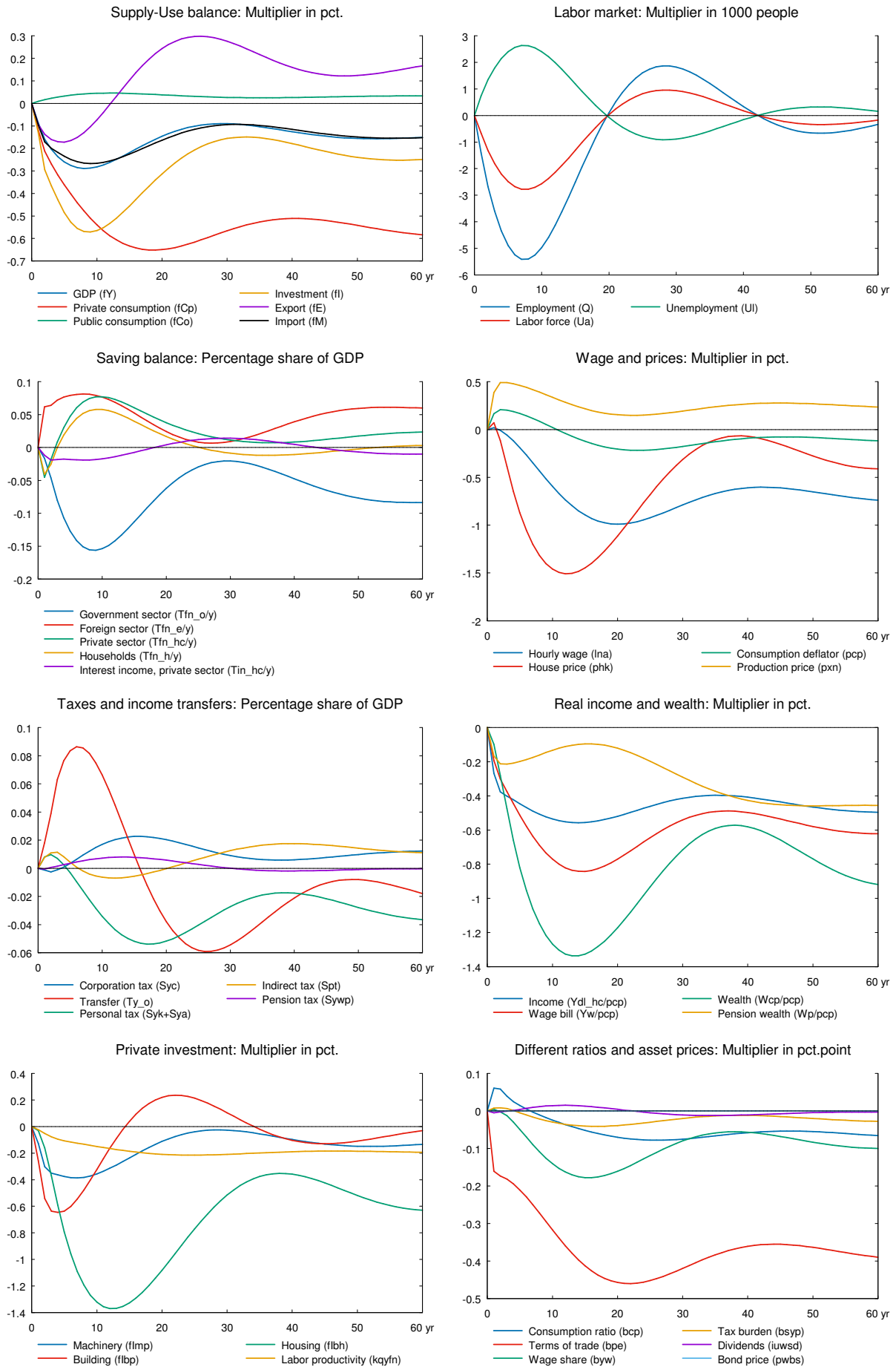
		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	-1134	-2041	-2625	-3144	-3631	-5839	-7384	-8156	-8332	-8247
Pub. consumption	<i>fCo</i>	50	92	128	160	189	278	296	273	241	221
Investment	<i>fi</i>	-575	-1377	-1771	-2124	-2442	-3077	-2678	-1985	-1413	-1146
Export	<i>fE</i>	-1152	-1712	-2033	-2178	-2231	-1022	1547	3930	5185	5184
Import	<i>fM</i>	-1058	-2014	-2422	-2661	-2902	-3523	-3198	-2495	-1896	-1671
GDP	<i>fY</i>	-1775	-3282	-4237	-4990	-5579	-6544	-5479	-3942	-2938	-2826
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-1.41	-2.67	-3.60	-4.34	-4.89	-4.97	-2.50	0.11	1.61	1.83
Unemployment	<i>Ul</i>	0.74	1.35	1.79	2.14	2.40	2.41	1.19	-0.07	-0.79	-0.89
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.02	-0.05	-0.08	-0.11	-0.13	-0.15	-0.11	-0.06	-0.03	-0.02
Priv. saving surplus	<i>Tfn_hc/Y</i>	-0.05	-0.02	0.01	0.03	0.05	0.08	0.06	0.04	0.02	0.01
Balance of payments	<i>Enl/Y</i>	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.05	-0.02	-0.01	-0.01
Foreign receivables	<i>Wnnb_e/Y</i>	0.01	-0.02	-0.05	-0.09	-0.13	-0.37	-0.57	-0.69	-0.75	-0.80
Bond debt	<i>Wbd_os_z/Y</i>	0.02	0.08	0.18	0.30	0.44	1.14	1.61	1.74	1.64	1.47
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	0.08	0.12	0.14	0.14	0.14	0.00	-0.18	-0.30	-0.34	-0.32
Labour intensity	<i>hq/fX</i>	0.04	0.05	0.06	0.06	0.06	0.05	0.05	0.06	0.06	0.07
User cost	<i>uim</i>	0.07	0.08	0.08	0.06	0.04	-0.08	-0.20	-0.26	-0.26	-0.22
Wage	<i>lna</i>	0.02	-0.01	-0.06	-0.12	-0.19	-0.59	-0.89	-0.99	-0.92	-0.79
Consumption price	<i>pcp</i>	0.17	0.21	0.20	0.19	0.17	0.02	-0.12	-0.20	-0.21	-0.18
Terms of trade	<i>bpe</i>	-0.16	-0.17	-0.18	-0.19	-0.21	-0.32	-0.41	-0.46	-0.45	-0.42
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.06	0.06	0.04	0.03	0.01	-0.02	-0.05	-0.07	-0.08	-0.07
Wage share	<i>byw</i>	0.00	0.00	-0.01	-0.03	-0.05	-0.14	-0.18	-0.16	-0.12	-0.08

The increase in oil prices raises expenditure on energy imports, and the balance of payments deteriorates immediately. Nevertheless, energy exports also increase and offset most of the negative effect on the balance of payments. The public budget improves in the short run because higher oil prices mean higher taxable profits in the hydrocarbon-extracting industry.

The increase in energy price affects the general price level, and the accompanying fall in real income reduces consumption and economic activity. In the medium run, the higher unemployment reduces wages and increases competitiveness, so the period of contraction is followed by a period of expansion in employment and production.

The long-term effect on employment is zero like in the previous demand shock experiments. Thus, the increase in oil prices also represents a shock to the supply side of the international economy but it does not constitute a permanent supply shock to the employment. The long-term effect on GDP is negative partly due to the substitution effect of the permanent fall in the relative price of labor, and partly due to the permanent fall in private consumption, which triggers a fall in the content of indirect taxes in GDP. In general, the higher oil price works as a negative demand shock in the short run, and in the long run it works as a supply shock as relative factor prices change in the long run. The higher public revenues can be used to increase e.g. private consumption. Higher consumption would reduce the negative impact on wages and the positive impact on exports.

Figure 9. The effect of a permanent increase in world market oil prices



10. Labor supply - number of workers

The focus now shifts to supply side shocks. Section 10-14 demonstrate the properties of ADAM to supply side shocks. Labor input in ADAM's production function is defined in terms of efficiency corrected labor hours, i.e. as a product of three elements: labor productivity, annual working hours per employed and employment. A change in any of these three components changes the labor input, and the experiments in section 10 - 12 present a shock to each of these three elements. In all cases, production increases in the medium and long run. In this section, labor supply is increased by increasing the number of workers. As in the previous experiments, each of the following six experiments (section 10 - 15) also include a sub-section where each multiplier exercise is repeated with a balanced public budget.

As mentioned earlier, the export relations in the current model version include supply effects. Expansion in labor force and productivity boosts production capacity making it possible to produce different varieties of a product. This leads to higher foreign demand shifting the demand curve outward and making it possible to sell higher exports without reducing prices. The positive response of exports to domestic output growth amplifies the effect on output and employment, because exports can expand without a need for declining terms of trade.

▼ A. Number of workers

Here we consider the effect of a permanent increase in the number of people in the work force caused by a reduction of 1 percent of total employment in the number of people outside the labor force not receiving transfers. The work force increases approximately by 27000 people.

Table 10a. The effect of a permanent increase in labor supply

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	1043	1464	1536	1148	600	-3104	-6188	-7372	-6839	-5494
Pub. consumption	<i>fCo</i>	-58	-111	-153	-176	-188	-176	-175	-246	-365	-484
Investment	<i>fi</i>	433	1077	1598	1963	2158	1878	1604	2317	3532	4539
Export	<i>fE</i>	617	1704	2999	4474	6132	15651	24820	31610	35284	36301
Import	<i>fM</i>	638	1065	1353	1460	1551	2107	3425	5376	7260	8496
GDP	<i>fY</i>	1419	3031	4520	5831	7019	11838	16157	20368	23800	25888
						<i>1000 Persons</i>					
Employment	<i>Q</i>	1.41	3.52	5.74	7.87	9.89	18.31	24.65	29.13	31.28	31.14
Unemployment	<i>U</i>	14.33	12.11	11.00	9.98	9.00	4.93	1.85	-0.31	-1.33	-1.25
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.13	-0.10	-0.05	0.02	0.07	0.24	0.36	0.47	0.57	0.65
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.08	0.02	-0.05	-0.11	-0.14	-0.11	-0.01	0.05	0.04	0.02
Balance of payments	<i>En/Y</i>	-0.05	-0.09	-0.10	-0.09	-0.07	0.13	0.35	0.52	0.62	0.67
Foreign receivables	<i>Wnnb_e/Y</i>	-0.01	0.01	0.00	0.00	0.02	0.57	1.87	3.65	5.61	7.51
Bond debt	<i>Wbd_os_z/Y</i>	0.12	0.27	0.37	0.40	0.38	-0.24	-1.39	-2.93	-4.74	-6.62
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.06	-0.14	-0.20	-0.26	-0.30	-0.49	-0.68	-0.83	-0.87	-0.81
Labour intensity	<i>hq/fX</i>	-0.02	-0.03	-0.04	-0.04	-0.04	-0.01	0.01	0.03	0.04	0.05
User cost	<i>uim</i>	-0.09	-0.21	-0.32	-0.42	-0.52	-0.91	-1.14	-1.21	-1.16	-1.06
Wage	<i>lna</i>	-0.23	-0.62	-0.96	-1.25	-1.52	-2.48	-2.91	-2.93	-2.70	-2.38
Consumption price	<i>pcp</i>	-0.08	-0.19	-0.30	-0.41	-0.51	-0.95	-1.24	-1.37	-1.36	-1.26
Terms of trade	<i>bpe</i>	-0.06	-0.15	-0.23	-0.31	-0.38	-0.69	-0.86	-0.91	-0.87	-0.78
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	-0.07	-0.03	0.02	0.06	0.08	0.01	-0.13	-0.23	-0.27	-0.26
Wage share	<i>byw</i>	-0.07	-0.18	-0.26	-0.32	-0.37	-0.49	-0.48	-0.39	-0.29	-0.20

The increased labor supply is not automatically employed at once as there is no demand side response, so unemployment increases. The higher unemployment reduces the growth of wages and prices. The decline in prices relative to the baseline improves competitiveness, as a result production and exports increase and gradually pull the extra labor force into employment. Employment increases until the additional labor force is employed and the rate of unemployment is back at its structural level.

The positive effect on employment, the negative effect on wages and the positive effect on exports is permanent. Private consumption rises in the short run as the unemployed people receive unemployment benefits and other social benefits. The long term impact on private consumption is negative due to the negative *real wage effect*. ▼ When domestic demand falls the export needs to increase even more for

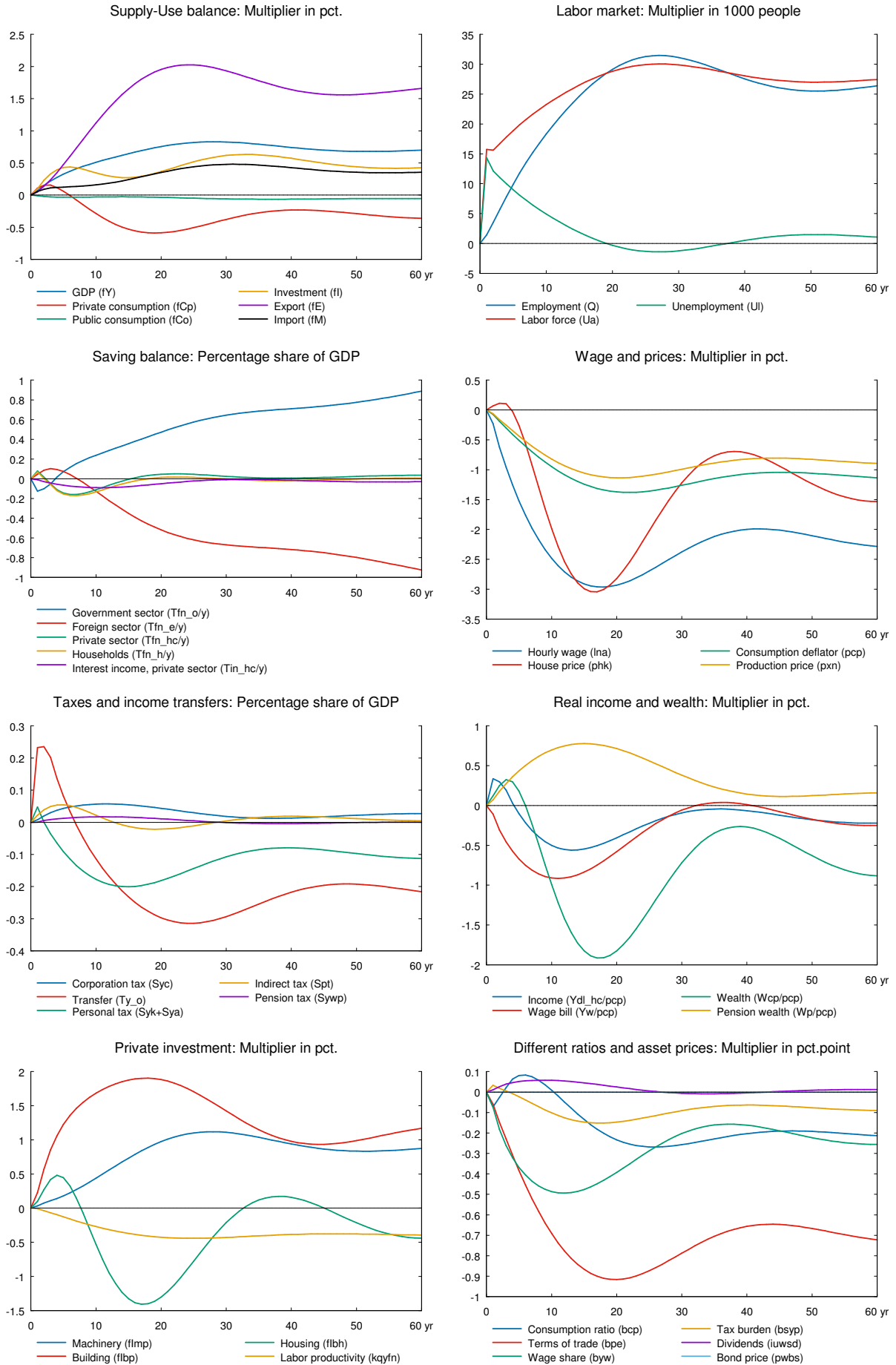
the extra supply of workers to be soaked up in the economy. For this to happen, terms of trade need to be even better. Thus, wage will have to decrease more.

Overall, there is a positive effect on production in the long run because of the permanent increase in employment. There is also a permanent change in the relative prices of production factors, as labor becomes relatively cheaper compared to the partly imported capital. This implies a *substitution effect*. ▼ Consequently, the substitution of labor for capital making production more labor intensive and reducing labor productivity. The substitution effect offsets part of the increase in production.

The wage share falls permanently, i.e. the distribution of income changes permanently in favor of capital. Wage relative to user cost falls in the long run because investment prices fall less than wages due to the deadweight from import prices.

There is a significant positive effect on public budget in the long term, because the nominal fall in revenues is less than the nominal fall in expenditures. Transfer payments and public wage-expenses decline as hourly wages fall. Other public expenditures also fall as prices fall. On the revenue side, taxes on personal income fall when hourly wages fall. But the number of tax payers increases and this offsets some of the fall in tax revenue.

Figure 10a. The effect of a permanent increase in labor supply



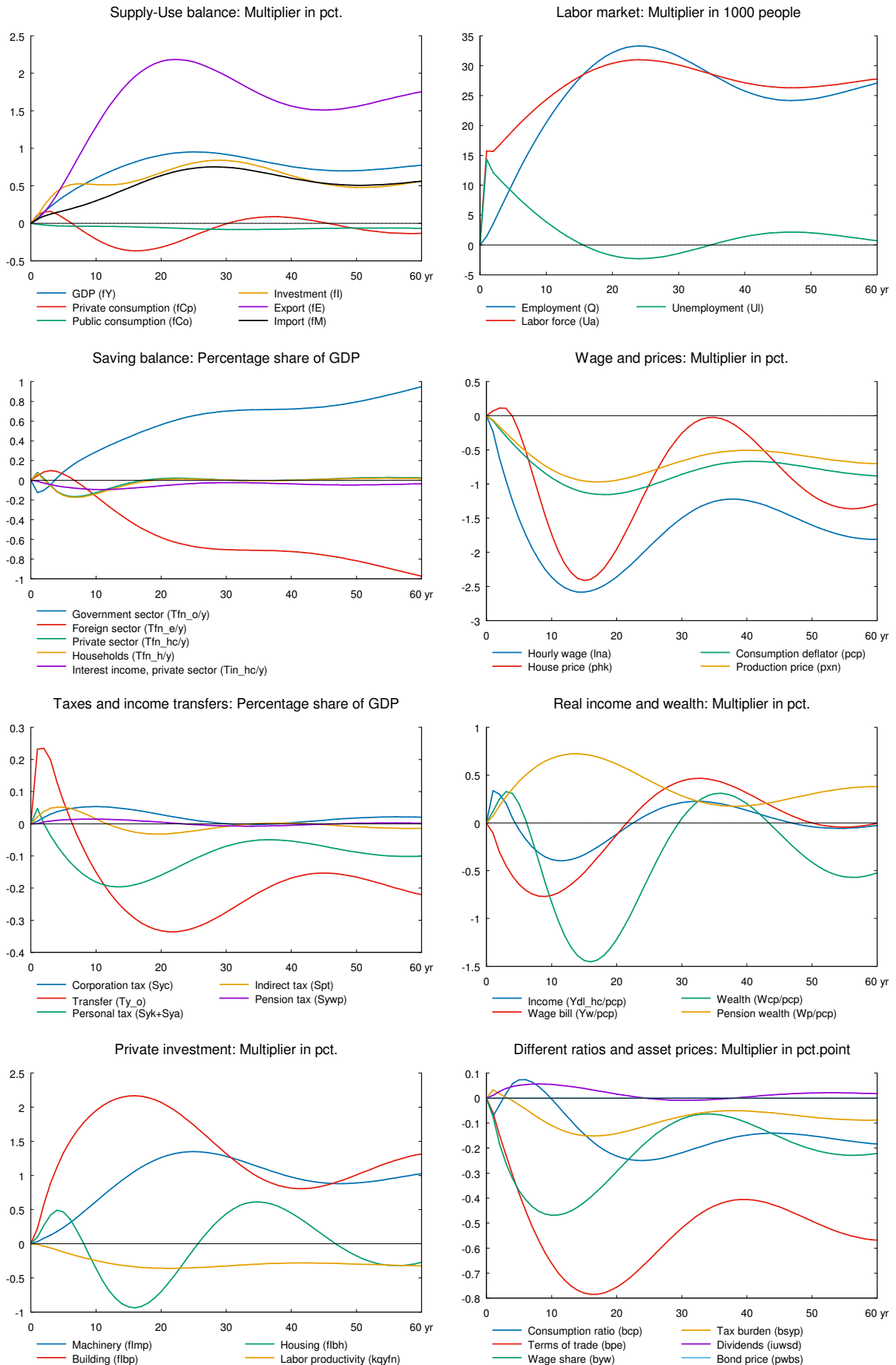
▼ B. Number of workers - including supply effects on exports

Increasing the labor supply has a permanent positive effect on domestic output; and it is likely that the market shares of danish exporter will rise. Table 10b presents the effect of a permanent increase in labor supply accompanied by supply effects in foreign trade. As in section A, the number of people outside the labor force not receiving transfers is reduced by 1 percent of total employment - approximately 27.000 people and, in contrast to section A, export performance are improved by an elasticity of 0.7 relative to GVA (gross value added).

Table 10b. The effect of a permanent increase in labor supply, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	1043	1470	1563	1218	737	-2273	-4192	-4000	-2222	-86
Pub. consumption	<i>fCo</i>	-58	-112	-156	-183	-200	-235	-292	-411	-555	-668
Investment	<i>fi</i>	433	1099	1677	2127	2427	2821	3192	4283	5507	6174
Export	<i>fE</i>	617	1777	3230	4928	6859	17969	28183	34913	37502	36891
Import	<i>fM</i>	638	1113	1512	1780	2072	3973	6715	9741	12127	13260
GDP	<i>fY</i>	1419	3084	4695	6193	7621	14022	19745	24574	27706	28776
		<i>1000 Persons</i>									
Employment	<i>Q</i>	1.41	3.57	5.90	8.22	10.49	20.46	27.84	32.20	33.26	31.57
Unemployment	<i>U</i>	14.33	12.08	10.91	9.80	8.69	3.87	0.30	-1.79	-2.28	-1.44
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.13	-0.10	-0.05	0.02	0.08	0.29	0.44	0.56	0.65	0.70
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.08	0.02	-0.05	-0.11	-0.15	-0.13	-0.03	0.02	0.02	0.00
Balance of payments	<i>Enl/Y</i>	-0.05	-0.08	-0.10	-0.09	-0.06	0.16	0.41	0.58	0.67	0.70
Foreign receivables	<i>Wnnb_e/Y</i>	-0.01	0.00	0.00	0.00	0.02	0.63	2.09	4.08	6.22	8.28
Bond debt	<i>Wbd_os_z/Y</i>	0.12	0.27	0.36	0.38	0.34	-0.47	-1.95	-3.85	-5.92	-7.92
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.06	-0.14	-0.21	-0.27	-0.33	-0.55	-0.73	-0.82	-0.78	-0.65
Labour intensity	<i>hq/fX</i>	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.02	-0.01	0.01	0.01
User cost	<i>uim</i>	-0.09	-0.21	-0.32	-0.42	-0.52	-0.88	-1.04	-1.02	-0.90	-0.74
Wage	<i>lna</i>	-0.23	-0.62	-0.95	-1.25	-1.51	-2.36	-2.58	-2.36	-1.92	-1.50
Consumption price	<i>pcp</i>	-0.08	-0.19	-0.30	-0.41	-0.50	-0.91	-1.12	-1.14	-1.03	-0.86
Terms of trade	<i>bpe</i>	-0.06	-0.15	-0.23	-0.31	-0.38	-0.66	-0.78	-0.75	-0.64	-0.52
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.07	-0.03	0.02	0.06	0.07	0.00	-0.14	-0.23	-0.25	-0.22
Wage share	<i>byw</i>	-0.07	-0.18	-0.26	-0.32	-0.37	-0.47	-0.42	-0.29	-0.17	-0.08

Figure 10b. The effect of a permanent increase in labor supply, with supply effects



▼ C. Number of workers - balanced budget

Increasing the labor supply has a permanent positive effect on the public budget balance. The additional public savings can be used to increase spending or to reduce tax rates in order to create expansionary effects in the economy. Table 10c presents the effect of a permanent increase in labor supply accompanied by a permanent decrease in income tax rates. As in section A and B, the number of people outside the labor force not receiving transfers is reduced by 1 percent of total employment - approximately 27.000 people and, in contrast to section A and B, central government income tax rates are reduced permanently by 6.16 percent (e.g. from 15 to 14.08 per cent) to balance the public budget in the long run.

Table 10c. The effect of a permanent increase in labor supply, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	1915	3047	3832	4224	4516	5992	8239	10334	10998	10057
Pub. consumption	<i>fCo</i>	397	1059	1809	2587	3361	6484	7813	7567	6677	6236
Investment	<i>fi</i>	924	2380	3687	4778	5657	7788	7837	6840	5369	4260
Export	<i>fE</i>	574	1662	2994	4494	6120	13412	16106	14499	11905	11542
Import	<i>fM</i>	1252	2398	3443	4311	5176	9132	11586	11912	10655	9317
GDP	<i>fY</i>	2610	5777	8870	11775	14487	24516	28399	27406	24431	22869
		<i>1000 Persons</i>									
Employment	<i>Q</i>	2.83	7.00	11.36	15.56	19.48	32.75	35.39	31.09	25.13	21.79
Unemployment	<i>U</i>	13.58	10.33	8.17	6.15	4.25	-2.11	-3.31	-1.18	1.72	3.31
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.22	-0.21	-0.16	-0.09	-0.04	0.08	0.08	0.04	-0.01	-0.04
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.15	0.06	-0.04	-0.12	-0.16	-0.18	-0.10	-0.04	-0.02	0.00
Balance of payments	<i>Enl/Y</i>	-0.08	-0.15	-0.19	-0.21	-0.20	-0.10	-0.02	-0.01	-0.03	-0.04
Foreign receivables	<i>Wnnb_e/Y</i>	-0.04	-0.17	-0.34	-0.52	-0.70	-1.34	-1.43	-1.23	-0.99	-0.77
Bond debt	<i>Wbd_os_z/Y</i>	0.15	0.37	0.51	0.59	0.61	0.22	-0.33	-0.62	-0.57	-0.30
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.10	-0.23	-0.33	-0.41	-0.47	-0.52	-0.34	-0.09	0.10	0.13
Labour intensity	<i>hq/fX</i>	-0.02	-0.02	-0.02	-0.01	0.01	0.07	0.10	0.09	0.07	0.06
User cost	<i>uim</i>	-0.08	-0.19	-0.27	-0.34	-0.39	-0.41	-0.21	-0.01	0.06	-0.03
Wage	<i>lna</i>	-0.22	-0.57	-0.83	-1.02	-1.15	-1.14	-0.55	-0.05	0.04	-0.24
Consumption price	<i>pcp</i>	-0.07	-0.17	-0.26	-0.33	-0.39	-0.47	-0.31	-0.11	-0.02	-0.08
Terms of trade	<i>bpe</i>	-0.06	-0.13	-0.20	-0.25	-0.29	-0.34	-0.21	-0.06	0.00	-0.06
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.14	-0.08	-0.02	0.03	0.05	0.02	-0.03	-0.02	0.01	0.02
Wage share	<i>byw</i>	-0.07	-0.17	-0.23	-0.25	-0.26	-0.16	0.01	0.10	0.06	-0.04

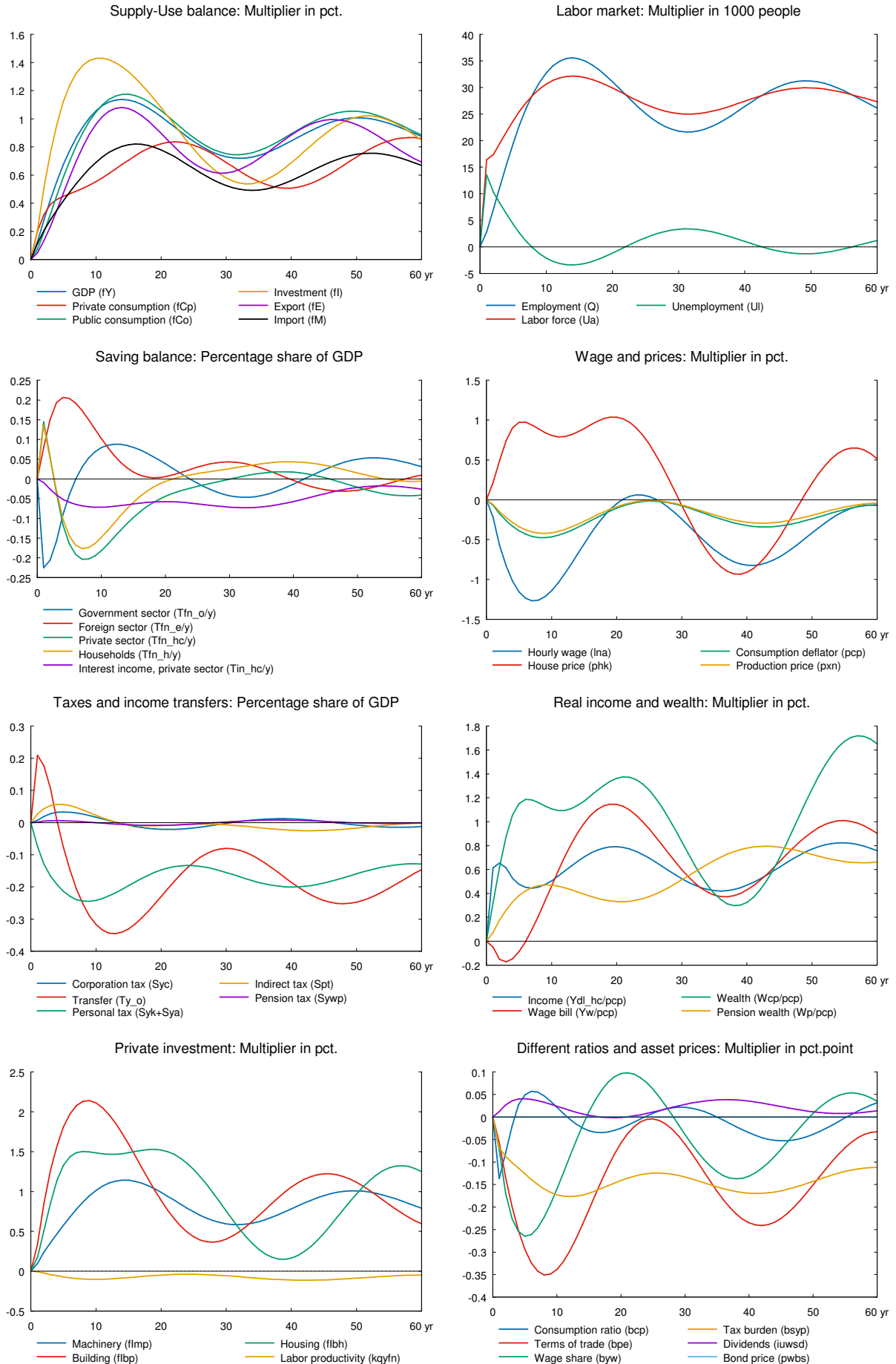
The lower income tax rates reduce government revenues and public savings fall. In the short run, the negative effect on the public budget dominates, but in the long term, public budget and debt constitute the same ratios of GDP as in the baseline.

The higher labor supply is not immediately employed, so unemployment increases in the short run. The higher unemployment exerts a downward pressure on wages and prices which improves competitiveness. This makes exports stimulate production and employment. The expansionary effect is reinforced by higher private consumption, which peaks after five years. The higher consumption reflects that the lower income tax rates have increased disposable income. The stronger domestic demand makes unemployment fall more sharply than in section-A. Employment keeps increasing until the additional labor force is employed and the rate of unemployment has returned to its baseline. The higher production increases the capital stock and investments permanently. Imports also increase permanently to meet the higher domestic demand.

When the government budget is unchanged as a share of GDP, the balance of payment is also unchanged in the long run as indicated in table 10b. Moreover, in this balanced-budget experiment net exports remain fairly unchanged implying that the volume change in net exports is balanced by the price change. This balancing of nominal exports and imports is illustrated in figure 10a, where the percentage increase in real exports minus the percentage increase in real imports, cf. first diagram on the left hand side, is equal to the percentage deterioration in the terms of trade, cf. last diagram on the right hand side.

In the long run, the need for lower wages to boost competitiveness will moderate the increase in real income and private consumption. The initial consumption boom raises the demand for dwellings, housing investment and house price increase, and the higher housing wealth has a certain feed-back effect on private consumption. Moreover, the short-run expansion of the housing capital is stronger than the long run effect. The excess supply of houses created in the medium run reduces house prices and the housing investment is adjusted downwards before the housing market reaches its equilibrium.

Figure 10c. The effect of a permanent increase in labor supply, balanced budget



This section illustrates the effect of introducing a budget constraint to the labor supply shock in section A and B. Spending the supply-driven improvement in public finances on fiscal easing makes employment increase faster, and the long-run need for higher exports and improved competitiveness is also lower in section C. In section A and B, the additional labor supply was used to boosted public savings and net exports. In section C, it is primarily used to increase domestic consumption. Making the public sector spend its additional revenues resembles an introduction of Say's law.

In a closed economy, spending the full-structural-employment GDP on consumption and investment would be enough to secure full structural employment. However, in an open economy a share of domestic demand will be met by higher imports, and exports will have to increase accordingly. Consequently, we still get an export increase in section C, but as we have seen, the export increase is smaller than in section A and especially in section B. In real terms, the long-run increase of exports in ADAM will always match full-structural-employment GDP plus imports minus domestic demand. And in section C, the increase of exports will also match the increase of imports in nominal terms, because the constant public budget plus the private consumption function makes the impact on domestic demand match the impact on GDP in nominal terms.

11. Labor supply - working hours

The supply of labor input will also increase if working hours increase. An increase in working hours raises employment in terms of hours and in the short run it reduces the number of workers employed. The following sections present a shock to working hours with and without balanced public budget.

▼ A. Working hours

Table 11a presents the effect of a permanent 1 percent increase in working hours.

Table 11a. The effect of a permanent increase in working hours

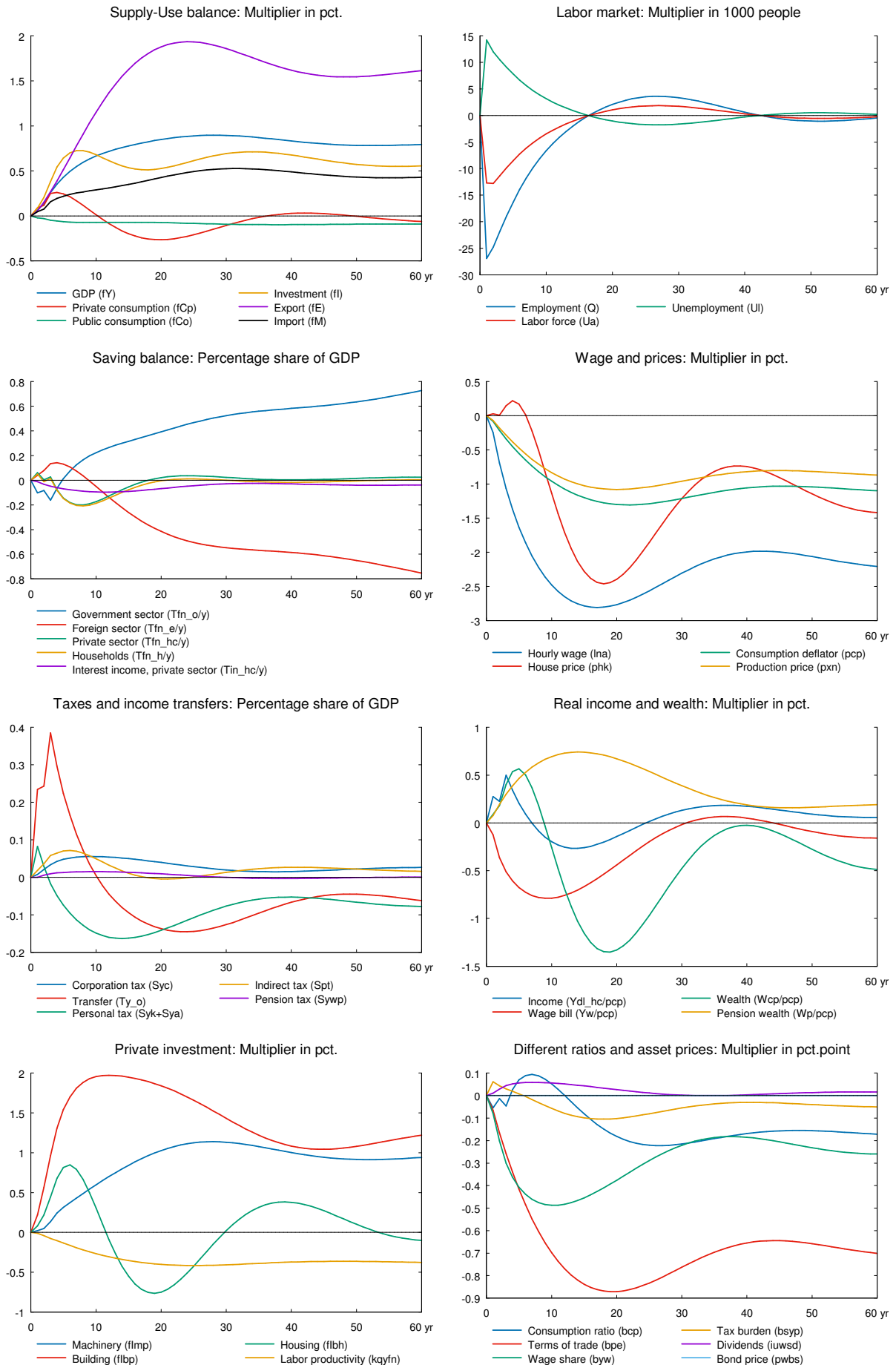
		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	841	1125	2428	2578	2449	144	-2307	-3316	-2830	-1538
Pub. consumption	<i>fCo</i>	-119	-169	-263	-325	-368	-450	-470	-532	-641	-763
Investment	<i>fi</i>	374	959	1848	2696	3237	3701	3141	3333	4187	5092
Export	<i>fE</i>	678	1909	3382	4943	6667	16052	24421	30379	33691	34889
Import	<i>fM</i>	523	886	1910	2371	2701	3818	4968	6519	8108	9290
GDP	<i>fY</i>	1266	2879	5383	7434	9204	15439	19469	22910	25869	28022
		<i>1000 Persons</i>									
Employment	<i>Q</i>	-26.93	-24.77	-21.79	-18.94	-16.31	-6.63	-1.13	2.09	3.51	3.36
Unemployment	<i>U</i>	14.21	11.98	10.46	9.09	7.82	3.16	0.51	-1.04	-1.72	-1.63
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.10	-0.08	-0.16	-0.07	0.01	0.22	0.32	0.39	0.47	0.52
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.06	0.00	0.03	-0.08	-0.14	-0.17	-0.05	0.02	0.04	0.02
Balance of payments	<i>Enl/Y</i>	-0.04	-0.08	-0.14	-0.14	-0.13	0.05	0.26	0.42	0.50	0.55
Foreign receivables	<i>Wnnb_e/Y</i>	0.00	0.04	-0.01	-0.08	-0.13	0.04	1.00	2.48	4.14	5.76
Bond debt	<i>Wbd_os_z/Y</i>	0.11	0.25	0.45	0.54	0.56	-0.02	-1.11	-2.44	-3.90	-5.42
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.06	-0.14	-0.24	-0.32	-0.37	-0.52	-0.61	-0.69	-0.72	-0.68
Labour intensity	<i>hq/fX</i>	-0.02	-0.03	-0.05	-0.06	-0.06	-0.03	-0.01	0.01	0.02	0.03
User cost	<i>uim</i>	-0.10	-0.23	-0.36	-0.47	-0.57	-0.93	-1.11	-1.16	-1.12	-1.03
Wage	<i>lna</i>	-0.25	-0.69	-1.07	-1.37	-1.63	-2.48	-2.79	-2.77	-2.56	-2.31
Consumption price	<i>pcp</i>	-0.08	-0.21	-0.34	-0.45	-0.55	-0.96	-1.20	-1.30	-1.29	-1.21
Terms of trade	<i>bpe</i>	-0.06	-0.16	-0.26	-0.34	-0.41	-0.70	-0.84	-0.87	-0.83	-0.76
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.06	-0.01	-0.05	0.03	0.07	0.05	-0.08	-0.18	-0.22	-0.22
Wage share	<i>byw</i>	-0.08	-0.20	-0.30	-0.36	-0.41	-0.49	-0.45	-0.38	-0.29	-0.22

When working hours of existing workers increase potential production increases immediately. Compared to the previous experiment the initial reaction via the production function is stronger in the present experiment because the working hours of already employed people increases. In the short run, there is no change in demand, so layoffs are inevitable and employment falls. The rise in unemployment dampens wages and competitiveness improves. Consequently, the *wage-driven crowding out* returns unemployment to the baseline in the long run. ▼

The previous section 10 showed that private consumption falls in the long term when the positive shock to labor input is in number of workers. When working hours increase, there is no fall in private consumption in the long run. Public transfer income is adjusted with the income per worker. Thus, the fall in total real income is smaller than in the previous experiment because the real income of public transfer earners is adjusted upwards with the number of working hours per employed. Transfer income is not adjusted with the number of employed. In this way, the different impact on consumption in experiment 10 and 11 reflects the institutional setup. The marginal increase in disposable income is not enough to raise private consumption in the long run as there is also a fall in real wealth due to a fall in housing wealth. The higher investment raises imports in the long run.

There is a positive effect on the public budget in the long run, because the fall in public expenses is larger than the fall in revenues. Personal income taxes do not fall as much as annual incomes, as the higher working hours offset the fall in annual incomes. Corporate taxes also increase due to the increase in profits. Indirect taxes also contribute to revenue. However, the positive long term effect on the public budget is smaller than in experiment 10 due to the indexation of public transfers.

Figure 11a. The effect of a permanent increase in working hours



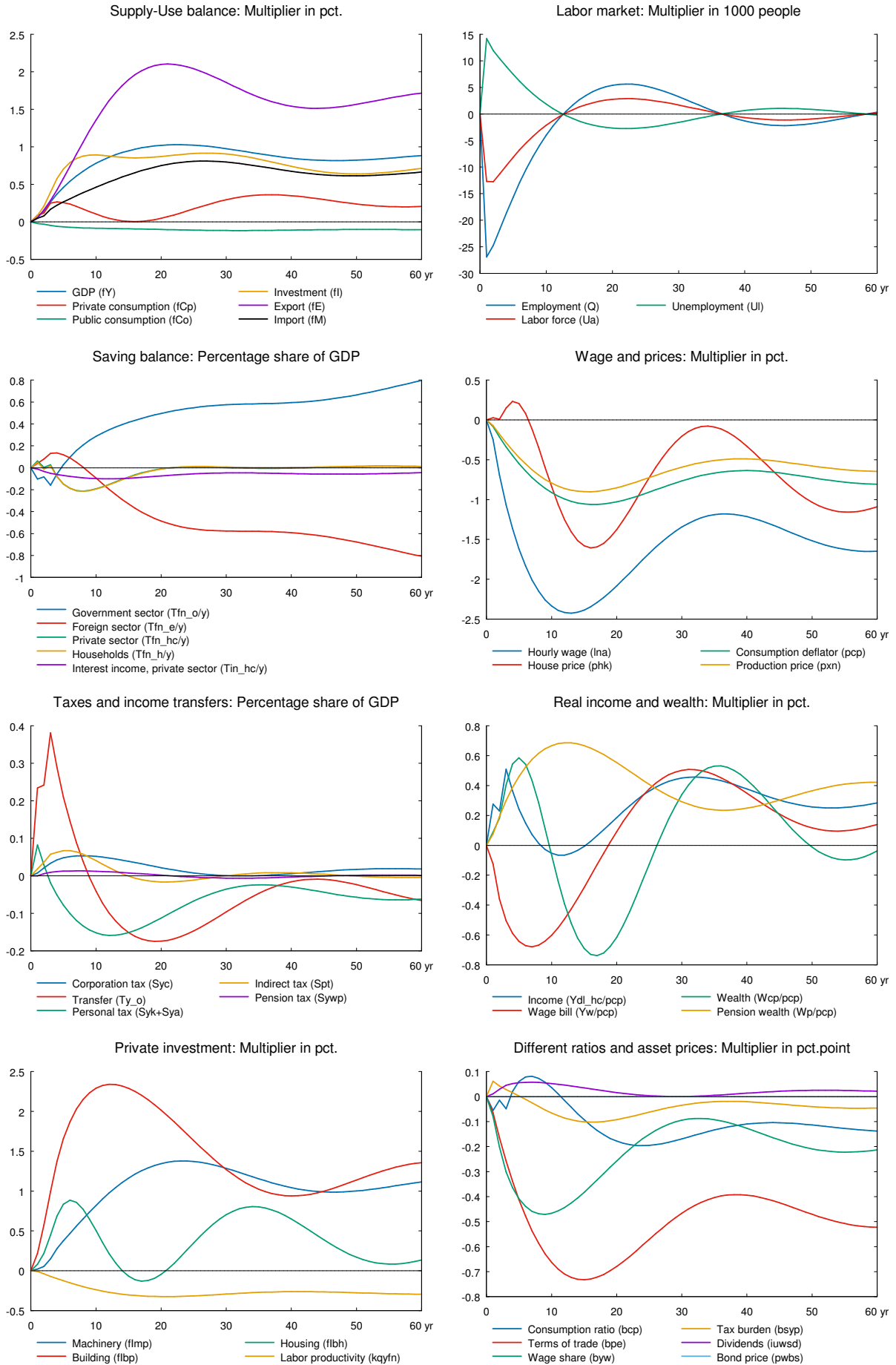
▼ B. Working hours - including supply effects on exports

A permanent increase in working hours has a permanent positive effect on domestic output; and it is likely that the market shares of danish exporter will rise. Table 10x presents the effect of a permanent increase in labor supply accompanied by supply effects in foreign trade. In contrast to section A, export performance are improved by an elasticity of 0.7 relative to GVA (gross value added).

Table 11b. The effect of a permanent increase in working hours, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	841	1131	2452	2647	2594	1135	78	605	2347	4313
Pub. consumption	<i>fCo</i>	-119	-169	-266	-332	-381	-521	-610	-720	-845	-950
Investment	<i>fi</i>	374	979	1923	2868	3542	4862	5033	5523	6224	6660
Export	<i>fE</i>	678	1976	3603	5431	7502	18955	28470	33949	35602	34873
Import	<i>fM</i>	523	930	2061	2712	3294	6123	8917	11466	13298	14148
GDP	<i>fY</i>	1266	2927	5550	7817	9884	18136	23761	27570	29779	30606
		<i>1000 Persons</i>									
Employment	<i>Q</i>	-26.93	-24.72	-21.63	-18.57	-15.64	-3.99	2.67	5.42	5.26	3.27
Unemployment	<i>U</i>	14.21	11.95	10.38	8.90	7.48	1.86	-1.34	-2.65	-2.55	-1.57
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.10	-0.08	-0.16	-0.06	0.03	0.29	0.41	0.50	0.55	0.57
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.06	0.00	0.03	-0.08	-0.15	-0.19	-0.08	-0.01	0.01	0.00
Balance of payments	<i>Enl/Y</i>	-0.04	-0.08	-0.13	-0.14	-0.12	0.09	0.33	0.49	0.56	0.58
Foreign receivables	<i>Wnnb_e/Y</i>	0.00	0.04	-0.02	-0.08	-0.13	0.12	1.28	3.00	4.88	6.65
Bond debt	<i>Wbd_os_z/Y</i>	0.11	0.25	0.44	0.52	0.52	-0.30	-1.80	-3.53	-5.27	-6.86
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.06	-0.14	-0.25	-0.33	-0.40	-0.59	-0.67	-0.67	-0.60	-0.48
Labour intensity	<i>hq/fX</i>	-0.02	-0.03	-0.05	-0.06	-0.07	-0.06	-0.04	-0.02	-0.01	-0.01
User cost	<i>uim</i>	-0.10	-0.23	-0.36	-0.47	-0.56	-0.90	-0.99	-0.94	-0.81	-0.68
Wage	<i>lna</i>	-0.25	-0.69	-1.07	-1.36	-1.62	-2.34	-2.39	-2.08	-1.68	-1.34
Consumption price	<i>pcp</i>	-0.08	-0.21	-0.34	-0.45	-0.55	-0.91	-1.05	-1.03	-0.91	-0.77
Terms of trade	<i>bpe</i>	-0.06	-0.16	-0.26	-0.34	-0.41	-0.66	-0.73	-0.68	-0.57	-0.46
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.06	-0.01	-0.05	0.02	0.06	0.04	-0.09	-0.18	-0.20	-0.17
Wage share	<i>byw</i>	-0.08	-0.20	-0.30	-0.36	-0.41	-0.47	-0.38	-0.26	-0.15	-0.09

Figure 11b. The effect of a permanent increase in working hours, with supply effects



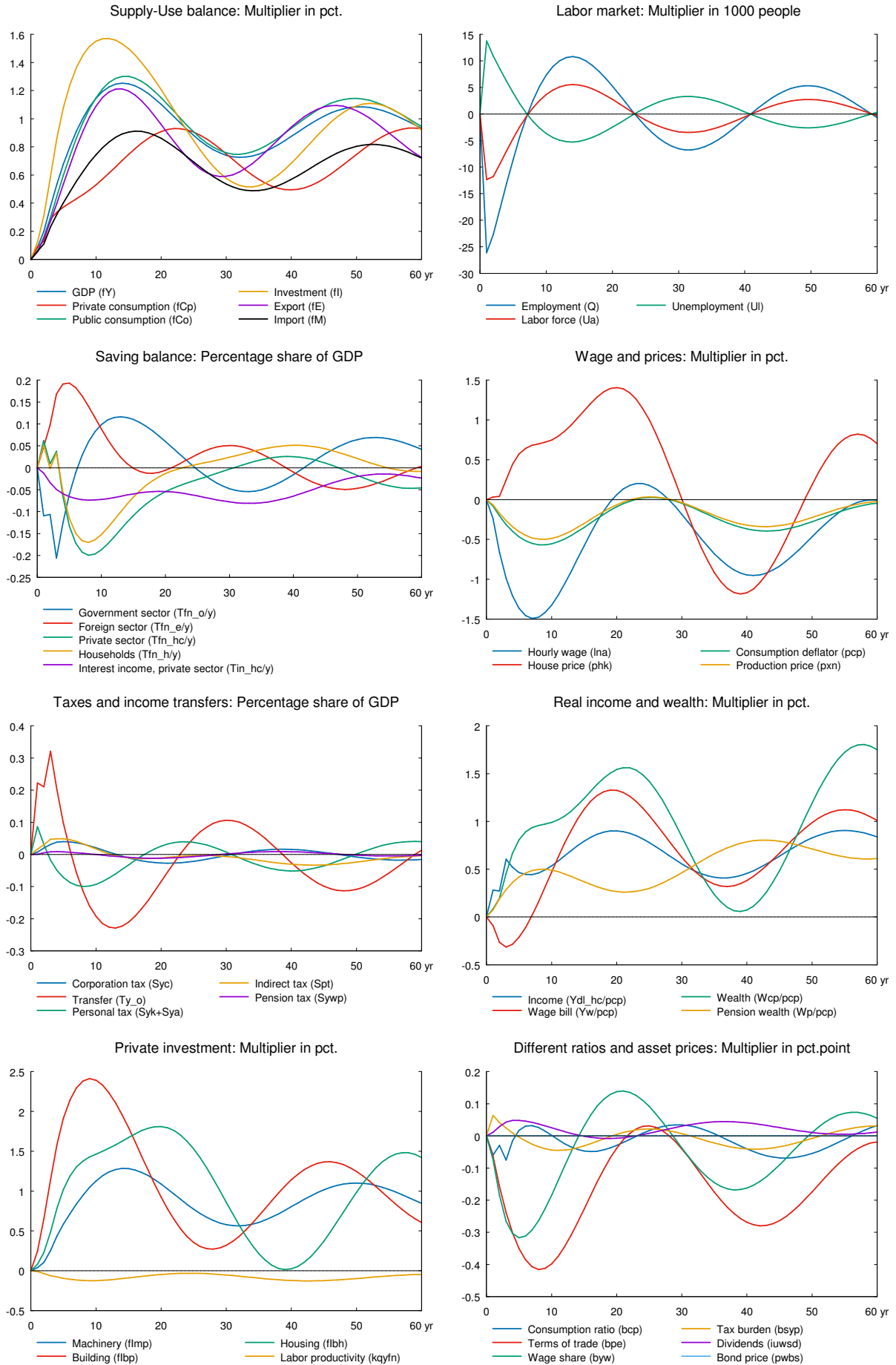
▼ C. Working hours - balanced budget

In the present case, the supply effect on exports ensures a balanced public budget leaving almost no room for income tax induced balancing in the public budget.

Table 11c. The effect of a permanent increase in working hours, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	845	1246	2795	3332	3727	5740	8698	11415	12250	10941
Pub. consumption	<i>fCo</i>	311	878	1679	2550	3433	7107	8653	8229	6982	6287
Investment	<i>fi</i>	537	1457	2854	4301	5436	8450	8804	7650	5766	4245
Export	<i>fE</i>	654	1906	3441	5114	6945	15218	17991	15511	11866	11094
Import	<i>fM</i>	629	1286	2815	3928	4982	9853	12864	13159	11410	9497
GDP	<i>fY</i>	1727	4144	7865	11306	14511	26603	31267	29757	25648	23206
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-26.11	-22.69	-17.88	-13.07	-8.53	7.34	10.59	5.23	-2.27	-6.54
Unemployment	<i>Ul</i>	13.78	10.91	8.48	6.16	3.96	-3.66	-5.14	-2.48	1.16	3.20
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.11	-0.11	-0.21	-0.13	-0.06	0.10	0.11	0.06	0.00	-0.05
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.06	0.01	0.04	-0.06	-0.13	-0.19	-0.11	-0.05	-0.03	0.00
Balance of payments	<i>Enl/Y</i>	-0.05	-0.10	-0.17	-0.19	-0.19	-0.09	0.00	0.01	-0.03	-0.05
Foreign receivables	<i>Wnnb_e/Y</i>	-0.02	-0.04	-0.18	-0.35	-0.53	-1.19	-1.28	-1.07	-0.83	-0.64
Bond debt	<i>Wbd_os_z/Y</i>	0.10	0.25	0.45	0.56	0.59	0.16	-0.54	-0.93	-0.89	-0.54
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.08	-0.18	-0.32	-0.43	-0.52	-0.63	-0.42	-0.10	0.14	0.18
Labour intensity	<i>hq/fX</i>	-0.01	-0.01	-0.02	-0.01	0.00	0.08	0.11	0.10	0.08	0.05
User cost	<i>uim</i>	-0.09	-0.22	-0.33	-0.41	-0.46	-0.49	-0.23	0.03	0.11	0.00
Wage	<i>lna</i>	-0.24	-0.66	-0.99	-1.21	-1.36	-1.32	-0.58	0.06	0.18	-0.19
Consumption price	<i>pcp</i>	-0.08	-0.20	-0.31	-0.40	-0.47	-0.56	-0.35	-0.09	0.03	-0.05
Terms of trade	<i>bpe</i>	-0.06	-0.16	-0.24	-0.30	-0.35	-0.40	-0.23	-0.04	0.03	-0.04
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	-0.06	-0.03	-0.08	-0.02	0.02	0.00	-0.05	-0.03	0.02	0.03
Wage share	<i>byw</i>	-0.07	-0.18	-0.27	-0.30	-0.32	-0.18	0.03	0.14	0.09	-0.04

Figure 11c. The effect of a permanent increase in working hours, balanced budget



12. Productivity - labor efficiency

Increasing the efficiency of labor increases the supply of labor measured in efficiency units. An increase in labor efficiency means that the same amount of labor can produce higher output. It also reduces the demand for other factors through substitution effects. The multiplier properties are demonstrated with and without balanced public budget.

▼ A. Labor efficiency

In this experiment, labor efficiency is increased permanently by 1 percent.

Table 12a. The effect of a permanent increase in labor efficiency

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	916	1753	2382	2785	3079	3738	4059	4591	5325	6086
Pub. consumption	<i>fCo</i>	4851	4870	4901	4942	4993	5340	5781	6259	6759	7286
Investment	<i>fi</i>	1437	2684	3252	3836	4286	4995	4607	4323	4361	4583
Export	<i>fE</i>	2771	4080	5434	6687	7929	12799	15290	16172	16424	16721
Import	<i>fM</i>	1639	2604	3278	3832	4331	5900	6616	7057	7443	7837
GDP	<i>fY</i>	8194	10395	12183	13932	15492	20511	22618	23758	24885	26289
		<i>1000 Persons</i>									
Employment	<i>Q</i>	-7.09	-6.52	-5.50	-4.17	-2.81	1.78	2.64	1.92	0.96	0.25
Unemployment	<i>U</i>	3.74	3.15	2.63	1.97	1.31	-0.89	-1.28	-0.92	-0.46	-0.12
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.16	-0.15	-0.09	-0.05	-0.01	0.09	0.08	0.06	0.05	0.04
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.05	0.00	-0.07	-0.11	-0.13	-0.14	-0.06	-0.01	0.01	0.01
Balance of payments	<i>En/Y</i>	-0.11	-0.15	-0.15	-0.15	-0.14	-0.05	0.02	0.05	0.05	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	-0.12	-0.25	-0.38	-0.50	-0.62	-0.91	-0.80	-0.50	-0.19	0.07
Bond debt	<i>Wbd_os_z/Y</i>	0.19	0.33	0.42	0.45	0.45	0.13	-0.29	-0.56	-0.70	-0.77
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.38	-0.46	-0.50	-0.54	-0.56	-0.53	-0.44	-0.36	-0.31	-0.29
Labour intensity	<i>hq/fX</i>	-0.64	-0.73	-0.79	-0.82	-0.84	-0.86	-0.86	-0.86	-0.86	-0.86
User cost	<i>uim</i>	-0.37	-0.43	-0.48	-0.52	-0.56	-0.62	-0.58	-0.53	-0.48	-0.46
Wage	<i>lna</i>	-0.23	-0.34	-0.44	-0.52	-0.58	-0.62	-0.45	-0.27	-0.16	-0.12
Consumption price	<i>pcp</i>	-0.35	-0.42	-0.48	-0.53	-0.58	-0.69	-0.68	-0.64	-0.60	-0.58
Terms of trade	<i>bpe</i>	-0.27	-0.32	-0.36	-0.40	-0.43	-0.49	-0.46	-0.42	-0.39	-0.37
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.07	-0.07	-0.01	0.01	0.03	0.01	-0.04	-0.07	-0.07	-0.07
Wage share	<i>byw</i>	-0.13	-0.19	-0.22	-0.24	-0.24	-0.19	-0.12	-0.08	-0.06	-0.06

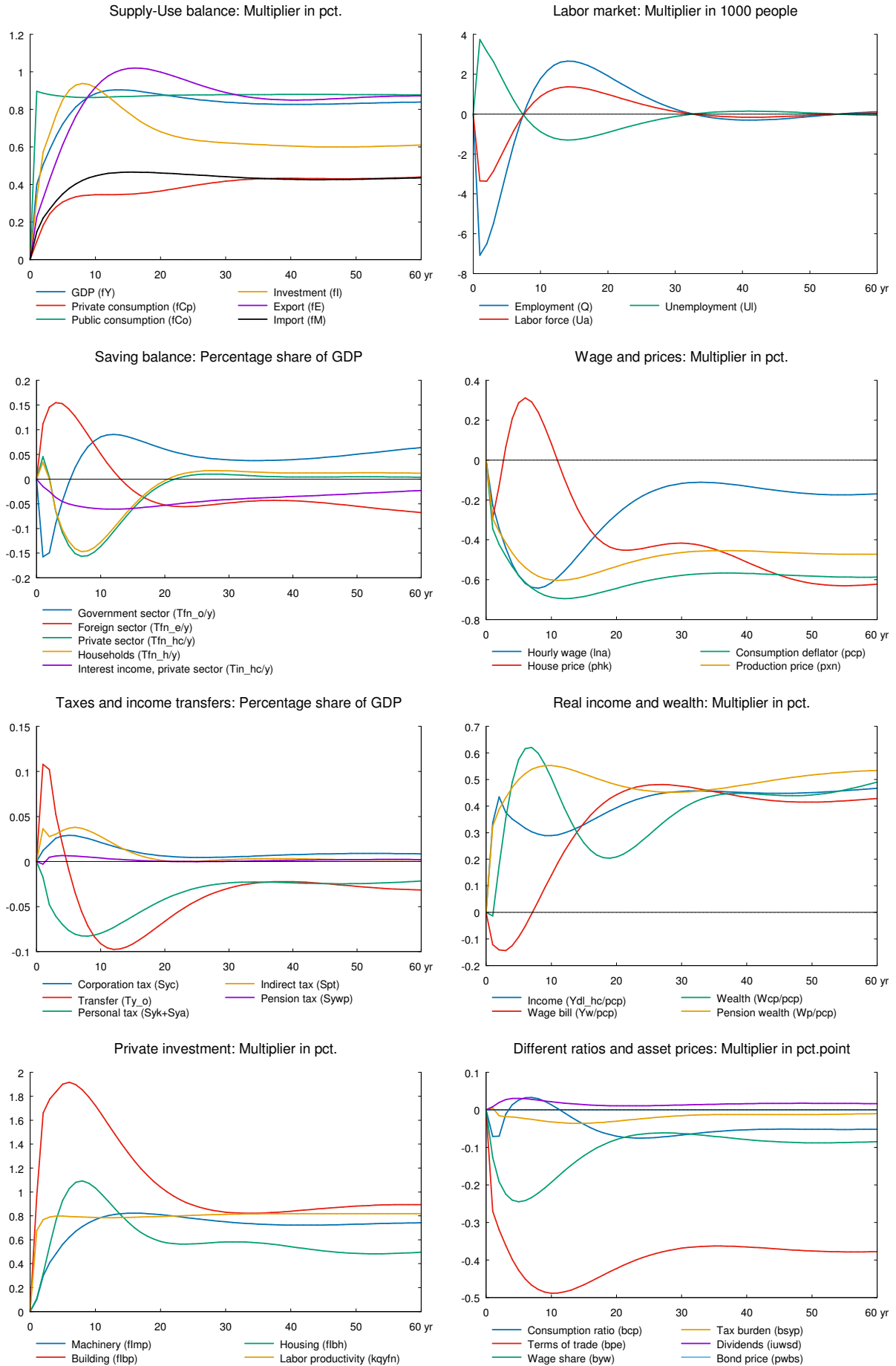
As the amount of output demanded can be produced by less labor, employment falls already in the first year, and due to lags in the labor demand relation, due to for example labor hoarding, the negative effect on employment peaks in the second year. The lower employment reduces wage growth and the **wage-driven crowding out** returns employment to its baseline. ▼

Compared to the previous two experiments - increase in number of workers and working hours - nominal hourly wages fall by a smaller percentage when labor efficiency improves, because production costs fall and make producer prices fall. Therefore, nominal wages do not have to decrease substantially to induce the fall in prices, that is necessary to make net exports increase and offset the initial fall in labor demand. This also explains the quicker response in exports in the present experiment, compared to the previous two experiments. Moreover, in the long run there is only a small negative effect on real hourly wages and there is no effect on private consumption in the long run.

The long term impact on investments is positive as there is a long term positive impact on production. Both capital intensity and labor intensity of production fall with the usual measure of intensity, and the fall in the latter is stronger as a result labor productivity increases. Note the efficiency corrected labor intensity increases relative to the baseline and production involves less capital and more labor in efficiency units. Due to this, output per working hour increases by less than 1 percent despite the 1 percent increase in labor efficiency.

Note that the higher unemployment in the short run raises unemployment benefits and worsens public finance temporarily. Later on the initial worsening in the government budget is reversed and the permanent budget effect is positive as employment rises and tax revenues increase. The improved competitiveness and the additional public savings also enhances the balance of payment.

Figure 12a. The effect of a permanent increase in labor efficiency



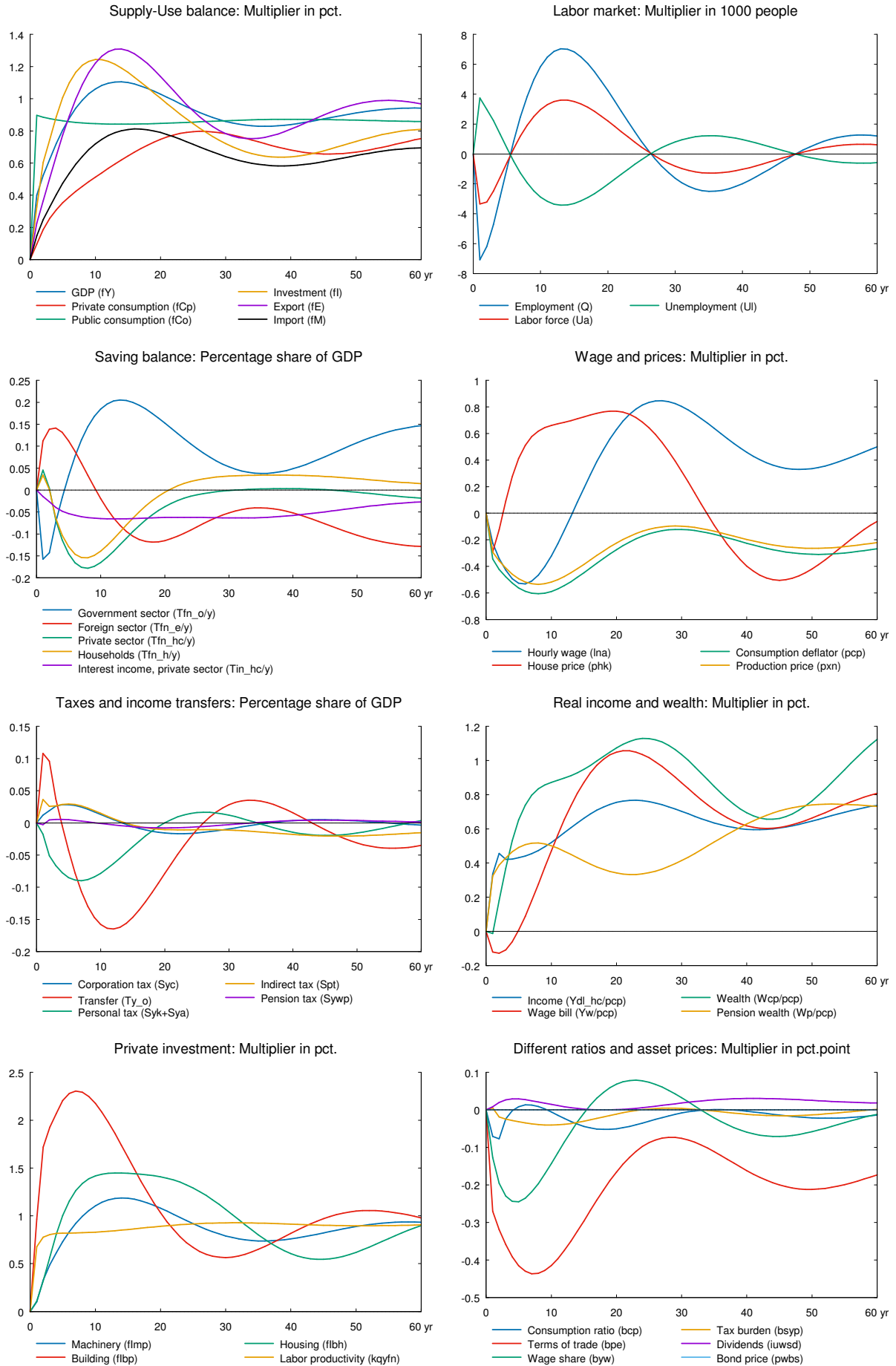
▼ B. Labor efficiency - including supply effects on exports

A permanent increase in labor efficiency has a permanent positive effect on domestic output; and it is likely that the market shares of danish exporter will rise. Table 10x presents the effect of a permanent increase in labor efficiency accompanied by supply effects in foreign trade. In contrast to section A, export performance are improved by an elasticity of 0.7 relative to GVA (gross value added).

Table 12b. The effect of a permanent increase in labor efficiency, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	916	1791	2514	3064	3543	5547	7509	9388	10765	11410
Pub. consumption	<i>fCo</i>	4851	4864	4887	4917	4953	5221	5599	6059	6585	7160
Investment	<i>fi</i>	1437	2827	3620	4414	5077	6772	6840	6355	5770	5308
Export	<i>fE</i>	2771	4561	6441	8244	10037	17030	19504	18410	16111	14710
Import	<i>fM</i>	1639	2916	3987	4947	5870	9508	11490	12074	11805	11354
GDP	<i>fY</i>	8194	10740	12970	15211	17287	24637	27551	27774	27106	26913
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-7.09	-6.20	-4.73	-2.89	-0.98	5.85	6.83	4.24	0.84	-1.63
Unemployment	<i>U</i>	3.74	2.98	2.24	1.33	0.40	-2.88	-3.31	-2.03	-0.38	0.81
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.16	-0.14	-0.07	-0.02	0.03	0.18	0.20	0.15	0.09	0.05
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.05	0.00	-0.07	-0.11	-0.14	-0.17	-0.09	-0.04	-0.01	0.00
Balance of payments	<i>Enl/Y</i>	-0.11	-0.14	-0.14	-0.13	-0.11	0.02	0.10	0.12	0.08	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	-0.12	-0.25	-0.39	-0.50	-0.61	-0.73	-0.34	0.22	0.69	1.00
Bond debt	<i>Wbd_os_z/Y</i>	0.19	0.32	0.38	0.38	0.33	-0.41	-1.32	-1.94	-2.18	-2.13
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.38	-0.47	-0.54	-0.60	-0.63	-0.63	-0.46	-0.26	-0.11	-0.04
Labour intensity	<i>hq/fX</i>	-0.64	-0.74	-0.80	-0.84	-0.86	-0.90	-0.89	-0.89	-0.89	-0.89
User cost	<i>uim</i>	-0.37	-0.43	-0.48	-0.52	-0.55	-0.54	-0.39	-0.22	-0.12	-0.10
Wage	<i>lna</i>	-0.23	-0.34	-0.43	-0.49	-0.53	-0.32	0.19	0.63	0.83	0.80
Consumption price	<i>pcp</i>	-0.35	-0.42	-0.48	-0.53	-0.56	-0.59	-0.45	-0.27	-0.15	-0.12
Terms of trade	<i>bpe</i>	-0.27	-0.32	-0.36	-0.39	-0.41	-0.41	-0.29	-0.16	-0.09	-0.08
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	-0.07	-0.08	-0.02	0.00	0.01	-0.01	-0.04	-0.05	-0.03	-0.01
Wage share	<i>byw</i>	-0.13	-0.20	-0.23	-0.24	-0.24	-0.14	-0.01	0.07	0.07	0.03

Figure 12b. The effect of a permanent increase in labor efficiency, with supply effects



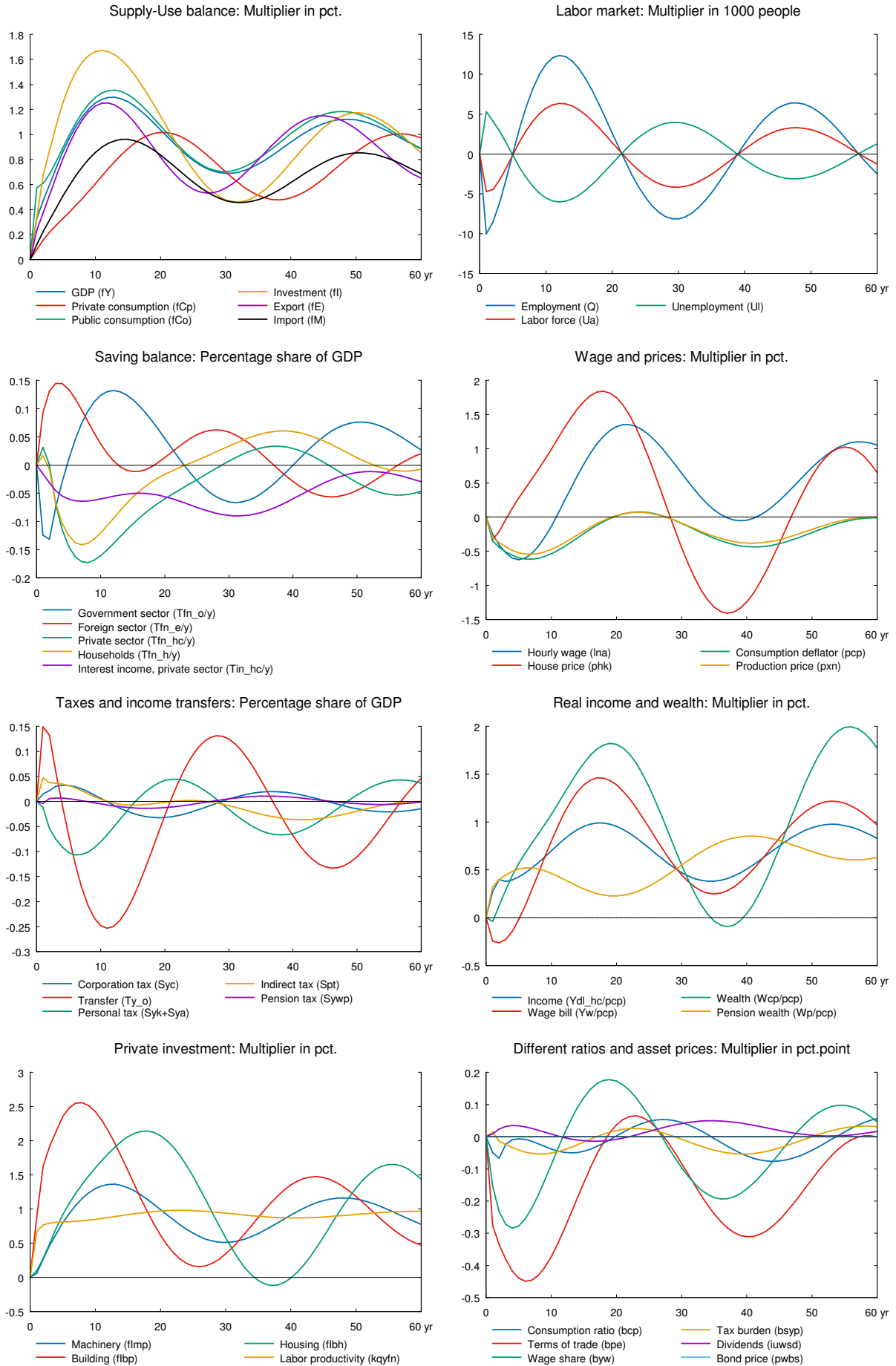
▼ C. Labor efficiency - balanced budget

The supply effect on exports ensures a balanced public budget leaving almost no room for income tax induced balancing in the public budget.

Table 12c. The effect of a permanent increase in labor efficiency, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	756	1507	2176	2729	3284	6569	10341	12767	12523	10209
Pub. consumption	<i>fCo</i>	3101	3354	3824	4440	5121	8013	8761	7660	6193	5836
Investment	<i>fi</i>	1462	3152	4262	5339	6295	9053	9066	7271	4920	3516
Export	<i>fE</i>	2851	4673	6621	8507	10384	17101	17349	13260	9819	10733
Import	<i>fM</i>	1320	2641	3885	5061	6252	11321	13640	12784	10212	8376
GDP	<i>fY</i>	6741	9689	12520	15499	18402	29036	31592	28004	23074	21587
		<i>1000 Persons</i>									
Employment	<i>Q</i>	-10.03	-8.55	-6.14	-3.12	0.07	11.26	10.68	2.62	-5.40	-8.15
Unemployment	<i>U</i>	5.29	4.11	2.88	1.39	-0.17	-5.53	-5.16	-1.20	2.68	3.96
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.12	-0.13	-0.07	-0.03	0.01	0.12	0.12	0.05	-0.03	-0.07
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.03	0.00	-0.07	-0.11	-0.14	-0.16	-0.10	-0.06	-0.03	0.01
Balance of payments	<i>Enl/Y</i>	-0.09	-0.13	-0.14	-0.14	-0.13	-0.04	0.01	-0.01	-0.05	-0.06
Foreign receivables	<i>Wnnb_e/Y</i>	-0.06	-0.18	-0.33	-0.48	-0.62	-1.10	-1.12	-0.93	-0.74	-0.58
Bond debt	<i>Wbd_os_z/Y</i>	0.20	0.32	0.38	0.38	0.34	-0.30	-1.01	-1.27	-1.04	-0.55
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.32	-0.43	-0.52	-0.59	-0.65	-0.65	-0.34	0.03	0.24	0.21
Labour intensity	<i>hq/fX</i>	-0.69	-0.78	-0.84	-0.87	-0.88	-0.88	-0.87	-0.89	-0.93	-0.95
User cost	<i>uim</i>	-0.39	-0.46	-0.52	-0.56	-0.58	-0.45	-0.12	0.11	0.11	-0.07
Wage	<i>lna</i>	-0.25	-0.41	-0.53	-0.60	-0.62	-0.13	0.78	1.32	1.20	0.64
Consumption price	<i>pcp</i>	-0.35	-0.44	-0.51	-0.56	-0.60	-0.54	-0.24	0.02	0.06	-0.09
Terms of trade	<i>bpe</i>	-0.28	-0.33	-0.38	-0.42	-0.44	-0.37	-0.14	0.04	0.05	-0.08
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	-0.05	-0.07	-0.02	-0.01	-0.01	-0.04	-0.05	0.00	0.05	0.04
Wage share	<i>byw</i>	-0.15	-0.23	-0.27	-0.28	-0.28	-0.09	0.12	0.17	0.06	-0.10

Figure 12c. The effect of a permanent increase in labor efficiency, balanced budget



13. Productivity - capital efficiency

Improvement in machinery efficiency can raise the production capacity of an economy. Alternatively, the same amount of output can be produced with less capital, which makes production less capital intensive, with the usual measure of capital. If, however, capital is measured in efficiency units, production will become more capital intensive, which raises productivity and production in the long run.

▼ A. Capital efficiency

In the following, machinery efficiency is increased by 1 percent permanently.

Table 13a. The effect of a permanent increase in machinery efficiency

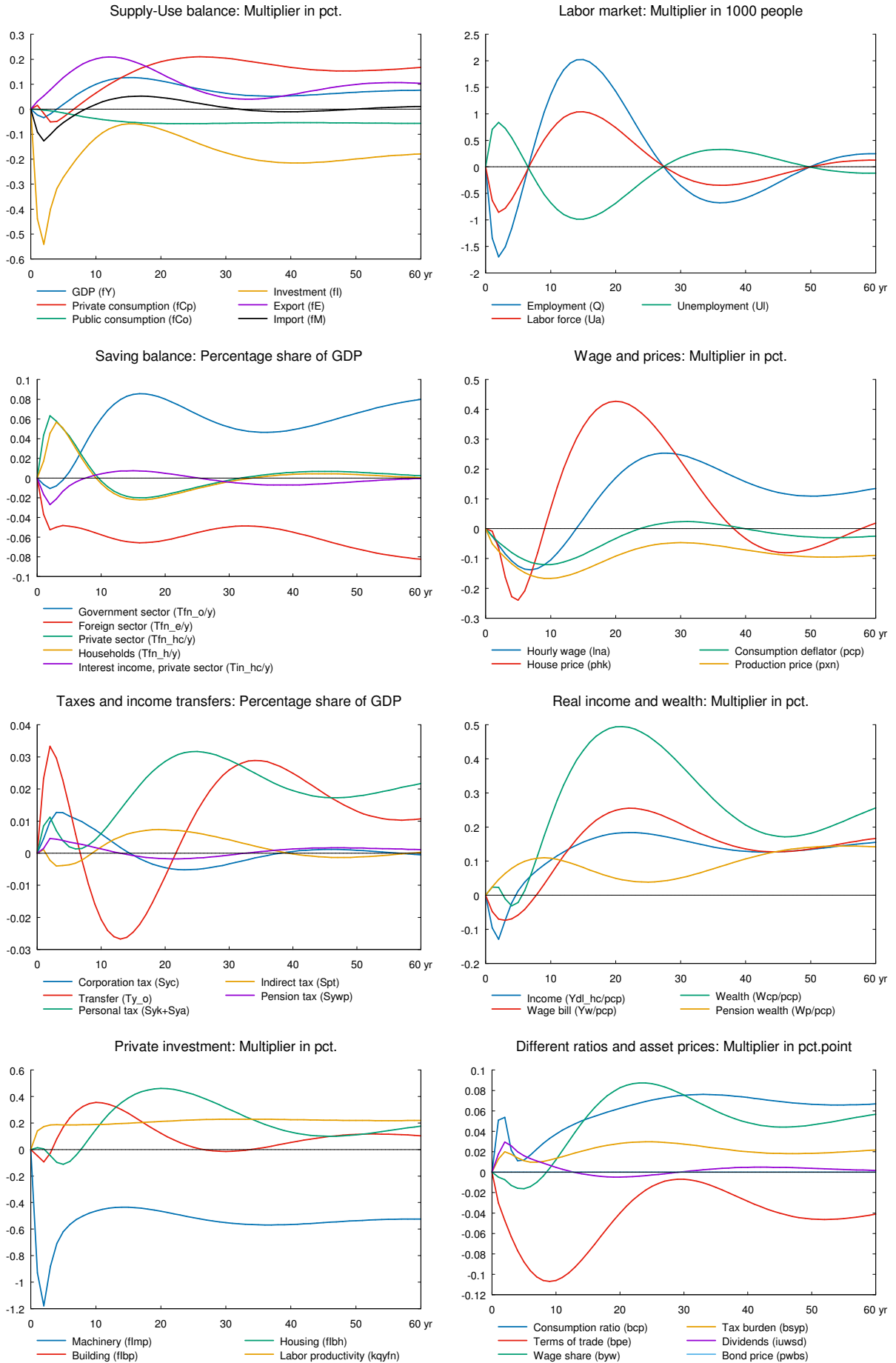
		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	146	-165	-498	-482	-325	698	1644	2386	2831	2979
Pub. consumption	<i>fCo</i>	-5	-21	-33	-55	-84	-234	-342	-407	-444	-467
Investment	<i>fi</i>	-1929	-2529	-1940	-1578	-1374	-623	-345	-506	-879	-1286
Export	<i>fE</i>	383	667	995	1319	1639	2817	2974	2312	1436	869
Import	<i>fM</i>	-1009	-1488	-1223	-917	-668	262	718	721	451	117
GDP	<i>fY</i>	-474	-697	-387	0	415	2325	3176	3058	2508	1999
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-1.34	-1.70	-1.51	-1.17	-0.74	1.37	2.02	1.42	0.42	-0.35
Unemployment	<i>U</i>	0.71	0.84	0.73	0.55	0.34	-0.68	-0.98	-0.68	-0.20	0.18
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.01	-0.01	-0.01	0.00	0.01	0.06	0.08	0.08	0.06	0.05
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.04	0.06	0.06	0.05	0.04	0.00	-0.02	-0.02	-0.01	0.00
Balance of payments	<i>En/Y</i>	0.04	0.05	0.05	0.05	0.05	0.06	0.07	0.06	0.06	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	0.07	0.15	0.20	0.25	0.29	0.45	0.61	0.76	0.88	0.98
Bond debt	<i>Wbd_os_z/Y</i>	0.03	0.05	0.07	0.07	0.07	-0.13	-0.47	-0.78	-0.97	-1.05
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.01	-0.04	-0.08	-0.11	-0.14	-0.21	-0.18	-0.13	-0.07	-0.05
Labour intensity	<i>hq/fX</i>	-0.03	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
User cost	<i>uim</i>	-0.01	-0.01	-0.03	-0.04	-0.05	-0.07	-0.04	0.01	0.05	0.06
Wage	<i>lna</i>	-0.03	-0.06	-0.08	-0.11	-0.13	-0.10	0.03	0.17	0.24	0.25
Consumption price	<i>pcp</i>	-0.03	-0.05	-0.06	-0.08	-0.09	-0.12	-0.09	-0.03	0.01	0.02
Terms of trade	<i>bpe</i>	-0.03	-0.05	-0.06	-0.08	-0.09	-0.11	-0.08	-0.04	-0.01	-0.01
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.05	0.05	0.02	0.01	0.01	0.04	0.05	0.06	0.07	0.08
Wage share	<i>byw</i>	0.00	-0.01	-0.01	-0.02	-0.02	0.01	0.06	0.08	0.09	0.08

As the efficiency of machines improves, the stock of machinery is reduced, and investment in machinery falls. The lower investment demand reduces production in the short run which further reduces machinery investment. Due to the high import content of machinery investments, imports also fall in the short run. The fall in machinery reduces capital cost and output prices, and the higher unemployment reduces wages. The combined effect is a fall in prices and the price effect occurs relatively quick due to the initial shock to efficiency. As prices fall competitiveness improves and hence exports and production rise. Over time employment returns to the baseline through the **wage-driven crowding out**. ▼ It may be noted that output per man hour increases in the long term as the higher efficiency of machines induces the substitute of machinery for labor.

Private consumption falls initially but in the long run it rises. This is because real income falls at first before it permanently increases. It is noted that the higher machinery efficiency will also stimulate the real income of transfer recipients. There is a permanent fall in machinery investment since the lower machinery inventory requires lower reinvestment. In the long run there is a slight positive effect on the nominal wage and a negligible impact on exports.

Public finances deteriorate first as transfer payments to the unemployed increase in the short run and improves in the long run.

Figure 13a. The effect of a permanent increase in machinery efficiency



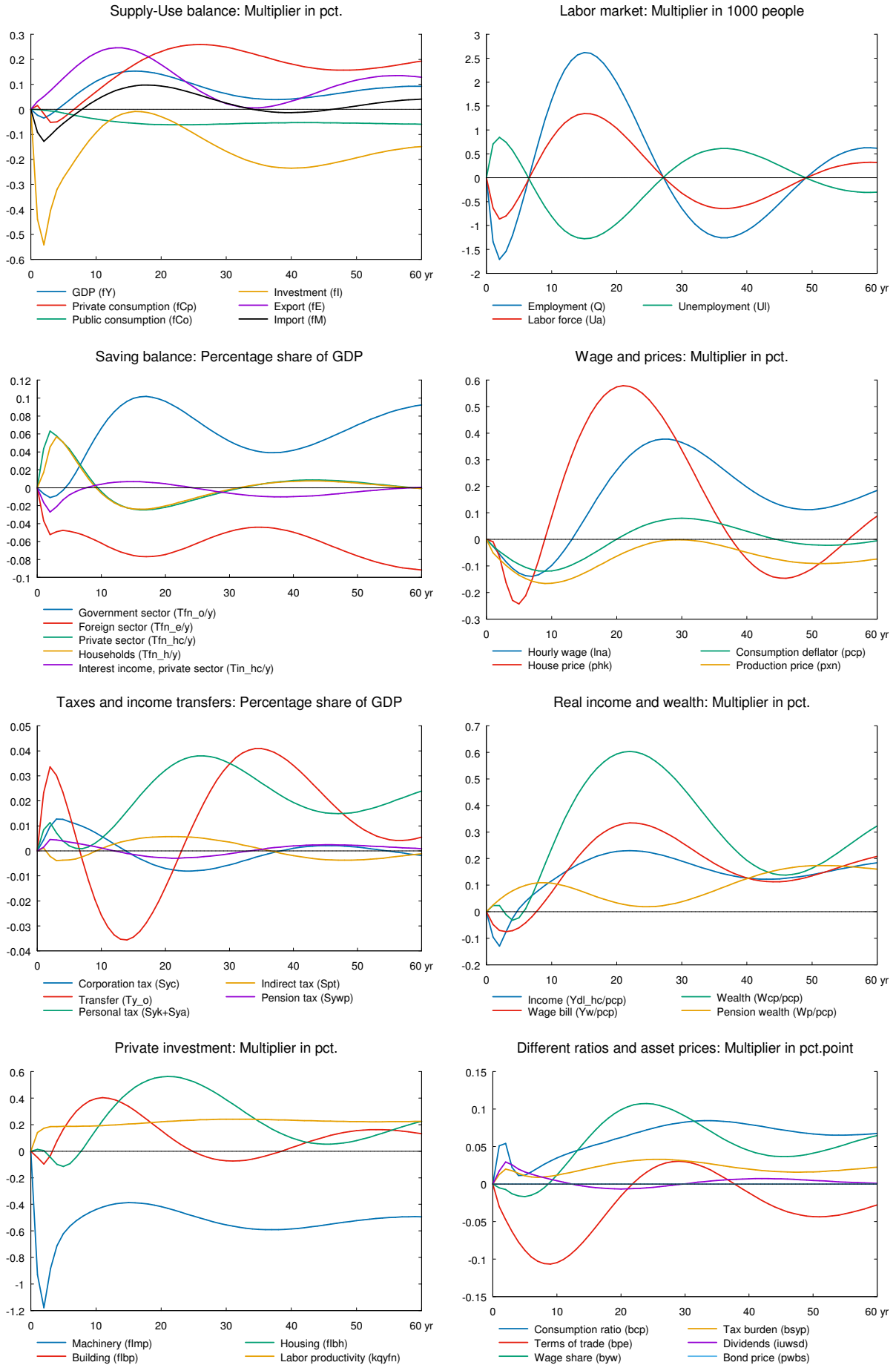
▼ B. Capital efficiency - including supply effects on exports

The experiment in section A is repeated accompanied by improved export performance.

Table 13b. The effect of a permanent increase in machinery efficiency, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	146	-166	-504	-492	-335	765	1922	2908	3501	3624
Pub. consumption	<i>fCo</i>	-5	-20	-33	-54	-83	-240	-360	-434	-469	-482
Investment	<i>fi</i>	-1929	-2535	-1955	-1595	-1382	-503	-68	-183	-652	-1237
Export	<i>fE</i>	383	648	954	1279	1622	3142	3634	2899	1555	443
Import	<i>fM</i>	-1009	-1500	-1252	-947	-683	492	1277	1431	1054	444
GDP	<i>fY</i>	-474	-711	-419	-36	395	2601	3820	3770	2926	1960
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-1.34	-1.71	-1.54	-1.20	-0.77	1.63	2.62	1.99	0.60	-0.64
Unemployment	<i>U</i>	0.71	0.85	0.74	0.57	0.36	-0.81	-1.28	-0.96	-0.28	0.32
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.01	-0.01	-0.01	0.00	0.01	0.07	0.10	0.10	0.07	0.05
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.04	0.06	0.06	0.05	0.04	0.00	-0.02	-0.02	-0.01	0.00
Balance of payments	<i>Enl/Y</i>	0.04	0.05	0.05	0.05	0.05	0.06	0.08	0.07	0.06	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	0.07	0.15	0.20	0.25	0.29	0.45	0.64	0.83	0.98	1.09
Bond debt	<i>Wbd_os_z/Y</i>	0.03	0.05	0.07	0.07	0.07	-0.14	-0.55	-0.92	-1.15	-1.22
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.01	-0.04	-0.08	-0.11	-0.14	-0.22	-0.20	-0.13	-0.05	-0.01
Labour intensity	<i>hq/fX</i>	-0.03	-0.04	-0.05	-0.06	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07
User cost	<i>uim</i>	-0.01	-0.01	-0.03	-0.04	-0.06	-0.07	-0.02	0.04	0.09	0.10
Wage	<i>lna</i>	-0.03	-0.06	-0.08	-0.11	-0.13	-0.10	0.07	0.26	0.37	0.37
Consumption price	<i>pcp</i>	-0.03	-0.05	-0.06	-0.08	-0.09	-0.12	-0.07	0.00	0.06	0.08
Terms of trade	<i>bpe</i>	-0.03	-0.05	-0.06	-0.08	-0.09	-0.10	-0.07	-0.02	0.02	0.03
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.05	0.05	0.02	0.01	0.01	0.03	0.05	0.06	0.07	0.08
Wage share	<i>byw</i>	0.00	-0.01	-0.01	-0.02	-0.02	0.01	0.06	0.10	0.11	0.09

Figure 13b. The effect of a permanent increase in machinery efficiency, with supply effects



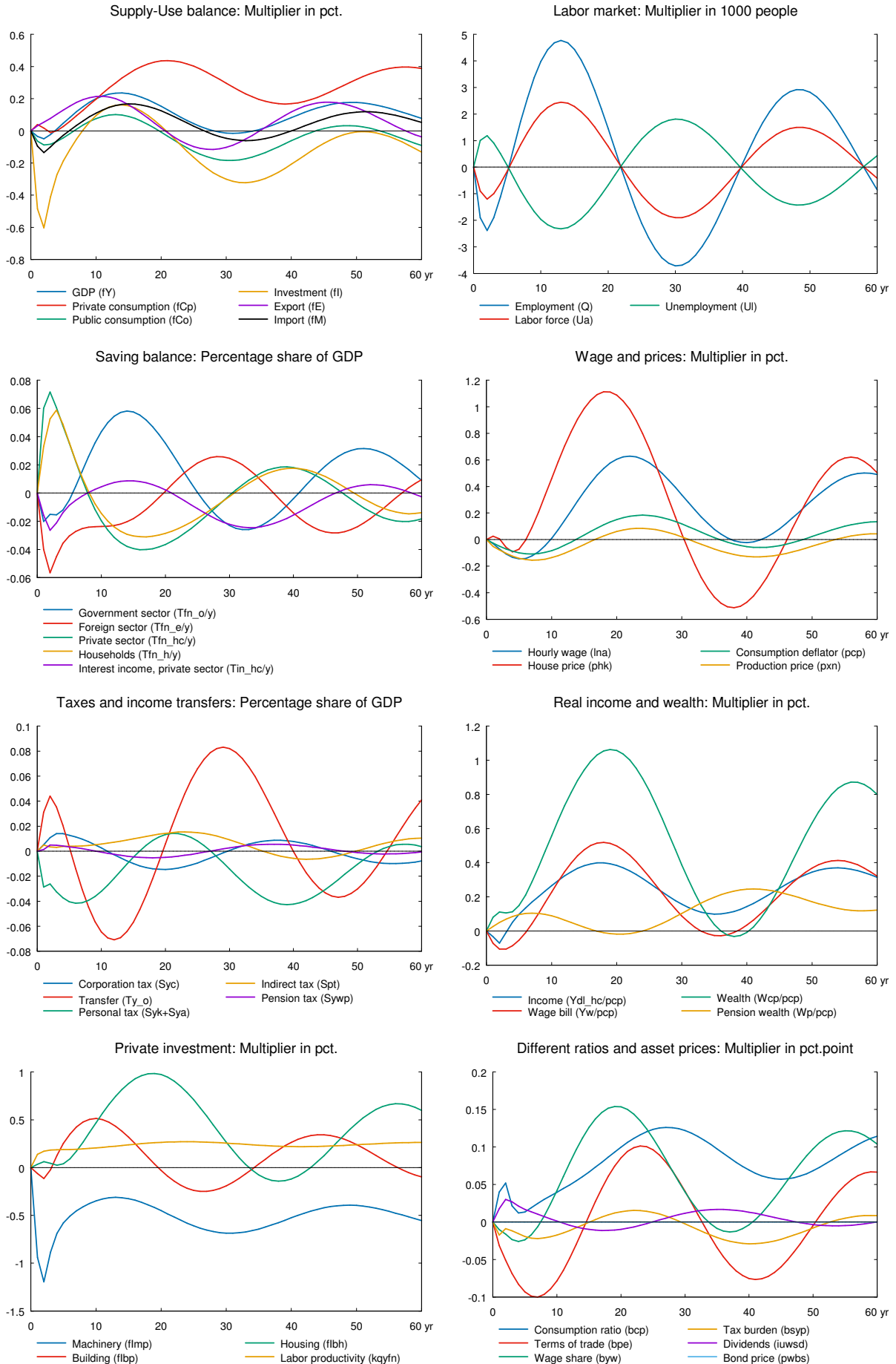
▼ C. Capital efficiency - balanced budget

The experiment in section B is repeated, where the income tax rates are reduced to balance the public budget.

Table 13c. The effect of a permanent increase in machinery efficiency, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	373	159	-100	12	283	2141	4150	5458	5441	4319
Pub. consumption	<i>fCo</i>	-343	-483	-463	-373	-246	475	598	-52	-980	-1527
Investment	<i>fi</i>	-2129	-2821	-1983	-1356	-941	518	919	186	-1127	-2215
Export	<i>fE</i>	398	673	988	1326	1683	2986	2438	292	-1703	-1915
Import	<i>fM</i>	-1054	-1594	-1206	-738	-332	1460	2377	1902	483	-817
GDP	<i>fY</i>	-718	-1011	-473	251	1032	4645	5790	4116	1301	-429
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-1.90	-2.38	-1.90	-1.12	-0.21	3.98	4.43	1.46	-2.12	-3.71
Unemployment	<i>U</i>	1.00	1.18	0.91	0.51	0.06	-1.96	-2.15	-0.68	1.06	1.81
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.02	-0.02	-0.02	-0.01	0.00	0.04	0.06	0.04	0.00	-0.02
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.06	0.07	0.06	0.05	0.04	-0.02	-0.04	-0.04	-0.02	0.00
Balance of payments	<i>Enl/Y</i>	0.04	0.06	0.05	0.04	0.03	0.02	0.02	0.00	-0.02	-0.02
Foreign receivables	<i>Wnnb_e/Y</i>	0.09	0.18	0.22	0.24	0.25	0.21	0.15	0.12	0.09	0.07
Bond debt	<i>Wbd_os_z/Y</i>	0.04	0.08	0.09	0.10	0.10	-0.09	-0.40	-0.58	-0.53	-0.34
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	0.00	-0.03	-0.08	-0.12	-0.16	-0.24	-0.15	0.00	0.11	0.11
Labour intensity	<i>hq/fX</i>	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.06	-0.07	-0.09	-0.10
User cost	<i>uim</i>	-0.02	-0.04	-0.06	-0.08	-0.09	-0.05	0.07	0.17	0.18	0.10
Wage	<i>lna</i>	-0.03	-0.07	-0.11	-0.13	-0.15	0.01	0.36	0.61	0.58	0.34
Consumption price	<i>pcp</i>	-0.03	-0.05	-0.07	-0.09	-0.10	-0.08	0.03	0.15	0.18	0.12
Terms of trade	<i>bpe</i>	-0.03	-0.05	-0.07	-0.08	-0.09	-0.08	0.01	0.09	0.10	0.04
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.04	0.05	0.02	0.01	0.01	0.04	0.07	0.10	0.12	0.12
Wage share	<i>byw</i>	-0.01	-0.02	-0.02	-0.03	-0.02	0.04	0.13	0.15	0.11	0.04

Figure 13c. The effect of a permanent increase in machinery efficiency, balanced budget



14. Productivity - labor and capital efficiency

Here the efficiency of capital and labor is increased, which leads to a fall in the demand for both factors. The experiment produces a general reduction in production costs, therefore, a long run gain in foreign trade and domestic production.

▼ A. Labor and capital efficiency

The efficiency of labor and capital is permanently raised by 1 percent.

Table 14a. The effect of a permanent increase in labor and capital efficiency

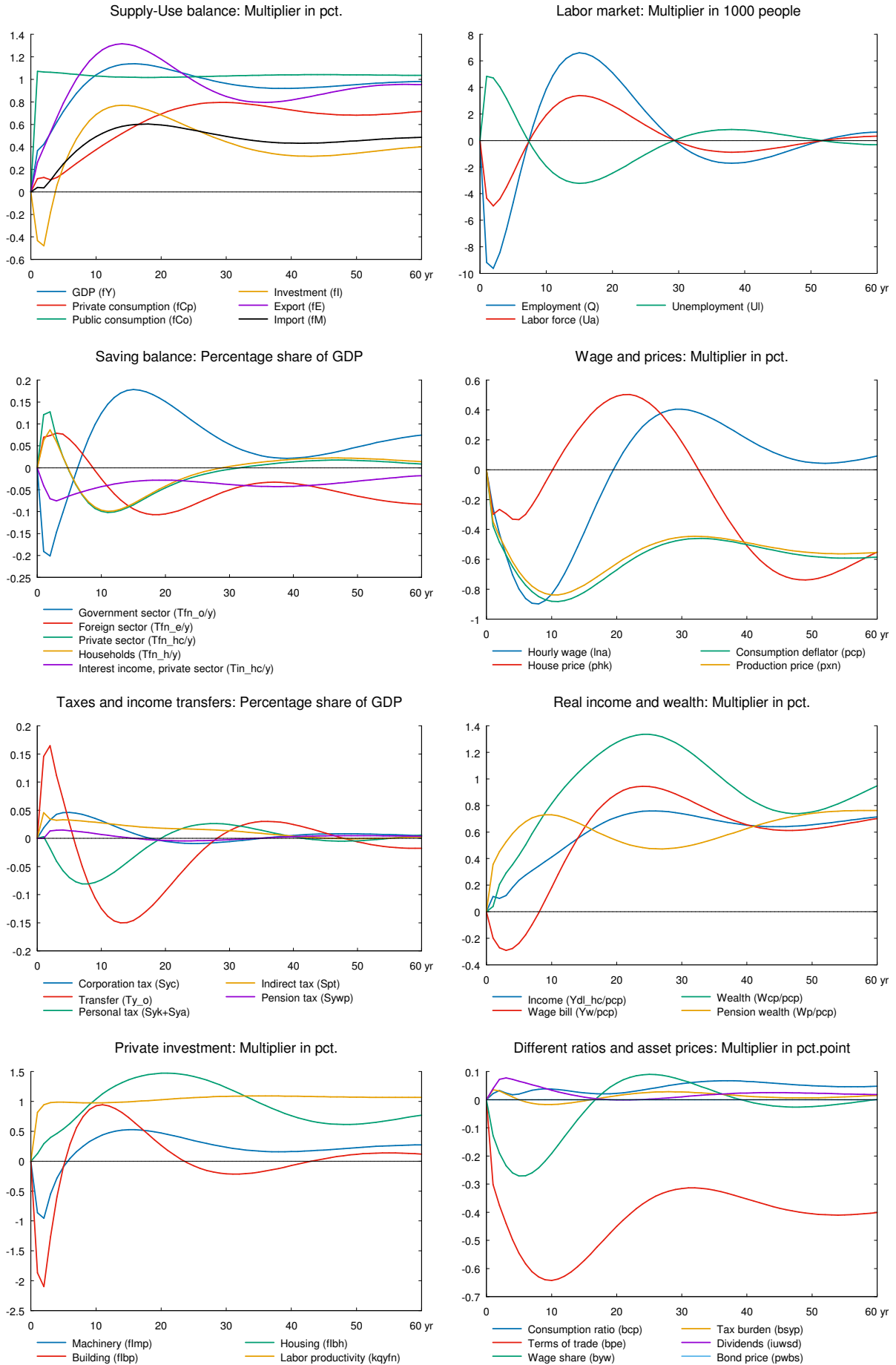
		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	1106	1228	1049	1265	1676	4061	6445	8699	10487	11590
Pub. consumption	<i>fCo</i>	5790	5850	5927	5995	6055	6365	6776	7288	7882	8542
Investment	<i>fi</i>	-1903	-2242	-874	289	1136	3741	4513	4338	3825	3278
Export	<i>fE</i>	3226	4912	6739	8477	10214	17008	19682	19068	17217	15926
Import	<i>fM</i>	431	428	1263	2198	3074	6493	8409	9094	9036	8740
GDP	<i>fY</i>	7513	8692	10830	13123	15343	24119	28498	29845	29970	30203
		<i>1000 Persons</i>									
Employment	<i>Q</i>	-9.19	-9.63	-8.43	-6.66	-4.66	3.87	6.61	5.11	2.20	-0.25
Unemployment	<i>U</i>	4.85	4.71	4.05	3.16	2.18	-1.94	-3.22	-2.46	-1.05	0.14
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	-0.19	-0.20	-0.15	-0.10	-0.06	0.12	0.18	0.15	0.10	0.05
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.12	0.13	0.07	0.03	-0.01	-0.10	-0.08	-0.05	-0.02	0.00
Balance of payments	<i>Enl/Y</i>	-0.07	-0.07	-0.08	-0.08	-0.07	0.03	0.09	0.11	0.08	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	0.01	0.01	-0.03	-0.09	-0.14	-0.24	-0.02	0.33	0.61	0.78
Bond debt	<i>Wbd_os_z/Y</i>	0.25	0.47	0.62	0.72	0.76	0.36	-0.49	-1.19	-1.56	-1.63
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.40	-0.51	-0.63	-0.73	-0.82	-0.99	-0.89	-0.71	-0.55	-0.46
Labour intensity	<i>hq/fX</i>	-0.69	-0.78	-0.85	-0.90	-0.93	-0.97	-0.97	-0.96	-0.96	-0.97
User cost	<i>uim</i>	-0.39	-0.45	-0.52	-0.58	-0.63	-0.71	-0.61	-0.44	-0.32	-0.26
Wage	<i>lna</i>	-0.26	-0.43	-0.58	-0.70	-0.80	-0.83	-0.42	0.04	0.33	0.41
Consumption price	<i>pcp</i>	-0.38	-0.48	-0.57	-0.65	-0.72	-0.88	-0.82	-0.67	-0.54	-0.47
Terms of trade	<i>bpe</i>	-0.30	-0.37	-0.44	-0.50	-0.54	-0.64	-0.57	-0.45	-0.35	-0.31
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.02	0.04	0.06
Wage share	<i>byw</i>	-0.13	-0.19	-0.23	-0.26	-0.27	-0.19	-0.04	0.06	0.09	0.07

Higher efficiency of labor and capital means that both factor inputs can be reduced, consequently investment and employment fall in the short term. The fall, particularly in machinery investment, reduces imports and depreciation, which increases gross operating surplus. As factors efficiency increases prices fall and net exports increase without relying on change in wages. Higher net exports increase production and employment. This offsets the initial fall in employment created by the increase in labor efficiency.

The initial fall in employment pushes wages and prices downward. This improves competitiveness and induce exports to rise even more. As in the previous experiment, the combined effect of higher efficiency and lower wages means that the short-term decrease in factor utilization disappears relatively quickly and the initial negative impact on employment is reversed quickly. In the long term, capital intensity and labor intensity fall by approximately 1 percent, excluding the housing sector.

There is a small positive impact on private consumption in the long run, due to the positive impact on real disposable income, which is stimulated as the higher productivity increases the real income of transfer recipients. The public budget improves in the long term.

Figure 14a. The effect of a permanent increase in labor and capital efficiency



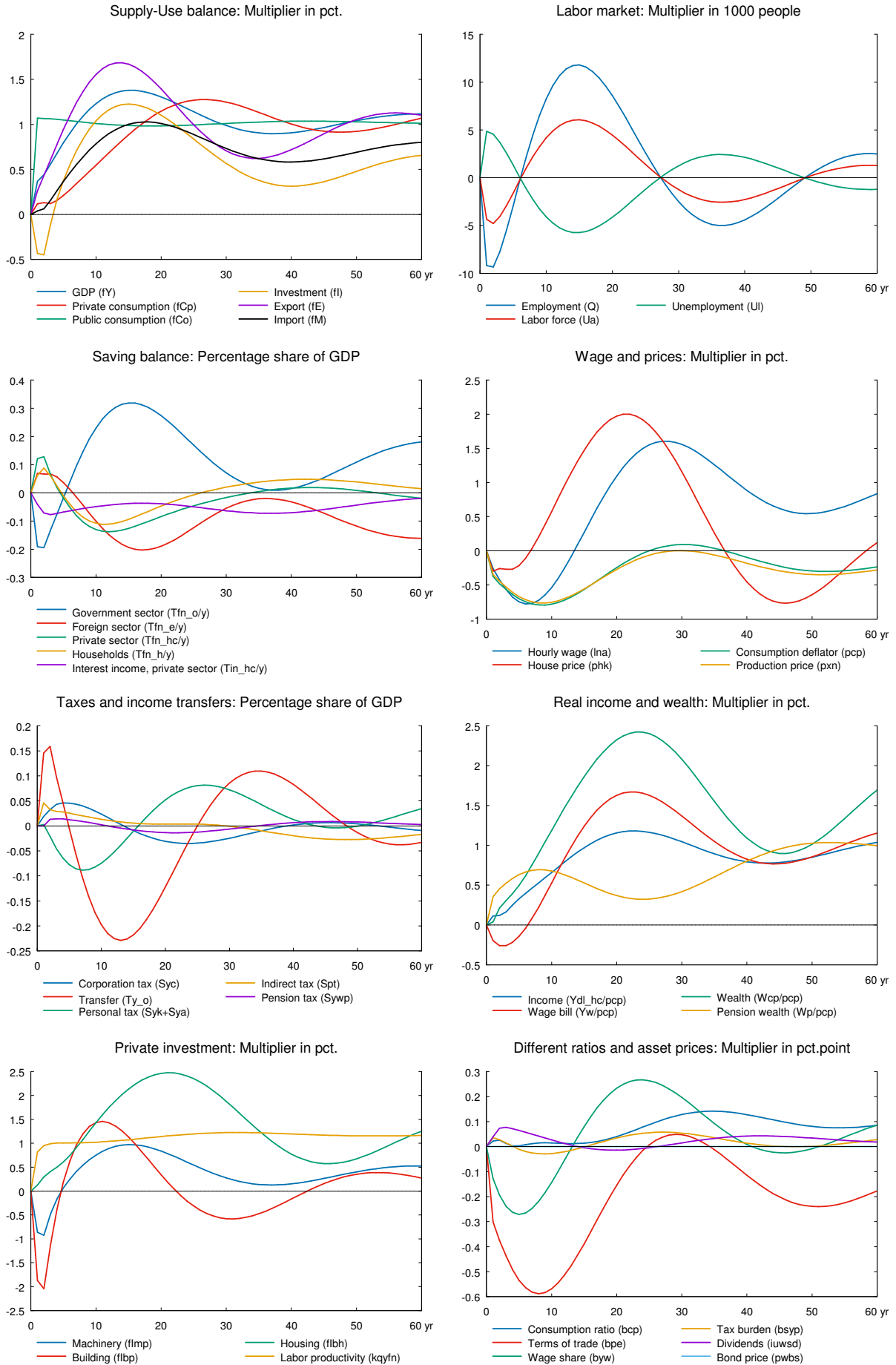
▼ B. Labor and capital efficiency - including supply effects on exports

The experiment in section A is repeated accompanied by improved export performance.

Table 14b. The effect of a permanent increase in labor and capital efficiency, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	1106	1264	1172	1524	2111	5925	10308	14390	17169	18182
Pub. consumption	<i>fCo</i>	5790	5845	5914	5971	6018	6239	6565	7039	7657	8382
Investment	<i>fi</i>	-1903	-2105	-535	822	1885	5663	7206	6985	5728	4172
Export	<i>fE</i>	3226	5371	7664	9926	12225	21679	25073	22543	17359	13264
Import	<i>fM</i>	431	726	1915	3234	4536	10384	14210	15440	14630	12993
GDP	<i>fY</i>	7513	9021	11556	14312	17048	28594	34529	35256	33158	30925
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-9.19	-9.33	-7.72	-5.47	-2.93	8.26	11.80	8.57	2.61	-2.50
Unemployment	<i>U</i>	4.85	4.55	3.68	2.56	1.32	-4.09	-5.74	-4.13	-1.22	1.25
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.19	-0.19	-0.13	-0.08	-0.02	0.23	0.32	0.27	0.17	0.07
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.12	0.13	0.07	0.02	-0.02	-0.13	-0.13	-0.08	-0.05	-0.02
Balance of payments	<i>Enl/Y</i>	-0.07	-0.07	-0.07	-0.06	-0.04	0.10	0.19	0.19	0.12	0.05
Foreign receivables	<i>Wnnb_e/Y</i>	0.01	0.01	-0.04	-0.09	-0.13	-0.06	0.47	1.15	1.65	1.90
Bond debt	<i>Wbd_os_z/Y</i>	0.25	0.46	0.59	0.65	0.64	-0.19	-1.63	-2.81	-3.36	-3.30
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.40	-0.52	-0.66	-0.78	-0.88	-1.10	-0.94	-0.62	-0.32	-0.15
Labour intensity	<i>hq/fX</i>	-0.69	-0.79	-0.86	-0.92	-0.95	-1.02	-1.01	-1.00	-1.00	-1.00
User cost	<i>uim</i>	-0.39	-0.45	-0.51	-0.57	-0.62	-0.64	-0.40	-0.10	0.11	0.18
Wage	<i>lna</i>	-0.26	-0.42	-0.57	-0.68	-0.75	-0.54	0.27	1.09	1.55	1.56
Consumption price	<i>pcp</i>	-0.38	-0.48	-0.57	-0.64	-0.70	-0.78	-0.57	-0.25	0.00	0.09
Terms of trade	<i>bpe</i>	-0.30	-0.37	-0.44	-0.49	-0.53	-0.57	-0.39	-0.15	0.01	0.05
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.02	0.03	0.01	0.00	0.00	0.01	0.01	0.04	0.09	0.13
Wage share	<i>byw</i>	-0.13	-0.19	-0.24	-0.26	-0.27	-0.14	0.08	0.23	0.26	0.20

Figure 14b. The effect of a permanent increase in labor and capital efficiency, with supply effects



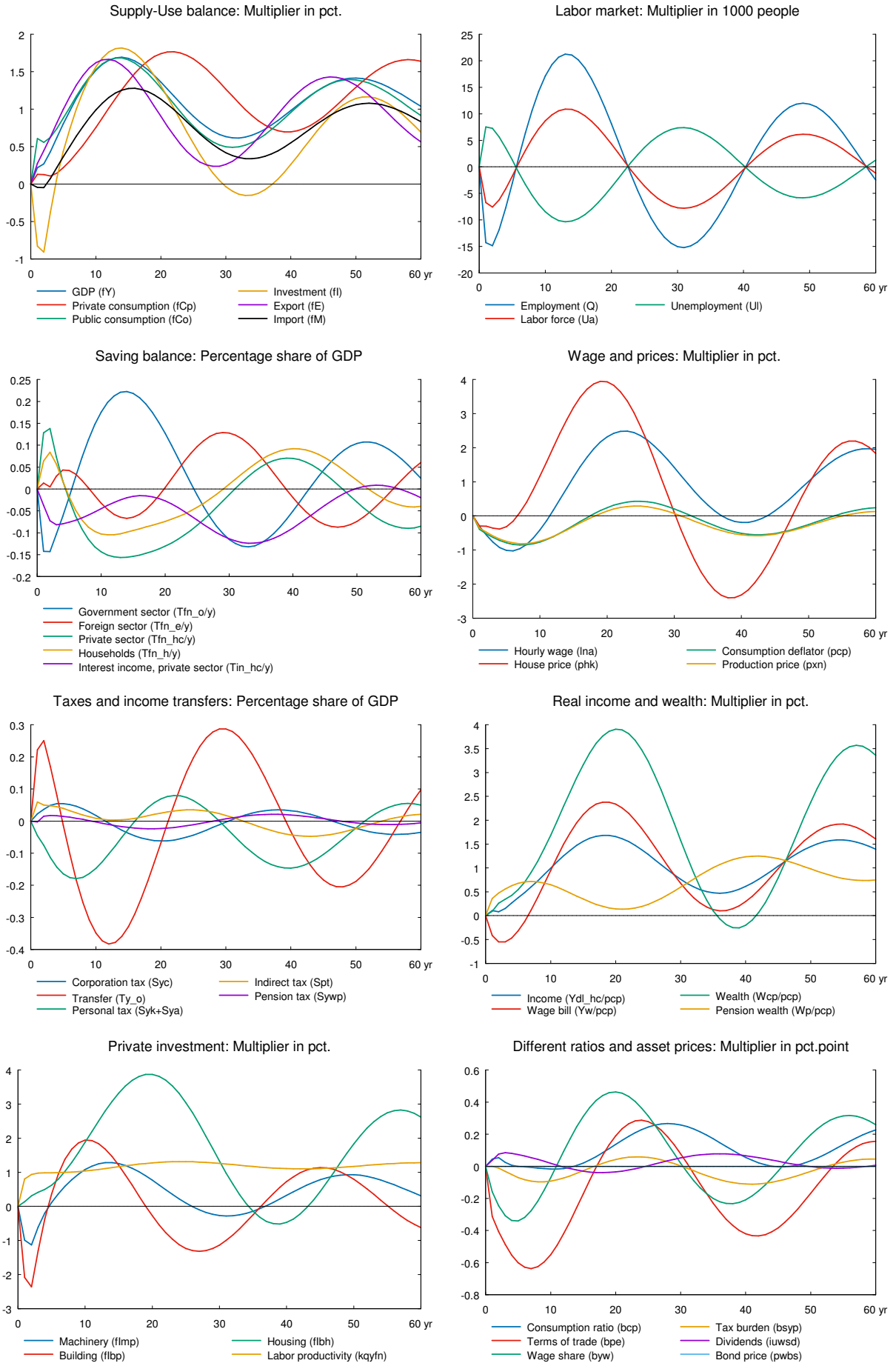
▼ C. Labor and capital efficiency - balanced budget

The experiment in section B is repeated, where the income tax rates are reduced to balance the public budget.

Table 14c. The effect of a permanent increase in labor and capital efficiency, with supply effects, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	1234	1230	1056	1459	2206	8203	16035	21891	22609	18484
Pub. consumption	<i>fCo</i>	3291	3069	3486	4189	5049	9451	11043	9181	5953	4141
Investment	<i>fi</i>	-3640	-4248	-1809	417	2204	8546	10560	8323	3721	-247
Export	<i>fE</i>	3375	5595	8004	10442	12951	22605	22717	14637	6229	4936
Import	<i>fM</i>	-477	-562	947	2736	4533	13093	18119	17350	12369	7435
GDP	<i>fY</i>	4468	5557	9034	13084	17245	35264	42046	36801	26370	19876
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-14.27	-14.86	-11.89	-7.70	-3.00	17.14	20.18	8.11	-7.24	-15.04
Unemployment	<i>U</i>	7.53	7.26	5.65	3.57	1.26	-8.46	-9.78	-3.82	3.63	7.34
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	-0.14	-0.14	-0.10	-0.06	-0.02	0.18	0.22	0.13	-0.01	-0.12
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.13	0.14	0.07	0.02	-0.02	-0.14	-0.15	-0.13	-0.08	-0.01
Balance of payments	<i>En/Y</i>	-0.01	0.00	-0.03	-0.04	-0.04	0.03	0.06	0.00	-0.10	-0.13
Foreign receivables	<i>Wnnb_e/Y</i>	0.17	0.27	0.25	0.18	0.09	-0.35	-0.48	-0.43	-0.41	-0.43
Bond debt	<i>Wbd_os_z/Y</i>	0.28	0.48	0.58	0.62	0.59	-0.25	-1.51	-2.22	-2.03	-1.19
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.29	-0.43	-0.63	-0.81	-0.96	-1.27	-0.92	-0.28	0.20	0.25
Labour intensity	<i>hq/fX</i>	-0.73	-0.83	-0.91	-0.95	-0.97	-0.96	-0.94	-0.97	-1.03	-1.08
User cost	<i>uim</i>	-0.43	-0.54	-0.64	-0.72	-0.77	-0.64	-0.10	0.38	0.47	0.18
Wage	<i>lna</i>	-0.30	-0.56	-0.77	-0.93	-1.01	-0.41	1.14	2.32	2.35	1.42
Consumption price	<i>pcp</i>	-0.39	-0.52	-0.63	-0.72	-0.79	-0.77	-0.28	0.24	0.43	0.21
Terms of trade	<i>bpe</i>	-0.31	-0.40	-0.48	-0.55	-0.60	-0.55	-0.17	0.19	0.28	0.08
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	0.05	0.05	0.03	0.01	0.00	-0.02	0.02	0.14	0.24	0.26
Wage share	<i>byw</i>	-0.16	-0.25	-0.31	-0.34	-0.34	-0.07	0.31	0.46	0.31	0.02

Figure 14c. The effect of a permanent increase in labor and capital efficiency, balanced budget



15. Interest rates

Due to the fixed exchange rate policy, the Danish interest rates are largely determined by conditions abroad. They are basically exogenous like foreign prices and foreign demand. In the experiment, both the domestic and foreign interest rates in ADAM are permanently reduced by 1 percentage point i.e. from 3.5 percent in the baseline scenario to 2.5 percent. The experiment does not take into account that a general fall in foreign interest rates can stimulate foreign markets and foreign competitiveness. Thus, the experiment maybe interpreted as a 1 percentage point reduction in the interest rate differential to the Euro zone interest rates. For a broader discussion of the interest rate experiment see [grh12912](#). The following two sections present the effects of reducing interest rates - with and without balanced public budget.

▼ A. Interest rates

Both domestic and foreign interest rates are permanently reduced by 1 percentage point.

Table 15a. The effect of a permanent fall in interest rates

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	1720	1322	7296	12040	16617	35034	46207	50806	50337	47264
Pub. consumption	<i>fCo</i>	-81	-86	-336	-596	-841	-1625	-1744	-1486	-1122	-834
Investment	<i>fi</i>	10386	19429	23366	27351	30510	36265	32385	26041	20825	18227
Export	<i>fE</i>	3779	6322	9123	10999	12450	9885	-4828	-21173	-30749	-31031
Import	<i>fM</i>	6707	10534	14653	17698	20403	27317	25901	20708	15568	12881
GDP	<i>fY</i>	9389	16968	25393	32886	39283	53668	47833	35423	25700	22553
		<i>1000 Persons</i>									
Employment	<i>Q</i>	2.92	9.57	16.99	23.99	29.97	38.94	23.58	3.37	-10.04	-13.86
Unemployment	<i>U</i>	-1.54	-4.93	-8.57	-11.96	-14.83	-18.91	-11.30	-1.48	4.96	6.74
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	0.18	-0.67	-0.39	-0.17	0.00	0.21	-0.24	-0.83	-1.28	-1.53
Priv. saving surplus	<i>Tfn_hc/Y</i>	-1.70	-0.79	-1.10	-1.32	-1.50	-1.67	-1.32	-0.96	-0.70	-0.53
Balance of payments	<i>Enl/Y</i>	-1.52	-1.46	-1.49	-1.50	-1.50	-1.46	-1.57	-1.79	-1.98	-2.06
Foreign receivables	<i>Wnnb_e/Y</i>	-2.43	-3.56	-4.85	-6.18	-7.55	-14.17	-20.19	-26.06	-31.93	-37.53
Bond debt	<i>Wbd_os_z/Y</i>	2.13	2.17	1.96	1.60	1.14	-1.32	-1.72	0.79	5.40	10.83
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.35	-0.48	-0.57	-0.58	-0.50	0.70	2.24	3.32	3.71	3.58
Labour intensity	<i>hq/fX</i>	-0.39	-0.53	-0.63	-0.70	-0.75	-0.77	-0.76	-0.78	-0.81	-0.84
User cost	<i>uim</i>	-5.90	-6.14	-6.26	-6.33	-6.34	-5.83	-5.06	-4.60	-4.58	-4.86
Wage	<i>lna</i>	-0.05	-0.09	0.02	0.25	0.60	3.29	5.82	6.92	6.60	5.57
Consumption price	<i>pcp</i>	-0.11	-0.57	-0.94	-1.20	-1.38	-1.34	-0.71	-0.26	-0.26	-0.61
Terms of trade	<i>bpe</i>	-0.13	-0.28	-0.38	-0.43	-0.43	0.02	0.67	1.06	1.08	0.85
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	1.24	-0.21	-0.01	0.08	0.17	0.34	0.32	0.27	0.20	0.09
Wage share	<i>byw</i>	-0.13	0.04	0.25	0.47	0.69	1.70	2.24	2.28	2.04	1.77

The lower interest rates have an expansionary effect on both investment and private consumption. The effect on consumption comes primarily from the effect on the housing market. Lower interest rates reduce the cost of capital and the demand for capital increases. The demand for capital including housing capital also increases due to the *substitution effect*. ▼ The higher capital demand increases investment and house prices. A rise in house price increases housing wealth, and since housing wealth is part of the total private wealth, private consumption increases. However, there is a delay in the response of private consumption to wealth. The decrease in the cost of capital also reduces prices and improves competitiveness, so exports increase in the short run. Thus, the short-run effect is positive on both domestic demand and exports.

The strong demand is met by increased domestic production and increased imports, and employment increases and drives wages upward. Despite the rise in wages, output prices fall at first as the cost of capital falls. This immediate positive effect on competitiveness reflects that the interest rate reduction works like a drop in the interest rate differential vis-a-vis the exogenous foreign interest rates. Later on, the wage effects on prices dominate and the *wage-driven crowding out* brings employment back to the baseline. ▼

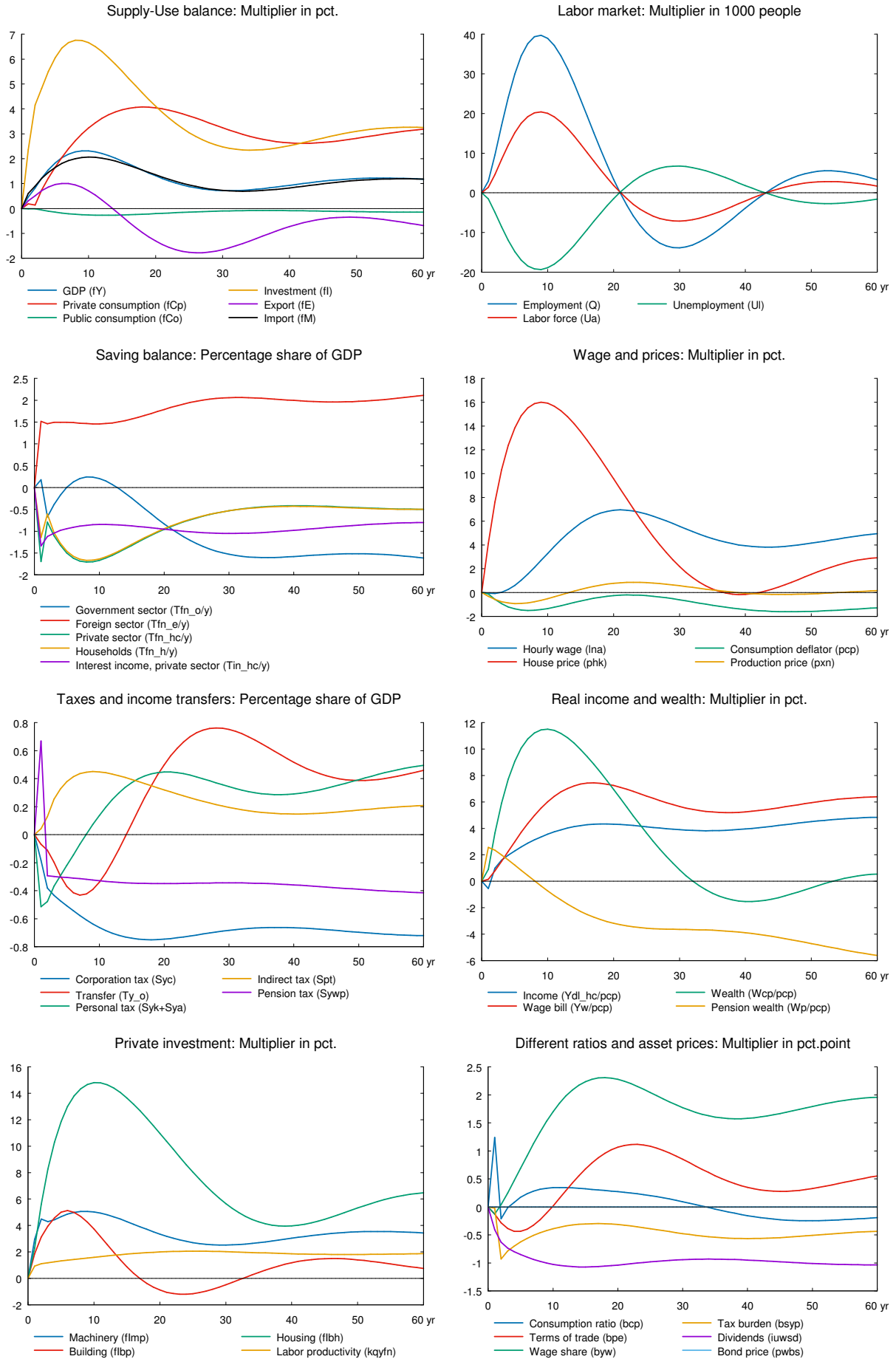
Private consumption increases permanently due to the positive *real wage effect*. ▼ More basically, the long term positive effect on disposable income and private consumption reflects that the interest rate after tax is lower than the growth rate implying that lower private net assets do not harm consumption,

see the discussion in the ADAM book. The lower private financial net assets reflect two mechanisms: 1) a decrease in total private wealth due to the decrease in pension savings that follows from the lower return on pension assets and more basically 2) the increase in the housing stock and hence in housing wealth. The desired private financial net assets equal total desired private wealth minus housing wealth. Total desired wealth of the private sector is determined in the long term by the consumption function and income, as income minus consumption represents private savings.

The long-term effect on total investment remains positive. The permanent fall in interest rates and the permanent rise in wages imply that capital stocks remain relatively cheaper than labor. So that the capital stock and investments increase permanently. The effect is strongest on housing investment and smallest on businesses building investment. The user cost is based on smaller depreciation rate for buildings than for machinery, so the user cost of business buildings falls more in percentage terms. However, the higher substitution possibility in machinery than in buildings implies that machinery investments rise by more than building investments.

The public budget deteriorates in the long term due to lower revenues from the taxation of private net financial income. A tax increase in order to keep the budget balance constant will almost eliminate the positive long-term effect on consumption. In general, the lower interest rate acts as a positive demand shock increasing the demand for capital through lower user costs and increasing the propensity to consume through the negative impact on institutional pension savings.

Figure 15a. The effect of a permanent 1 percentage point fall in interest rates



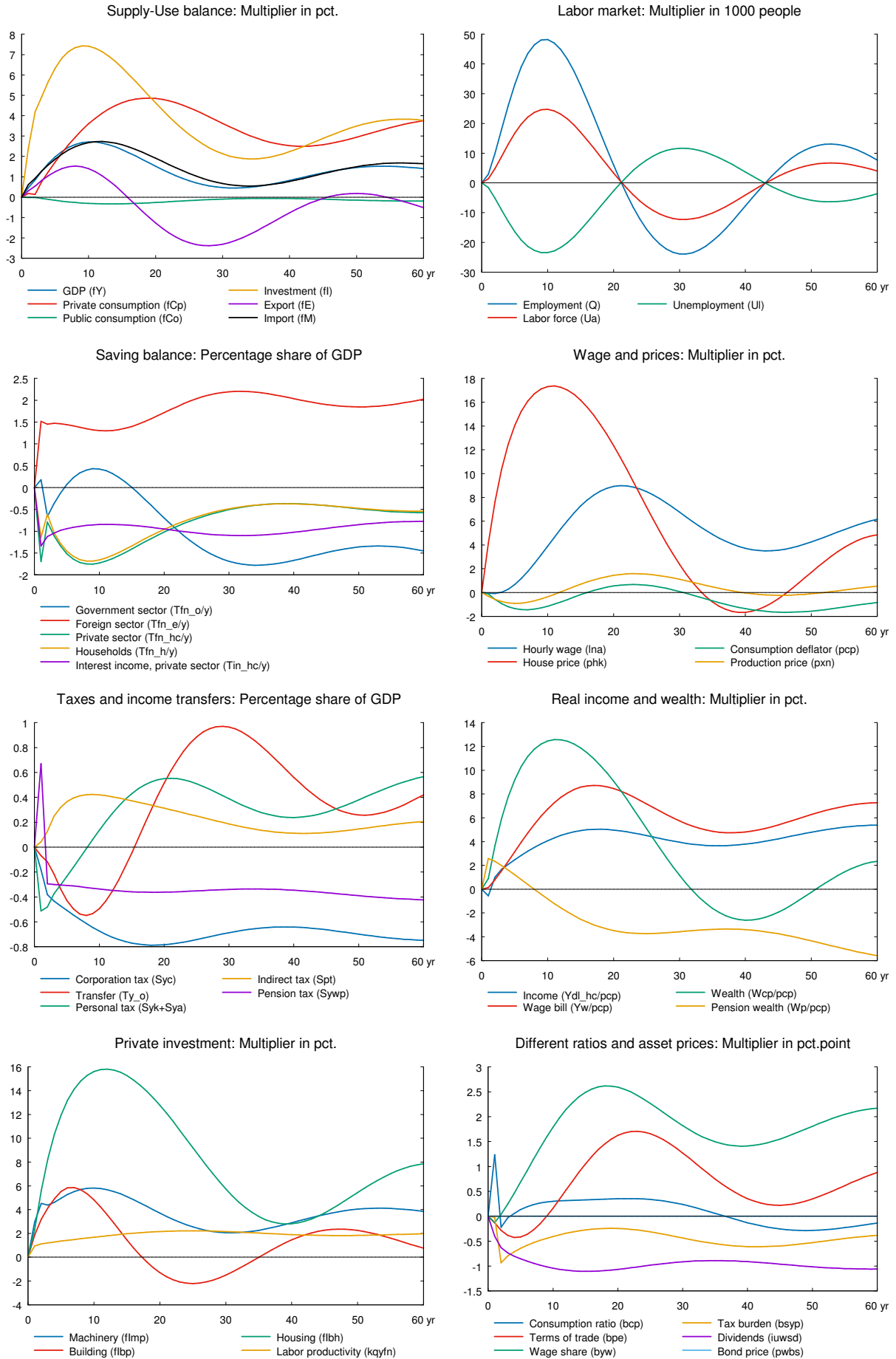
▼ B. Interest rates - including supply effects on exports

The experiment in section A is repeated accompanied by improved export performance.

Table 15b. The effect of a permanent fall in interest rates, with supply effects

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	1720	1362	7457	12432	17358	38979	54054	60826	59475	52815
Pub. consumption	<i>fCo</i>	-81	-91	-354	-633	-905	-1886	-2145	-1853	-1304	-782
Investment	<i>fi</i>	10386	19578	23833	28242	31912	40364	37344	29336	21061	15657
Export	<i>fE</i>	3779	6821	10446	13438	16203	19558	3812	-20446	-38926	-43335
Import	<i>fM</i>	6707	10858	15575	19431	23118	35469	36505	29218	19210	11848
GDP	<i>fY</i>	9389	17325	26408	34844	42409	63020	58460	41001	23611	14748
						<i>1000 Persons</i>					
Employment	<i>Q</i>	2.92	9.89	17.97	25.92	33.09	48.18	32.84	5.97	-15.52	-23.91
Unemployment	<i>U</i>	-1.54	-5.10	-9.08	-12.94	-16.39	-23.44	-15.78	-2.68	7.69	11.65
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	0.18	-0.66	-0.37	-0.13	0.07	0.43	0.01	-0.70	-1.32	-1.69
Priv. saving surplus	<i>Tfn_hc/Y</i>	-1.70	-0.79	-1.11	-1.33	-1.52	-1.73	-1.41	-1.02	-0.71	-0.51
Balance of payments	<i>Enl/Y</i>	-1.52	-1.45	-1.47	-1.46	-1.44	-1.30	-1.40	-1.72	-2.04	-2.20
Foreign receivables	<i>Wnnb_e/Y</i>	-2.43	-3.56	-4.86	-6.18	-7.53	-13.78	-19.14	-24.56	-30.50	-36.60
Bond debt	<i>Wbd_os_z/Y</i>	2.13	2.15	1.92	1.50	0.95	-2.36	-3.84	-1.89	3.04	9.50
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.35	-0.50	-0.61	-0.66	-0.63	0.47	2.20	3.64	4.31	4.20
Labour intensity	<i>hq/fX</i>	-0.39	-0.54	-0.65	-0.74	-0.79	-0.86	-0.82	-0.81	-0.82	-0.85
User cost	<i>uim</i>	-5.90	-6.14	-6.26	-6.32	-6.33	-5.69	-4.65	-3.97	-3.92	-4.38
Wage	<i>lna</i>	-0.05	-0.08	0.03	0.29	0.68	3.89	7.27	8.92	8.49	6.76
Consumption price	<i>pcp</i>	-0.11	-0.57	-0.93	-1.19	-1.35	-1.15	-0.18	0.55	0.62	0.08
Terms of trade	<i>bpe</i>	-0.13	-0.28	-0.38	-0.42	-0.42	0.16	1.05	1.62	1.65	1.27
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	1.24	-0.22	-0.03	0.05	0.13	0.30	0.33	0.35	0.34	0.24
Wage share	<i>byw</i>	-0.13	0.04	0.24	0.46	0.68	1.79	2.49	2.59	2.27	1.82

Figure 15b. The effect of a permanent fall in interest rates, with supply effects



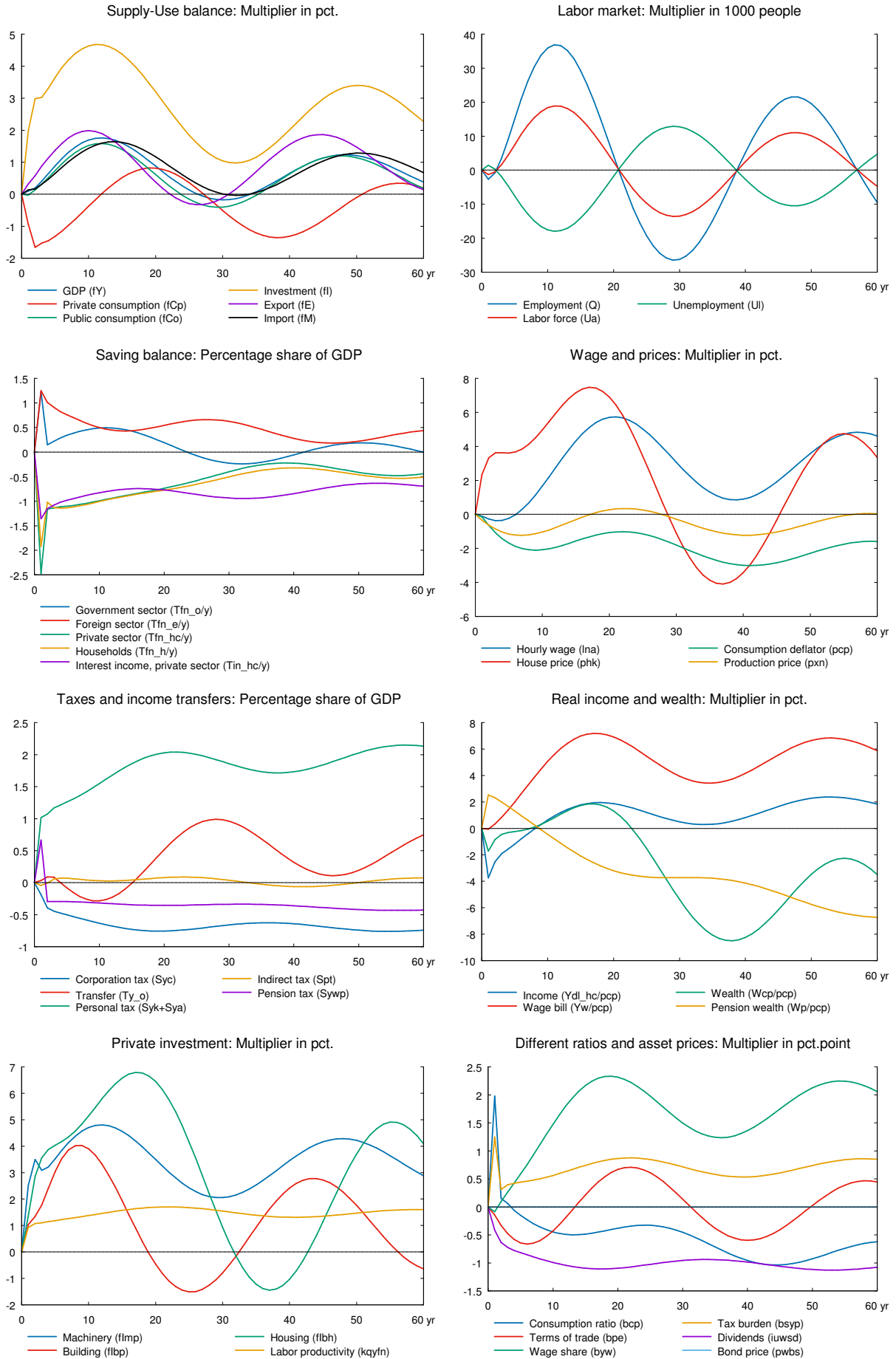
▼ C. Interest rates - balanced budget

The experiment in section B is repeated with an increase in income tax rates to balance the public budget.

Table 15c. The effect of a permanent fall in interest rates, balanced budget

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	-8855	-15916	-14904	-14368	-13187	-4052	6030	10258	4930	-7335
Pub. consumption	<i>fCo</i>	-126	730	1769	2955	4239	9408	9297	4412	-1185	-3321
Investment	<i>fi</i>	8676	13986	14649	16469	18375	25241	25700	20303	12640	7679
Export	<i>fE</i>	3963	7204	11123	14528	17876	27715	21735	6185	-5050	-2147
Import	<i>fM</i>	1542	1935	3834	5725	8074	19011	23026	17883	7800	223
GDP	<i>fY</i>	2060	3955	8534	13623	19046	39383	40086	23788	3884	-5475
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-2.68	-0.81	3.53	9.05	15.10	35.94	29.32	4.18	-19.25	-26.27
Unemployment	<i>U</i>	1.41	0.32	-1.90	-4.63	-7.60	-17.57	-14.12	-1.80	9.52	12.77
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	1.22	0.15	0.22	0.29	0.34	0.49	0.43	0.19	-0.07	-0.23
Priv. saving surplus	<i>Tfn_hc/Y</i>	-2.47	-1.16	-1.14	-1.11	-1.10	-0.99	-0.86	-0.74	-0.58	-0.40
Balance of payments	<i>En/Y</i>	-1.25	-1.01	-0.91	-0.83	-0.76	-0.50	-0.44	-0.54	-0.65	-0.63
Foreign receivables	<i>Wnnb_e/Y</i>	-2.25	-2.70	-3.25	-3.86	-4.50	-7.54	-9.95	-12.06	-14.16	-16.11
Bond debt	<i>Wbd_os_z/Y</i>	1.55	1.00	0.39	-0.23	-0.86	-3.84	-5.98	-6.54	-5.46	-3.47
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	-0.11	-0.08	-0.14	-0.21	-0.28	-0.11	0.82	1.90	2.48	2.27
Labour intensity	<i>hq/fX</i>	-0.32	-0.40	-0.46	-0.52	-0.55	-0.58	-0.59	-0.66	-0.75	-0.80
User cost	<i>uim</i>	-5.88	-6.10	-6.23	-6.32	-6.36	-5.98	-5.13	-4.58	-4.70	-5.33
Wage	<i>lna</i>	-0.11	-0.27	-0.36	-0.35	-0.24	1.66	4.32	5.71	5.03	3.07
Consumption price	<i>pcp</i>	-0.15	-0.65	-1.08	-1.42	-1.69	-2.08	-1.57	-1.07	-1.15	-1.80
Terms of trade	<i>bpe</i>	-0.14	-0.33	-0.47	-0.58	-0.64	-0.43	0.21	0.67	0.61	0.14
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	1.98	0.15	0.06	-0.06	-0.15	-0.45	-0.49	-0.38	-0.33	-0.45
Wage share	<i>byw</i>	-0.08	0.10	0.27	0.42	0.59	1.48	2.17	2.32	1.98	1.50

Figure 15c. The effect of a permanent fall in interest rates, balanced budget



16. Private consumption

All the previous sections have highlighted the role that consumption and wage equations play in ADAM in achieving stability after the economy have been displaced from equilibrium. In the present and subsequent section, we introduce a shock to these equations one by one. This section presents the effect of a temporary increase in the propensity to consume. The shock to private consumption is made by a one off change in the constant of the consumption function, which directly influences consumption. Private consumption is increased in year one by 0.1 percent of GDP, in 2010 prices. ([See experiment](#))

Table 16. The effect of a temporary exogenous increase in private consumption

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
		<i>Million 2010-Dkr.</i>									
Priv. consumption	<i>fCp</i>	2678	1405	1108	850	648	7	-350	-492	-463	-323
Pub. consumption	<i>fCo</i>	-107	-88	-71	-55	-41	9	27	26	14	2
Investment	<i>fi</i>	807	1054	778	577	377	-304	-425	-279	-82	65
Export	<i>fE</i>	-46	-144	-218	-285	-355	-561	-368	56	419	544
Import	<i>fM</i>	1467	812	541	357	201	-278	-379	-256	-64	90
GDP	<i>fY</i>	1967	1509	1139	800	490	-542	-724	-428	-42	212
		<i>1000 Persons</i>									
Employment	<i>Q</i>	1.39	1.42	1.17	0.85	0.51	-0.71	-0.83	-0.37	0.10	0.35
Unemployment	<i>U</i>	-0.74	-0.69	-0.56	-0.40	-0.23	0.35	0.40	0.18	-0.05	-0.17
		<i>Percent of GDP</i>									
Pub. budget balance	<i>Tfn_o/Y</i>	0.06	0.05	0.05	0.04	0.02	-0.02	-0.02	-0.02	0.00	0.00
Priv. saving surplus	<i>Tfn_hc/Y</i>	-0.14	-0.10	-0.08	-0.06	-0.04	0.01	0.02	0.01	0.01	0.00
Balance of payments	<i>Enl/Y</i>	-0.08	-0.05	-0.03	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00
Foreign receivables	<i>Wnnb_e/Y</i>	-0.12	-0.16	-0.18	-0.19	-0.20	-0.18	-0.15	-0.13	-0.10	-0.07
Bond debt	<i>Wbd_os_z/Y</i>	-0.08	-0.12	-0.16	-0.19	-0.20	-0.14	0.00	0.09	0.11	0.08
		<i>Percent</i>									
Capital intensity	<i>fKn/fX</i>	-0.06	-0.04	-0.01	0.01	0.03	0.06	0.03	0.00	-0.02	-0.03
Labour intensity	<i>hq/fX</i>	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
User cost	<i>uim</i>	0.00	0.01	0.01	0.02	0.03	0.03	0.01	-0.01	-0.02	-0.02
Wage	<i>lna</i>	0.01	0.04	0.06	0.07	0.08	0.07	0.00	-0.05	-0.06	-0.04
Consumption price	<i>pcp</i>	0.01	0.02	0.02	0.03	0.03	0.04	0.02	-0.01	-0.02	-0.02
Terms of trade	<i>bpe</i>	0.00	0.01	0.01	0.02	0.02	0.02	0.00	-0.01	-0.02	-0.01
		<i>Percentage-point</i>									
Consumption ratio	<i>bcp</i>	0.16	0.07	0.06	0.05	0.04	0.00	-0.01	-0.01	-0.01	-0.01
Wage share	<i>byw</i>	-0.02	0.00	0.01	0.02	0.02	0.01	-0.01	-0.02	-0.01	0.00

The shock to private consumption initially works in the same way as a shock to public consumption. Higher private consumption boosts domestic demand; hence private production and employment increase. This creates additional demand for consumption and investment. Imports also increase in the short run as part of the higher domestic demand is met through imports. The higher employment stimulates wage growth and prices and competitiveness fall, leading to a fall in exports.

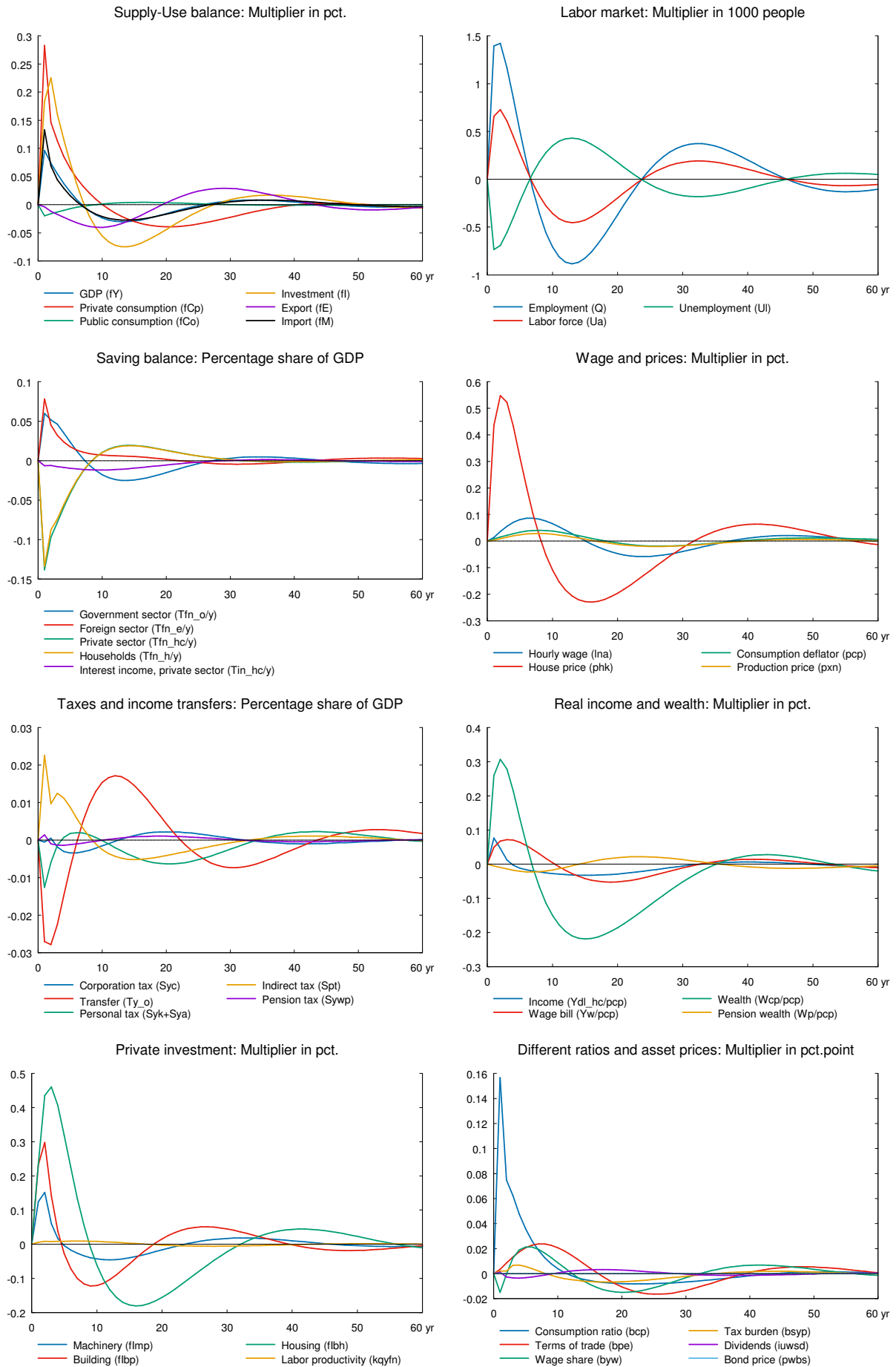
The effect on employment, production, private and public saving balances, etc is temporary reflecting that it is a temporary demand shock and the consumption function is an error correction equation that adjusts back to the long term value. Consumption keeps adjusting until the ratio between wealth and income is back to the baseline value. The adjustment of consumption, however, takes a long time. Consumption remains above the baseline for a few years followed by a long period below the baseline. The latter period restores wealth and the ratio between income and wealth will return to the equilibrium value, and consumption will return to the baseline. The initial stimulus to economic activity is sufficient to stimulate wages and hence prices, and it takes time for the higher wage rate to return to the baseline.

The crowding out process is illustrated by the fluctuation in unemployment. Unemployment falls initially and this pushes up the wage rate slightly. In year 2, the consumption shock disappears and the higher wage pulls unemployment up. Unemployment has to be above the baseline for a while in order to pull the wage rate back down to the baseline. Basically, wages fall relative to the baseline as long as unemployment is above the baseline. So that both unemployment and wage will fluctuate around the baseline on their way back to the baseline. This reflects that the link between unemployment and wage change makes unemployment fluctuate, while the area between unemployment and the baseline converges to zero. It is noted that the basic adjustment process is similar to the adjustment after an overheating of the economy.

The experiment also makes the housing market fluctuate. In the first year, house prices increase sharply because of the higher consumption and this raises housing wealth. Higher housing wealth in turn expands

private consumption. The immediate positive impact on house prices triggers a higher Tobin's q and housing investment increases. Later on, the higher housing capital reduces house price and Tobin's q after the initial increase in consumption has disappeared. The lower house price drives housing investment and hence housing capital down. In this way, housing capital returns to the baseline and the area between Tobin's q and the baseline converges to zero just like the area between investments and its baseline. In general, the temporary shock to consumption starts an adjustment process with fluctuations.

Figure 16. The effect of a temporary exogenous increase in private consumption



17. Hourly wages

Here, we introduce a shock to the wage equation. Table 17 presents the effect of a one off 1 percent shock to the constant in the Phillips curve of ADAM. After the shock the wage level is 1 percent above its equilibrium and it is up to the crowding out mechanism of ADAM to make the wage rate return to its baseline.

Table 17. The effect of a temporary increase in wage

		1. yr	2. yr	3. yr	4. yr	5. yr	10. yr	15. yr	20. yr	25. yr	30. yr
						<i>Million 2010-Dkr.</i>					
Priv. consumption	<i>fCp</i>	458	219	1724	2275	2564	2400	1028	-393	-1236	-1338
Pub. consumption	<i>fCo</i>	44	71	24	-5	-22	-19	38	81	87	62
Investment	<i>fi</i>	-324	-689	-453	-93	151	267	-413	-817	-699	-261
Export	<i>fE</i>	-2492	-3255	-3914	-4474	-4941	-5654	-4423	-2171	106	1606
Import	<i>fM</i>	-5	-378	182	266	201	-482	-1124	-1221	-795	-146
GDP	<i>fY</i>	-2222	-2945	-2326	-2071	-1954	-2058	-2267	-1790	-708	455
						<i>1000 Persons</i>					
Employment	<i>Q</i>	-3.18	-4.49	-4.59	-4.60	-4.60	-4.48	-3.91	-2.49	-0.70	0.74
Unemployment	<i>U</i>	1.68	2.24	2.24	2.24	2.23	2.18	1.89	1.20	0.32	-0.37
						<i>Percent of GDP</i>					
Pub. budget balance	<i>Tfn_o/Y</i>	0.01	-0.01	-0.16	-0.14	-0.12	-0.09	-0.09	-0.09	-0.06	-0.04
Priv. saving surplus	<i>Tfn_hc/Y</i>	0.04	0.05	0.14	0.08	0.03	-0.06	-0.04	0.00	0.01	0.01
Balance of payments	<i>Enl/Y</i>	0.05	0.05	-0.02	-0.06	-0.09	-0.14	-0.13	-0.09	-0.05	-0.03
Foreign receivables	<i>Wnnb_e/Y</i>	-0.02	0.03	0.00	-0.07	-0.15	-0.64	-1.05	-1.25	-1.29	-1.22
Bond debt	<i>Wbd_os_z/Y</i>	-0.17	-0.16	-0.01	0.11	0.22	0.62	0.98	1.27	1.42	1.40
						<i>Percent</i>					
Capital intensity	<i>fKn/fX</i>	0.14	0.17	0.15	0.14	0.14	0.17	0.15	0.07	-0.02	-0.07
Labour intensity	<i>hq/fX</i>	0.03	0.02	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00
User cost	<i>uim</i>	0.34	0.34	0.33	0.32	0.31	0.23	0.12	0.02	-0.05	-0.06
Wage	<i>lna</i>	1.11	1.03	0.94	0.88	0.82	0.49	0.16	-0.10	-0.23	-0.23
Consumption price	<i>pcp</i>	0.31	0.33	0.33	0.33	0.32	0.27	0.16	0.04	-0.04	-0.08
Terms of trade	<i>bpe</i>	0.24	0.24	0.24	0.24	0.23	0.17	0.09	0.00	-0.05	-0.06
						<i>Percentage-point</i>					
Consumption ratio	<i>bcp</i>	-0.04	-0.03	-0.10	-0.04	0.00	0.09	0.08	0.04	0.00	-0.02
Wage share	<i>byw</i>	0.31	0.26	0.21	0.17	0.14	0.04	-0.04	-0.07	-0.07	-0.05

The higher wage has both a positive and negative effect on the economy. The former is due to the positive effect on real wages which raises private consumption. Two years after the wage increase, income transfers from the government increase, because the equation for the rate of income transfers depends on wages with a lag of two years. This further increases disposable income and consumption and worsens public finance.

The negative demand effect arises due to a negative effect on the market share of Danish exports. The higher wage raises prices and worsens competitiveness, which leads to a fall in net exports. Consequently, production and employment fall. The lower production also drags investments down. In the short run, the negative effect is stronger and unemployment increases, i.e. the wage increase creates an economic downturn.

In the long run, the *wage-driven crowding out* returns unemployment and wage to the baseline. ▼ In the long run, all variables return to their baseline except for a permanent negative impact on public and foreign debt, reflecting the accumulated budget impact in the transition period before the equilibrium is reestablished.

Note the symmetry of the model responses in the present experiment and the foreign price shock in section 8. A permanent 1 percent fall in foreign prices will trigger a similar adjustment process as the baseline wage will be 1 percent above its equilibrium after such a foreign price shock, cf. chapter 11 of the ADAM book.

Figure 17. The effect of a temporary increase in wage

