Chapter 10

Dynamic effects of policy experiments and exogenous shocks

In the following section, the properties of the DREAM model are demonstrated by conducting a number of experiments with the model. Short-run as well as long-run effects are explained. It should be emphasized that results from the first few years of a simulation in DREAM are not to be interpreted as attempts to simulate realistic short-run effects of the Danish economy. This is so because the model does not attempt to catch most of the various reasons for inertia in the adjustment effects. Instead, normally focus should be on the model's medium-term and long-run results - say, starting about 5 years after the shock. Nevertheless, also the immediate effects of the various shocks are reported and explained here in some detail to give a better understanding of the model's workings on its own premises.

10.0.11 Effects of a permanent rise in the (real) interest rate

In the first experiment, the international nominal interest rate is permanently increased from 4.75 per cent to 5.25 per cent from 2009. It is assumed that there are no real or nominal effects from this rise in other exogenous foreign variables of the model (productivity growth, inflation, foreign trade elasticities, etc.). The shock is then to be interpreted as a rise in the international real interest rate.

For firms, an immediate effect is that the user cost of capital rises. This reduces the shadow prices of machinery and building capital and book capital in 2009, making investments less profitable and consequently reducing the investment level of the private sectors accordingly. From 2010, the capital stock is permanently lower in both private production sectors.

Tabel 1e: Macroeconomic development						
	2003	2008	2009	2010	2015	2020
					Index in fixed prices, base-line = 100, not	
Private consumption	100.00	100.00	95.47	97.80	97.63	97.88
Real GDP	100.00	100.00	100.12	99.79	98.94	98.72
Unemployment	100.00	100.00	100.46	101.78	100.43	100.55
Employment	100.00	100.00	100.05	99.91	99.90	99.87
Construction sector	100.00	100.00	91.40	88.09	93.68	96.59
Private non-construction sector	100.00	100.00	99.61	99.82	98.92	98.45
Public sector	100.00	100.00	103.86	103.92	104.01	104.02
Capital stock						
Construction sector	100.00	100.00	100.00	92.25	91.35	94.06
Private non-construction sector	100.00	100.00	100.00	98.99	96.48	95.66
Public sector	100.00	100.00	100.00	103.50	103.92	103.92
Net foreign assets*	-12.7	12.5	21.0	28.6	62.1	89.0

Index is assets in per cent of GDP

Figure 10.1:

Employment is affected by the changes in the real wage and unemployment benefits. When the capital stock diminishes, the marginal product of labour decreases as well. This decreases nominal and real wages so that the medium- and long-run effect is a decrease in employment. However, in the first period after the shock (2009), the capital stock used in production is still unchanged because the fall in investments only affects the capital stock at the end of the period. At the same time, costs of living fall because house prices are reduced by the shock so that the real wage actually increases in the very first year after the shock. Consequently, in 2009 employment is marginally *higher* because of the interest rate shock. From 2010 employment becomes permanently lower. The long-run effect is a decline of 0.15 per cent.

Unemployment benefits are linked to wages so they decrease with the same percentage, but with a delay of two years, so that the shock only affects the size of per-capita unemployment benefits from 2011. The development of the unemployment rate depends on the absolute difference between nominal wages and unemployment benefits. In 2009, the nominal wage falls slightly because of the larger labour supply from households caused by the real wage rise. This diminishes the gain from being employed relative to being unemployed and causes the unemployment rate to rise together with employment in this year. In 2010, unemployment benefits are still unchanged whereas the nominal wage decreases further following diminished productivity so that the relative increase in unemployment reaches its maximum in this year. From 2011 also unemployment benefits start falling, but as the absolute difference between wages and benefits remains smaller relative to the base-line scenario the unemployment rate is permanently higher following the shock.

Table 4e: Change in assets	2003	2007	2008	2009	2010
					in billion kr., Growth
+ Financial wealth of households	0.0	0.0	-4.1	59.6	98.6
+ Financial wealth, pension funds	0.0	0.0	-35.1	-24.9	-20.7
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.2	0.4
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.2	0.3
+ Financial wealth, ATP Fund	0.0	0.0	0.0	1.1	2.1
- Debt of government sector	0.0	0.0	0.0	52.7	80.4
- Equity and debt of firms	0.0	0.0	-39.2	-55.1	-65.2
= Net foreign assets	0.0	0.0	0.0	38.5	65.5
Value of household dwellings stock	0.0	0.0	-194.7	-207.3	-223.6

Figure 10.2:

A lower capital stock and less employment in future periods both reduce the value of firms at the impact of the interest rate shock: Indeed, the value of the firms is reduced with 39 billion DKK already in 2008 because of the ultimo dating convention of DREAM. Likewise, the value of the housing stock is decreased immediately by 195 billion DKK at the end of 2008. By far the largest capital loss falls on land, the value of which is reduced by 160 billion DKK on impact, whereas the value of the building stock is reduced by 34 billion DKK.

Households consequently suffer an immediate capital loss when the interest rate rises as both their financial and residential wealth shrinks. (Households until the age of 33 years are net financial debtors and consequently gain from the fall in the value of shares. For these households, however, the loss in residential value more than outweighs the gain in financial debt.)

Income from wages and government transfers in all future periods will be smaller because of the interest rate shock (like unemployment benefits other government transfers are also indexed to wages and consequently also fall). At the same time, the higher interest rate increases discounting so that the present value of a given future stream of income becomes smaller. For all intertemporally optimizing households living at the time of the shock, the sum of their financial, residential and human capital falls, implying that the present value of their consumption possibilities for the remaining time horizon decreases correspondingly.

The optimal intertemporal allocation of consumption is also affected by the interest rate hike: The Keynes-Ramsey rule implies that the desired slope of the consumption profile over time increases so that households wish to consume relatively more during the last periods of their time horizon. This increases the aggregate savings rate for households. In 2009, aggregate savings for households (including pensions savings) out of after-tax income increases by 5.2

percentage points. After 2009, the increase is smaller, but remains positive and is 0.99 per cent in the steady state. The distribution of savings is also changed: Because of the increased user-cost for a given dwelling value, households save permanently less in dwellings. Also pension savings out of net income fall as wage income falls both in absolute numbers and in later years relatively to total net income which also comprises capital income. Savings in free financial assets consequently rise considerably: By 9.2 percentage points in 2007 and 2.6 per cent in the steady state.

Savings behaviour naturally differs for different age groups... The aggregate effect is a considerable increase in household financial wealth. Already at the end of 2009, it is DKK 60 billion DKK larger than in the base-line, whereas residential wealth has declined by DKK 207 billion. By 2018, the increased financial savings outweigh the fall in residential wealth so that aggregate household wealth is permanently larger than in the base-line case from this year. In the steady state, household wealth has increased by DKK 347 billion.

For the various funded pensions arrangements, the pension fund and the private pensions arrangement together experience a capital loss of 5 billion DKK in 2008. The wealth of the ATP, SP and LD funds are not affected upon impact because these arrangements hold only bonds. For all funded pensions, contributions fall permanently in all periods from 2009 (by 0.8 per cent in steady state) because wage income is smaller. The increased returns to savings outweigh this effect however: For all the exclusively bond-based funds, both the assets accumulated in the funds and the benefits paid out are permanently higher in all years. For the two funds which suffered an inital capital loss, paid-out benefits decrease during the first years, but by 2018 accumulated assets and paid-out benefits also are permanently larger than in the base-line scenario.

For the government sector, the long-run implication is an improvement in fiscal conditions so that the necessary permanent cut in collective government consumption is reduced by 1.1 per cent of GDP from 2009. One reason for the improvement is the discounting effect of the government's intertemporal budget condition: Because of the actual policy reaction function used and the time profile of the expected demographic changes, the government accumulates large assets during the base-line projection. The government consequently gains from an increase in the interest on government net assets. Another way of expressing this is that the net present value of given future primary deficits decreases when the interest rate increases.

Table 2c: Change in public expenditure and revenue	2003	2003	2008	2009	2010	2015
	Level, billion DKK					per cent o
Expenditure	0.00	0.00	0.00	2.94	1.74	1.35
Public transfers	0.00	0.00	0.00	0.26	0.25	0.01
Age-dep. pub. consumption	0.00	0.00	0.00	0.22	0.15	0.11
Non-age-dep. pub. consumption	0.00	0.00	0.00	1.10	1.10	1.10
Other Expenditure	0.00	0.00	0.00	1.37	0.24	0.13
Revenue	0.00	0.00	0.00	-0.82	-0.18	0.24
Primary budget surplus	0.00	0.00	0.00	-3.75	-1.92	-1.12
Net interest expenses	0.00	0.00	0.00	0.00	0.17	0.48
Net public debt	0.00	0.00	0.00	3.76	5.72	12.87
GDP in 2003-prices	0.00	0.00	0.00	-25.20	-23.68	-21.75
GDP in 2003-prices in per cent	0.00	0.00	0.00	-1.60	-1.47	-1.25

Figure 10.3:

Table 2c: Change in government expenditures (count-base)	2003	2008	2009	2010	2015	2020
				per cent of GDP, market pri		
Government consumption	0.00	0.00	1.31	1.25	1.21	1.19
Subsidies, from DK	0.00	0.00	0.02	0.01	0.00	-0.01
Total expenditures to income transfers	0.00	0.00	0.26	0.25	0.01	0.00
Miscellaneous transfers	0.00	0.00	0.00	0.00	0.00	0.00
Transfers to foreign countries	0.00	0.00	0.00	0.00	0.00	0.00
Government investments	0.00	0.00	1.35	0.23	0.13	0.13
Capital transfers to foreign countries	0.00	0.00	0.00	0.00	0.00	0.00
Lump sum transfers	0.00	0.00	0.00	0.00	0.00	0.00
Total government expenditures	0.00	0.00	2.94	1.74	1.35	1.31

Figure 10.4:

The importance today of larger government expenditure in the far future is therefore smaller. This can be seen directly from the steady-state rule (7.77) where a given primary budget needs to be counter-balanced by smaller net government assets when the interest rate increases.

The other reason for the improvement of government finances is the effect of various general equilibrium effects upon the primary budget itself. The changes in primary government expenditure over time following the shock is shown in table ? As already mentioned, collective government consumption increases by 1.1 per cent of GDP relative to the base-line in every year while still fulfilling the intertemporal government budget constraint. Also individual government consumption increases as a percentage of GDP (from 0.22 per cent in 2009 to 0.03 per cent in the long run). The reason for this is that consumption per individual rises with the exogenous productivity growth regardless of the development in GDP. When GDP falls because of the higher interest rate, individual goverment consumption rises relative to GDP.

Table 2c: Change in government revenue (count-base)						
	2003	2008	2009	2010	2015	2020
					per cent of GDP, market pric	
Capital income	0.00	0.00	0.01	0.07	0.08	0.08
Revenue from rents, dividend income and so on	0.00	0.00	0.00	0.00	0.00	0.00
Indirect taxes	0.00	0.00	-0.59	-0.52	-0.35	-0.26
Direct taxes	0.00	0.00	-0.27	0.24	0.48	0.59
Compulsory contributions to social security	0.00	0.00	0.02	0.02	0.00	0.00
Optional social contributions	0.00	0.00	0.00	0.00	0.00	0.00
Imputed contribtution to civil servant pensions	0.00	0.00	0.01	0.01	0.01	0.01
Other contributions	0.00	0.00	0.00	0.00	0.00	0.00
Capital taxes	0.00	0.00	0.00	0.00	0.01	0.01
Capital transfers from foreign countries	0.00	0.00	0.00	0.00	0.00	0.00
Capital transfers from households	0.00	0.00	0.00	0.00	0.00	0.00
Lump sum transfers	0.00	0.00	0.00	0.00	0.00	0.00
Total government revenue	0.00	0.00	-0.82	-0.18	0.24	0.43

Figure 10.5:

Because of the relative increase in both collective and individual government consumption, government investments must increase by 1.35 per cent of GDP in 2009 to fulfill the policy rule that the capital-output ratio for the government producer is constant. Afterwards, investments are permanently larger by around 0.13 per cent of GDP to maintain the increased capital stock at this level.

Subsidies, mainly to firms, fall slightly by 0.02 per cent in the long run after a very small initial rise. In absolute amounts, subsidies are smaller in all years because they follow production. Composition effects imply that they may fall more or less than GDP. In the same way, the total expenditure for transfers to households fall in all years in absolute numbers because the regulation of transfers follow the decline in wages. For one transfer, unemployment compensation, there is an increase in the number of recipients following the shock, but even the expenditures for this transfer alone decreases in the long run. Relative to GDP, however, transfer expenditures are higher during the first years after the shock and only decline some time after 2020.

Changes in government revenue because of the shock show considerable variation from a large decline in revenue of 0.82 per cent of GDP in 2009 to long-run increases of around 1 per cent. In the shock year, direct taxes fall by 0.27 per cent of GDP. Capital losses of the pensions funds account for more than 100 per cent of this with a decline in revenue of 0.29 per cent of GDP. Also company taxation falls by 0.24 per cent of GDP, whereas revenue from source

taxation of individuals falls in absolute amounts, but rises relative to GDP. In all future years, source tax revenues relative to GDP are larger than in the base-line scenario. This is due to the larger tax revenues from capital income of households (in steady state, these revenues have increased by DKK 11.5 billion or 0.93 per cent of GDP). At the same time, the decline in residential wealth does not translate into a corresponding decline in tax revenues from owner-occupied dwellings because of the tax freeze: When house prices decline, the effective tax rate on owner-occupied dwellings in 2009 rise so that revenue remains almost constant as per cent of GDP. Also revenue from the taxation of labour-market income and transfers roughly follows GDP. Tax revenue from the income in pensions funds yields 0.06 per cent of GDP more in the long run. Also revenue from company taxation increases slightly as per cent of GDP in the long run.

Revenue from indirect taxes decrease permanently because of the interest rate hike, though the strength of the decline varies: In the first period, revenues fall by almost 0.6 per cent of GDP; in the long run, the difference is 0.1 per cent. This reflects two different developments: Many indirect taxes follow the development in aggregate consumption, which is smaller relative to GDP during the first years after the shock until 2024, when the larger household wealth is reflected in a higher aggregate consumption share. Consumption taxes follow the same profile, so that e.g. VAT revenue is higher in the long run than in the base-line. However, revenue from land taxation is permanently somewhat lower (by around 0.18 per cent of GDP), and this causes total revenue from indirect taxes to also permanently be smaller than in the base-line scenario.

Taken together, the most important revenue development in the long run is the large increase from capital income taxes. The primary budget, however, is in all periods worsened compared to the base-line because of the increase in government consumption. Because of the changed discounting, this is compatible with continued fiscal sustainability.

For the development of national wealth, the consequences of the shock as percentages of GDP is seen in table (). After the initial capital loss, household net financial assets quickly rise by more than 15 per cent of GDP in 5 year's time and almost 50 per cent of GDP in steady state. Also pension wealth increases compared to the base-line, but much less so. In the medium run (in 2040) pension wealth is around 4 percentage points higher. Afterwards lower wages again reduce pensions savings, so that the steady-state increase is around 1 per cent of GDP.

Table 4f: Change in assets in per cent of GDP	2003	2008	2009	2010	2015	2020
					per cent point	
+ Financial wealth of households	0.0	-0.3	4.5	7.3	16.9	22.0
+ Financial wealth, pension funds	0.0	-2.5	0.0	0.3	1.3	1.9
+ Financial wealth, LD Fund	0.0	0.0	0.1	0.1	0.1	0.2
+ Financial wealth, SP Fund	0.0	0.0	0.1	0.1	0.2	0.3
+ Financial wealth, ATP Fund	0.0	0.0	0.4	0.4	0.7	1.0
- Debt of government sector	0.0	0.0	3.8	5.7	12.9	18.1
- Equity and debt of firms	0.0	-2.8	-1.7	-2.7	-4.9	-5.6
= Net foreign assets	0.0	0.0	3.1	5.1	11.2	12.8
Value of household dwellings stock	0.0	-13.9	-12.3	-13.7	-17.6	-18.1

Figure 10.6:

Table 2c: GDP identity in alternative projection	2003	2008	2009	2010	2015	2020
					Index, base run = 100	
GDP	100.0	100.0	98.4	98.5	98.8	99.0
Private consumption	100.0	100.0	95.9	98.9	99.4	99.7
Government consumption	100.0	100.0	105.7	105.4	105.1	105.0
Investments	100.0	100.0	90.4	88.1	94.1	96.7
Private inv. in production	100.0	100.0	89.0	91.2	94.9	96.3
Private inv. in housing	100.0	100.0	73.3	75.2	88.5	94.8
Inventory investments	100.0	-	-	-	-	-
Government investments	100.0	100.0	154.5	109.5	105.2	105.1
Net export	100.0	100.0	145.4	130.8	105.9	92.5

Figure 10.7:

Government net asset accumulation on the contrary is smaller because of the dimished need to save for future expenditure. Also the sum of equity and debt of private firms decreases as per cent of GDP though the difference is not so marked. These changes imply together that net foreign assets grow considerably (by 14.1 per cent of GDP in steady state). On the other hand, residential value has fallen permanently, by close to 17 per cent of GDP. Aggregate national wealth can then be said to be almost constant in terms of GDP (bearing in mind that the size of the government capital stock has increased as well).

The composition of GDP also changes: In the impact period, both private consumption and investment fall relatively, whereas government consumption increases. Also net exports increase: The net fall in domestic demand is met by larger foreign purchases, but at the price of a fall in the terms of trade: All domestic prices fall in 2009.

Whereas the fall in investments and the rise in government consumption are permanent phenomena, private consumption increases relative to the base-line in the long run because of the larger accumulation of wealth. Also net exports become more negative: In steady state,

Table 1c: Prices i alternative projection	2003	2008	2009	2010	2015
					Index, base run
Nominal wage index	100.0	100.0	99.6	99.2	98.9
Consumer price index	100.0	100.0	98.9	99.6	100.6
Government consumption price index	100.0	100.0	99.6	99.4	99.4
Government transfer regulation index	100.0	100.0	100.0	100.0	98.9
Real wage index	100.0	100.0	100.7	99.6	98.4
Housing price index	100.0	91.8	92.4	92.6	93.5
Buildings price index	100.0	98.1	98.8	99.1	99.9
Land price index	100.0	69.3	69.0	68.8	68.2
Average yield on household finansial assets after tax	100.0	100.0	109.3	106.3	107.1
Average yield on pension financial assets after tax	100.0	100.0	106.1	105.4	103.2

Figure 10.8:

Table 3c: Macroeconomic variables in alternative projection	2003	2008	2009	2010	2015
					Index, base run
GDP at market prices	100.0	100.0	98.4	98.5	98.8
Real GDP at factor prices	100.0	100.0	100.1	99.8	98.9
Gross national income	100.0	100.0	98.5	98.7	99.2
Wage sum in pct. of GDP	100.0	100.0	101.3	100.6	100.1

Figure 10.9:

the accumulation of larger net foreign assets and consequently larger interest payments from abroad are mirrored in a correspondingly larger trade balance deficit. The higher consumption level is thus in part sustained by permanently higher import levels. A corollary of this is that whereas GDP measured both at market prices and in real terms fall, gross national income after 2040 is permanently higher following the interest rate shock.

10.0.12 Effects of a permanent rise in inflation and nominal interest rate

This experiment like the preceding one analyses an increase in the interest rate from 4.75 per cent to 5.25 per cent (now from 2011). However, now the foreign inflation rate g^P is increased from 1.75 to 2.2357 as well so that the real interest rate is unchanged[1]. The experiment consequently examines the consequences of a purely nominal shock to the economy. The shock does have real effects upon the economy, however, because of the Danish tax system which is based upon nominal taxation. Even though the before-tax real interest rate is unchanged, the after-tax real interest rate falls because of the shock. Upon impact, this is reflected in

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[1] As the real interest rate is $\frac{(1+i_t)}{1+g_t^P} - 1$.

Table 1f: Macroeconomic development, Growth corrected	2003	2010	2011	2012	2015	2020
				Index in fixed prices, base-line = 100, g		
Private consumption	100.0	100.0	103.0	100.9	100.9	100.8
Real GDP	100.0	100.0	99.9	100.0	100.0	100.1
Unemployment	100.0	100.0	99.1	99.3	100.1	99.9
Employment	100.0	100.0	100.0	100.0	100.0	100.0
Construction sector	100.0	100.0	101.7	103.4	102.4	101.1
Private non-construction sector	100.0	100.0	99.7	99.7	99.8	100.0
Public sector	100.0	100.0	100.1	99.8	99.8	99.8
Capital stock						
Construction sector	100.0	100.0	100.0	101.9	102.4	101.3
Private non-construction sector	100.0	100.0	100.0	99.8	99.9	100.2
Public sector	100.0	100.0	100.0	100.1	99.8	99.8
Net foreign assets*	-12.7	23.5	27.4	32.3	46.6	69.9

Index is assets in per cent of GDP

Figure 10.10:

Table 1c: Prices i alternative projection	2003	2010	2011	2012	2015	2020
				Index, base run = 100		
Nominal wage index	100.0	100.0	100.5	100.3	100.3	100.2
Consumer price index	100.0	100.0	100.7	100.2	100.0	99.9
Government consumption price index	100.0	100.0	100.4	100.3	100.2	100.1
Government transfer regulation index	100.0	100.0	100.0	100.0	100.3	100.2
Real wage index	100.0	100.0	99.8	100.1	100.3	100.3
Housing price index	100.0	103.7	103.3	103.2	102.9	102.8
Buildings price index	100.0	100.8	100.5	100.4	100.2	100.1
Land price index	100.0	113.9	113.9	114.0	114.2	114.2
Average yield on household finansial assets after tax	100.0	100.0	106.7	108.3	108.4	108.3
Average yield on pension financial assets after tax	100.0	100.0	107.6	107.8	108.4	109.0

Figure 10.11:

immediate capital gains: The stock value is increased by 1 per cent of GDP, most of which accrues to the pensions sector. The value of owner-occupied dwelling rises by 6.2 per cent of GDP. The largest rise is in the value of land for dwelling purposes. This reflects the fact that the fall in the average after-tax real returns to assets for households influences the user-cost for land relatively more than that for buildings (cf. the two expressions on p. ...).

The capital gains induce an increase in private consumption of 3 per cent in 2011. The larger demand causes a further increase in the domestic price level on top of the imported inflation. Nominal wages consequently increase more than the CPI, and the real wage increase leads to slightly larger employment and production.

The lower after-tax real interest rate causes a decrease in private savings. The long-run effect is a considerable decrease in the financial wealth of households and after some decades also in

Table 4f: Change in assets in per cent of GDP	2003	2010	2011	2012	2015
					per cent poi
+ Financial wealth of households	0.0	0.1	-2.1	-3.4	-5.9
+ Financial wealth, pension funds	0.0	1.0	-0.5	0.0	0.1
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	-0.1	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	-0.2	-0.1	-0.1
- Debt of government sector	0.0	0.0	-0.6	-1.1	-1.9
- Equity and debt of firms	0.0	1.0	-0.8	-0.2	0.2
= Net foreign assets	0.0	0.0	-1.6	-2.2	-4.2
Value of household dwellings stock	0.0	6.2	4.5	6.0	7.1

Figure 10.12:

Table 2c: Change in public expenditure and revenue	2003	2003	2010	2011	2012	2015
	Level, billion DKK					*per cent ×*
Expenditure	0.00	0.00	0.00	-0.35	-0.31	-0.12
Public transfers	0.00	0.00	0.00	-0.18	-0.10	-0.01
Age-dep. pub. consumption	0.00	0.00	0.00	-0.11	-0.05	-0.03
Non-age-dep. pub. consumption	0.00	0.00	0.00	-0.06	-0.06	-0.06
Other Expenditure	0.00	0.00	0.00	0.01	-0.10	-0.02
Revenue	0.00	0.00	0.00	0.34	0.15	0.09
Primary budget surplus	0.00	0.00	0.00	0.69	0.46	0.21
Net interest expenses	0.00	0.00	0.00	-0.03	-0.09	-0.19
Net public debt	0.00	0.00	0.00	-0.60	-1.13	-1.92
GDP in 2003-prices	0.00	0.00	0.00	17.40	9.07	6.77
GDP in 2003-prices in per cent	0.00	0.00	0.00	1.07	0.55	0.39

Figure 10.13:

total private consumption, whereas GDP permanently is at a slightly higher level. The wealth of pensions funds, firms and dwelling capital also permanently has a higher level than in the base-line run.

The net result for government revenues is a long-run loss of around 0.1 per cent of GDP. Even though revenues from taxes on labour income, pensions and indirect taxes (these being dominated by increases in land taxation) rise, this is more than offset by falling capital income tax revenues from the savings of households. On the expenditure side, consequently the preservation of fiscal sustainability requires a cut in collective government consumption of 0.06 per cent of GDP.

Tabel 1e: Macroeconomic development						
	2003	2010	2011	2012	2015	2020
				Index in fixed prices, base-line = 100, not		
Private consumption	100.0	100.0	109.0	105.8	106.9	108.5
Real GDP	100.0	100.0	100.2	100.7	102.6	105.3
Unemployment	100.0	100.0	102.4	101.4	100.2	100.3
Employment	100.0	100.0	100.2	100.8	102.4	105.0
Construction sector	100.0	100.0	105.9	110.3	112.0	112.3
Private non-construction sector	100.0	100.0	102.3	102.5	104.2	107.1
Public sector	100.0	100.0	93.6	94.2	95.5	97.9
Capital stock						
Construction sector	100.0	100.0	100.0	105.8	111.0	112.1
Private non-construction sector	100.0	100.0	100.0	101.1	103.5	106.7
Public sector	100.0	100.0	100.0	94.1	95.0	97.3
Net foreign assets*	-12.7	23.5	25.2	28.5	38.3	55.2

* Index is assets in per cent of GDP

Figure 10.14:

10.0.13   Effects of a permanent rise in productivity growth

In this experiment, the labour-augmenting productivity growth rate is increased from 2.0 to 2.5 per cent permanently from 2011. Again, no other exogenous variables are affected, implying among other things that the growth-corrected interest rate falls by $\frac{1}{2}$ percentage point. The shock affects both foreign and domestic variables and is consequently to be interpreted as a world-wide rise in productivity growth.

The immediate effect is on the labour market where effective labour supply rises already in 2011. As the capital stock is still constant during this period, the marginal product of labour and consequently the wage per productivity unit falls, resulting in a rise in unemployment and fewer hours worked for the employed workers, so that the net rise in effective employment is only 0.2 per cent compared to the base-line during the first year. The rise in real GDP is consequently equally small: 0.2 per cent of GDP. From 2012, also the capital stock of the private firms rises more than in the base-line scenario because investments become more profitable when effective labour supply is higher. In the long run, effective labour supply, capital and production naturally are much higher than in the base-line. In 2100, effective employment and real GDP are around 55 per cent higher; the unemployment is still marginally higher than in the base-line scenario, however, as the real wage has never completely caught up with the productivity growth rate. It should be noted that disutility of work rises in line with the productivity growth rate, so if the real wage growth was exactly identical to productivity growth, there would be no changes in employed working hours at all.

Table 1f: Macroeconomic development, Growth corrected					
	2003	**2010**	**2011**	**2012**	**2015**
					Index in fixed prices, base-li
Private consumption	100.0	100.0	108.5	104.8	104.3
Real GDP	100.0	100.0	99.7	99.7	100.1
Unemployment	100.0	100.0	102.4	101.4	100.2
Employment	100.0	100.0	99.7	99.8	99.9
Construction sector	100.0	100.0	105.4	109.3	109.3
Private non-construction sector	100.0	100.0	101.8	101.5	101.6
Public sector	100.0	100.0	93.1	93.2	93.2
Capital stock					
Construction sector	100.0	100.0	99.5	104.8	108.3
Private non-construction sector	100.0	100.0	99.5	100.1	101.0
Public sector	100.0	100.0	99.5	93.2	92.7
Net foreign assets*	-12.7	23.5	25.4	28.8	39.3

* Index is assets in per cent of GDP

Figure 10.15:

For comparison, we also show the same table in growth-corrected values, i.e. where the shock scenario and the base-line scenario are deflated with their respective growth rates.

The positive productivity shock results in a rise in the value of firms by 2.4 per cent of GDP already at the end of 2010. Also the value of household dwellings rises by more than 11 per cent of GDP upon impact, almost exclusively because of the rise in the value of land which becomes more productive in future. Consequently, households and to some extent pension funds receive a capital gain. In all future periods, households will also receive higher income from wages and transfers. At the same time, the desired development of consumption growth resulting from the Keynes-Ramsey rule does not change. With the increase in future non-capital income, households need to save less. Private consumption therefore rises by 9 per cent already in 2011 and keeps rising more than production for the first several years. The counterpart is that financial wealth of households diminishes rapidly and after some decades turns into a debt about the size of GDP.

For the government sector, the changes are in many ways the opposite of the case of an interest rate increase. During the first years after the change, revenues increase, partly because of the taxation of the initial capital gains, partly because incomes from indirect taxation of private consumption increase. However, as share of GDP the sharply falling capital income of households translate into falling tax revenues from capital income taxes, and in the long run this causes total revenues to fall by almost 1.6 per cent of GDP. On the expenditure side, excluding the change in collective government consumption, most components follow

Table 2c: Change in public expenditure and revenue							
	2003	2003	2010	2011	2012	2015	2020
	Level, billion DKK					per cent of GDP	
Expenditure	0.00	0.00	0.00	-4.85	-2.57	-2.49	-2.39
Public transfers	0.00	0.00	0.00	-0.25	-0.18	-0.25	-0.20
Age-dep. pub. consumption	0.00	0.00	0.00	-0.35	-0.24	-0.23	-0.20
Non-age-dep. pub. consumption	0.00	0.00	0.00	-1.97	-1.97	-1.97	-1.97
Other Expenditure	0.00	0.00	0.00	-2.28	-0.18	-0.04	-0.03
Revenue	0.00	0.00	0.00	0.68	0.13	-0.20	-0.57
Primary budget surplus	0.00	0.00	0.00	5.54	2.70	2.29	1.82
Net interest expenses	0.00	0.00	0.00	0.01	-0.25	-0.60	-1.07
Net public debt	0.00	0.00	0.00	-5.37	-8.14	-15.42	-25.41
GDP in 2003-prices	0.00	0.00	0.00	34.72	35.76	63.85	110.76
GDP in 2003-prices in per cent	0.00	0.00	0.00	2.13	2.16	3.66	5.82

Figure 10.16:

Table 4f: Change in assets in per cent of GDP						
	2003	2010	2011	2012	2015	2020
					per cent point	
+ Financial wealth of households	0.0	0.1	-7.0	-10.8	-21.5	-35.8
+ Financial wealth, pension funds	0.0	2.3	-0.7	-0.6	-2.0	-2.8
+ Financial wealth, LD Fund	0.0	0.0	-0.1	-0.1	-0.1	-0.1
+ Financial wealth, SP Fund	0.0	0.0	-0.1	-0.1	-0.2	-0.4
+ Financial wealth, ATP Fund	0.0	0.0	-0.4	-0.4	-0.7	-1.0
- Debt of government sector	0.0	0.0	-5.4	-8.1	-15.4	-25.4
- Equity and debt of firms	0.0	2.4	0.8	1.9	2.6	3.6
= Net foreign assets	0.0	0.0	-3.6	-5.8	-11.6	-18.2
Value of household dwellings stock	0.0	11.3	8.9	9.8	10.0	9.9

Figure 10.17:

GDP relatively closely, although the relative fall in wages initially means that expenditures for individual government consumption and for transfers fall slightly.

The necessary adjustment for maintaining fiscal sustainability is increased for two reasons: Firstly, the fall in revenues relative to expenditures causes the primary budget to deteriorate in the absence of adjustments. Secondly, the growth rate itself influences the steady-state rule for respecting the government intertemporal budget constraint: When productivity growth increases, a given steady-state primary budget needs to be counter-balanced by larger net government assets as can be seen from eq. (7.77). In other words, the relevant discounting rate for the government sector is the growth-corrected real interest rate. When growth increases and the interest rate itself stays constant, this discounting rate becomes smaller and the government needs to build up larger assets to meet future expenditure demands. The necessary adjustment now is a cut in collective consumption of 4.8 per cent or 2 per cent more than in the base-line scenario.

Table 2c: GDP identity in alternative projection	2003	2010	2011	2012	2015
					Index, base run
GDP	100.0	100.0	101.6	101.2	101.2
Private consumption	100.0	100.0	108.6	104.5	103.7
Government consumption	100.0	100.0	90.1	90.6	90.7
Investments	100.0	100.0	105.7	109.5	108.7
Private inv. in production	100.0	100.0	109.9	109.1	107.4
Private inv. in housing	100.0	100.0	128.6	115.8	115.3
Inventory investments	100.0	-	-	-	-
Government investments	100.0	100.0	8.0	93.0	98.5
Net export	100.0	100.0	48.7	66.0	73.9

Figure 10.18:

The composition of national wealth is shown in table ... As shares of GDP, the wealth of the various pension funds do not change much. The gross value of firms increases a little. But by far the two most important changes concern the financial wealth of households, which are far more negative, and the government net assets which have to grow to a higher relative level. As the increased government savings do not make up for the private dissavings, net foreign assets as share of GDP are still lower in the steady state. The counterpart is that both private and government consumption in the steady state make out a smaller GDP percentage, whereas investments are permanently higher and net exports are close to zero (whereas in the base-line net exports amount to -1.5 per cent of GDP).

10.0.14 Effects of a rise in the risk premium

In this experiment, the risk premium on shares rises by 0.5 percentage points from 4.1 per cent to 4.6 per cent in 2011. The shock may illustrate the effects of a sudden higher perceived uncertainty concerning the future income streams of firms.

The main first-order effect appears on the stock market: The increased risk premium implies that the pension fund investors are willing to pay less for a share in a given stream of future dividends: The effective discount rate increases, cf. .., and this leads to a major fall in the stock market value of firms upon impact. The total capital loss on shares equals DKK 25.7 billion in that year.

The fall in the value of firms and shadow value of capital causes a decrease in investment. The fall in the capital stock in both private sectors is between 2 and 2.5 per cent in the long run. This causes a fall in the nominal wage and hence a slightly smaller employment so that GDP

Tabel 1e: Macroeconomic development						
	2003	2010	2011	2012	2015	2020
					Index in fixed prices, base-line = 100, not	
Private consumption	100.00	100.00	97.58	98.88	98.79	98.80
Real GDP	100.00	100.00	100.08	99.89	99.65	99.48
Unemployment	100.00	100.00	100.93	101.50	100.32	100.26
Employment	100.00	100.00	99.99	99.93	99.96	99.95
Construction sector	100.00	100.00	96.64	94.85	96.18	98.28
Private non-construction sector	100.00	100.00	100.22	100.30	100.14	99.82
Public sector	100.00	100.00	100.50	100.65	100.70	100.72
Capital stock						
Construction sector	100.00	100.00	100.00	96.46	95.09	96.71
Private non-construction sector	100.00	100.00	100.00	99.53	98.75	98.16
Public sector	100.00	100.00	100.00	100.44	100.63	100.66
Net foreign assets*	-12.70	23.46	30.79	37.46	56.46	84.17

Index is assets in per cent of GDP

Figure 10.19:

Table 4e: Change in assets						
	2003	2010	2011	2012	2015	2020
					in billion kr., Growth adjusted	
+ Financial wealth of households	0.0	-1.5	20.5	37.1	75.2	111.5
+ Financial wealth, pension funds	0.0	-24.2	-18.1	-15.8	-11.3	-7.1
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	-0.1	-0.3	-0.6
+ Financial wealth, ATP Fund	0.0	0.0	0.0	-0.1	-0.2	-0.5
- Debt of government sector	0.0	0.0	15.2	23.7	39.3	53.9
- Equity and debt of firms	0.0	-25.7	-33.6	-38.3	-46.3	-50.9
= Net foreign assets	0.0	0.0	20.8	35.7	70.4	100.3
Value of household dwellings stock	0.0	-82.8	-81.2	-87.8	-103.1	-109.1

Figure 10.20:

ultimately declines by about $\frac{1}{2}$ per cent.

Financial savings rise considerably because of the shock so that consumption initially falls by almost 2.5 per cent, but in the long run decreases by slightly less than production. There are several reasons for the rise in savings: Firstly, the initial capital loss of shares and to a much larger extent of dwellings makes the presently living households worse off, and they naturally wish to distribute the resulting loss in consumption over several periods. Secondly, their anticipated loss in future labour income works in the same direction. Thirdly, a consequence of the higher risk premium is that the relevant aftertax returns to household savings i_t^H rises which causes the optimal consumption path over time to become steeper. Already after the first year household financial wealth has increased by DKK 20 billion, and in the long run the increase is more than 200 billion. This more than offsets the long-run fall in pension funds wealth of DKK 30 billlion and in the value of dwellings of 90 billion.

Table 2c: Change in government revenue (count-base)	2003	2010	2011	2012	2015
					per cent of GDP,
Capital income	0.00	0.00	0.01	0.01	0.02
Revenue from rents, dividend income and so on	0.00	0.00	0.00	0.00	0.00
Indirect taxes	0.00	0.00	-0.27	-0.22	-0.18
Direct taxes	0.00	0.00	-0.19	0.12	0.18
Compulsory contributions to social security	0.00	0.00	0.01	0.01	0.00
Optional social contributions	0.00	0.00	0.00	0.00	0.00
Imputed contribtution to civil servant pensions	0.00	0.00	0.01	0.01	0.01
Other contributions	0.00	0.00	0.00	0.00	0.00
Capital taxes	0.00	0.00	0.00	0.00	0.00
Capital transfers from foreign countries	0.00	0.00	0.00	0.00	0.00
Capital transfers from households	0.00	0.00	0.00	0.00	0.00
Lump sum transfers	0.00	0.00	0.00	0.00	0.00
Total government revenue	0.00	0.00	-0.43	-0.07	0.03

Figure 10.21:

Table 2c: Change in public expenditure and revenue	2003	2003	2010	2011	2012	2015
	Level, billion DKK					*per cent o*
Expenditure	0.00	0.00	0.00	0.64	0.51	0.29
Public transfers	0.00	0.00	0.00	0.17	0.16	0.01
Age-dep. pub. consumption	0.00	0.00	0.00	0.09	0.07	0.05
Non-age-dep. pub. consumption	0.00	0.00	0.00	0.19	0.19	0.19
Other Expenditure	0.00	0.00	0.00	0.19	0.09	0.04
Revenue	0.00	0.00	0.00	-0.43	-0.07	0.03
Primary budget surplus	0.00	0.00	0.00	-1.07	-0.58	-0.26
Net interest expenses	0.00	0.00	0.00	0.00	0.05	0.11
Net public debt	0.00	0.00	0.00	0.99	1.59	2.66
GDP in 2003-prices	0.00	0.00	0.00	-15.47	-14.57	-15.10
GDP in 2003-prices in per cent	0.00	0.00	0.00	-0.95	-0.88	-0.87

Figure 10.22:

For the government sector, the main result is a long-run increase in tax revenues. This comes mainly from the increase in capital income taxes from households. In 2011, the capital losses and decrease in consumption cause a large fall in government revenues, but already by 2015 net revenues have increased as a percentage of GDP, even though indirect taxes are permanently lower because of the lower land values. On the expenditure side, the main effect is that general improved fiscal conditions enables the government to raise collective consumption permanently by 0.19 per cent of GDP. Because of the 2-year delay in the wage regulation rule, transfers rise by about 0.17 per cent of GDP in 2011 and 2012 before the nominal wage fall is reflected in the indexation.

Table 1c: Prices i alternative projection	2003	2010	2011	2012	2015	2020
					Index, base run = 100	
Nominal wage index	100.00	100.00	100.37	100.54	100.68	100.69
Consumer price index	100.00	100.00	100.03	100.02	99.96	99.90
Government consumption price index	100.00	100.00	100.16	100.27	100.33	100.33
Government transfer regulation index	100.00	100.00	100.00	100.00	100.63	100.69
Real wage index	100.00	100.00	100.34	100.52	100.73	100.79
Housing price index	100.00	100.19	100.24	100.21	100.14	100.10
Average yield on household finansial assets after tax	100.00	100.00	101.80	100.17	100.04	99.99
Average yield on pension financial assets after tax	100.00	100.00	98.53	98.71	98.87	98.92

Figure 10.23:

Tabel 1e: Macroeconomic development	2003	2010	2011	2012	2015	2020
				Index in fixed prices, base-line = 100, not		
Private consumption	100.0	100.0	100.1	100.1	100.2	100.3
Real GDP	100.0	100.0	99.5	99.6	99.7	99.8
Unemployment	100.0	100.0	99.1	98.7	99.7	99.8
Employment	100.0	100.0	100.1	100.1	100.0	100.045
Construction sector	100.0	100.0	101.7	102.1	101.6	100.8
Private non-construction sector	100.0	100.0	100.2	100.1	100.2	100.3
Public sector	100.0	100.0	99.3	99.3	99.3	99.3
Capital stock						
Construction sector	100.0	100.0	100.0	101.4	102.0	101.4
Private non-construction sector	100.0	100.0	100.0	100.3	100.7	100.9
Public sector	100.0	100.0	100.0	99.4	99.4	99.4
Net foreign assets*	-12.7	23.5	28.8	34.1	50.0	75.3

Index is assets in per cent of GDP

Figure 10.24:

10.0.15 Effects of a permanent decline in mark-ups

This experiment illustrates a fall in the markup factor of 25 per cent in 2011.

The shock can be explained as an increase in the price elasticity of demand faced by the producers or possibly interpreted as the result of various reforms furthering perfect competition (anti-monopolist measures, etc.). It causes the difference between marginal revenue and sales price of produced units to decrease and likewise decreases the profits of producers. This increases production in the two private sectors.

Most of the gains from the shock is appropriated by workers: Wages rise in order to obtain the increased labour supply necessary to generate increased production in private sectors. The wage quote rises considerably.

Investments, materials and labour supply in the private sectors all rise, but in the government

Table 2c: Change in public expenditure and revenue

	2003	2003	2010	2011	2012	2015
	Level, billion DKK					*per cent o*
Expenditure	0.00	0.00	0.00	-0.38	-0.20	-0.08
Public transfers	0.00	0.00	0.00	-0.01	-0.03	0.08
Age-dep. pub. consumption	0.00	0.00	0.00	0.03	0.02	0.03
Non-age-dep. pub. consumption	0.00	0.00	0.00	-0.15	-0.15	-0.15
Other Expenditure	0.00	0.00	0.00	-0.25	-0.04	-0.04
Revenue	0.00	0.00	0.00	-0.71	-0.10	-0.11
Primary budget surplus	0.00	0.00	0.00	-0.33	0.10	-0.03
Net interest expenses	0.00	0.00	0.00	0.00	0.02	0.01
Net public debt	0.00	0.00	0.00	0.33	0.25	0.28
GDP in 2003-prices	0.00	0.00	0.00	0.18	2.39	3.23
GDP in 2003-prices in per cent	0.00	0.00	0.00	0.01	0.14	0.18

Figure 10.25:

Table 4f: Change in assets in per cent of GDP

	2003	2010	2011	2012	2015
					per cent poi
+ Financial wealth of households	0.0	-0.3	-0.4	-0.5	-0.7
+ Financial wealth, pension funds	0.0	-4.1	-3.5	-3.7	-3.7
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	0.3	0.3	0.3
- Equity and debt of firms	0.0	-4.3	-4.0	-3.9	-3.7
= Net foreign assets	0.0	0.0	-0.2	-0.5	-0.9
Value of household dwellings stock	0.0	0.3	0.5	0.4	0.8

Figure 10.26:

sector they fall so that GDP at market prices only falls a little, and real GDP at factor prices even falls. Over-all employment only rises slightly. For government finances, the increased wage imply increased expenditure for transfers and individual government consumption as a per cent of GDP; at the same time tax revenue falls. Even though source taxes and consumption taxes rise, corporate taxes and the tax on pension fund returns fall even more.

Hvorfor falder BFI realt, dvs. faldet i off. sektor er større end stigningen i privat sektor? Dette lader til at skyldes en uhensigtsmæssighed i beregningsformlen for realt BFI (hvilke prisindeks er relevante?)

Tabel 1e: Macroeconomic development						
	2003	**2010**	**2011**	**2012**	**2015**	**2020**
					Index in fixed prices, base-line = 100, not	
Private consumption	100.0	100.0	100.1	100.1	100.1	100.1
Real GDP	100.0	100.0	100.3	100.4	100.4	100.4
Unemployment	100.0	100.0	89.4	89.4	89.3	89.5
Employment	100.0	100.0	100.5	100.5	100.5	100.5
Construction sector	100.0	100.0	100.6	100.8	100.7	100.4
Private non-construction sector	100.0	100.0	100.2	100.2	100.3	100.3
Public sector	100.0	100.0	101.1	101.0	101.0	101.0
Capital stock						
Construction sector	100.0	100.0	100.0	100.4	100.6	100.4
Private non-construction sector	100.0	100.0	100.0	100.1	100.2	100.3
Public sector	100.0	100.0	100.0	101.0	101.0	101.0
Net foreign assets*	-12.7	23.5	28.8	34.2	50.2	75.3

* Index is assets in per cent of GDP

Figure 10.27:

Table 2c: Change in public expenditure and revenue							
	2003	**2003**	**2010**	**2011**	**2012**	**2015**	**2020**
	Level, billion DKK					*per cent of GDP*	
Expenditure	0.00	0.00	0.00	0.34	-0.02	-0.04	-0.04
Public transfers	0.00	0.00	0.00	-0.19	-0.20	-0.21	-0.21
Age-dep. pub. consumption	0.00	0.00	0.00	-0.07	-0.07	-0.08	-0.08
Non-age-dep. pub. consumption	0.00	0.00	0.00	0.23	0.23	0.23	0.23
Other Expenditure	0.00	0.00	0.00	0.37	0.01	0.01	0.01
Revenue	0.00	0.00	0.00	-0.03	-0.05	-0.06	-0.07
Primary budget surplus	0.00	0.00	0.00	-0.38	-0.02	-0.02	-0.02
Net interest expenses	0.00	0.00	0.00	0.00	0.02	0.02	0.03
Net public debt	0.00	0.00	0.00	0.40	0.43	0.49	0.64
GDP in 2003-prices	0.00	0.00	0.00	5.58	5.93	6.45	6.84
GDP in 2003-prices in per cent	0.00	0.00	0.00	0.34	0.36	0.37	0.36

Figure 10.28:

10.0.16 Effects of a permanent fall in the structural unemployment rate

In this experiment, the unemployment rate decreases permanently by 0.5 percentage point from 2011. The change is produced by changing the parameter ζ in the labour supply function. Literally, the experiment consequently illustrates a change in the preferences causing lower disutility of work. However, it could also be interpreted as a change in other unmodelled factors influencing structural unemployment such as a decrease in search costs.

The unemployment rate decreases from 4.6 to 4.2 per cent in 2011 and stays in the range between 4.2 and 4.5 per cent during the whole projection. Employment correspondingly increases by 0.5 per cent and GDP by 0.4 per cent as investments rise correspondingly.

Table 4f: Change in assets in per cent of GDP	2003	2010	2011	2012	2015
					per cent poi
+ Financial wealth of households	0.0	0.0	0.3	0.2	0.0
+ Financial wealth, pension funds	0.0	0.1	-0.3	-0.3	-0.3
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	-0.1	-0.1	-0.1
- Debt of government sector	0.0	0.0	0.4	0.4	0.5
- Equity and debt of firms	0.0	0.1	-0.3	-0.3	-0.2
= Net foreign assets	0.0	0.0	-0.2	-0.4	-0.7
Value of household dwellings stock	0.0	0.2	-0.7	-0.7	-0.5

Figure 10.29:

Labour income and consumption rises, and tax incomes also rise. However, as per cent of GDP government revenues fall. There are mainly two reasons for this: One is that the larger effective labour supply causes a fall in real wages of around 0.1 per cent. The second is that households now receive fewer unemployment benefits. The increase in household income is consequently not proportional to the increase in production. This is also confirmed indirectly from table ... where it is seen that private consumption increases only by 0.1 per cent.

The reverse side is that government transfers fall by more than 0.2 per cent of GDP. The fall in unemployment benefits, a fall in the indexation level of transfers altogether because of the fall in the wage level and a larger GDP level are all responsible for this. In the same way individual government consumption falls by close to 0.1 per cent of GDP, partly because wages for government employees fall and partly because GDP rises. The net effect of these changes are that the sustainability of government finances improve so that collective government consumption can rise 0.23 per cent of GDP compared to the base-line scenario.

Asset accumulation is little influenced in this experiment. There is a very modest capital gain for firms and dwellings upon impact because of the increased prosperity prospects. Later, the increased total wage incomes lead to increased pensions wealth, whereas the free financial household savings fall. Because of improved fiscal conditions, the need of the government to accumulate savings also are smaller in the experiment.

10.0.17 A rise in the bottom-bracket tax rate

In this and the following tax experiments, a lump-sum transfer of 1 billion DKK is distributed to the adult population annually from 2011. The transfer is financed by an endogenous

Table 1f: Macroeconomic development, Growth corrected						
	2003	**2010**	**2011**	**2012**	**2015**	**2020**
				Index in fixed prices, base-line = 100, g		
Private consumption	100.00	100.00	99.95	99.96	99.96	99.95
Real GDP	100.00	100.00	99.98	99.98	99.97	99.97
Unemployment	100.00	100.00	100.09	100.10	100.12	100.11
Employment	100.00	100.00	99.97	99.97	99.97	99.97
Construction sector	100.00	100.00	99.93	99.91	99.93	99.96
Private non-construction sector	100.00	100.00	99.97	99.97	99.97	99.96
Public sector	100.00	100.00	99.98	99.99	99.99	99.99
Capital stock						
Construction sector	100.00	100.00	100.00	99.95	99.94	99.96
Private non-construction sector	100.00	100.00	100.00	99.99	99.98	99.97
Public sector	100.00	100.00	100.00	99.99	99.99	99.99
Net foreign assets*	-12.7	23.5	29.0	34.6	50.9	76.3

* Index is assets in per cent of GDP

Figure 10.30:

permanent change in a single tax rate from the same year. In the case of the bottom-bracket tax rate on non-capital incomes this requires a rise from 5.5 to 5.67 per cent. The higher tax rate causes a fall in labour supply (even though the unemployment rate remains constant). Firms anticipate lower employment and reduce investment slightly so that GDP is adversely affected from a fall in capital as well as labour supply.

Upon impact, this is reflected in a fall in the value of firms, causing a capital loss of 0.1 billion DKK which is mostly suffered by the pensions sector. However, households simultaneously suffer a capital loss of residential dwellings of 0.9 billion DKK as future demand falls. In future years, lower wage income leads to a slightly smaller accumulation of funds in the pensions sector following the decline in GDP. To compensate for lower future wage and transfer income, households save more so that free financial household savings rise for an increase in total private savings by about 0.2 per cent of GDP in the long run.

For the government finances, the primary budget is almost unchanged during the whole projection period following the shock. As per cent of GDP revenues increase by 0.1 because of the larger income tax payments. Expenditures increase by 0.7-0.8 percentage points because of the lump-sum transfer. Besides, individual government consumption and other transfer payments increase slightly, each by 0.1 per cent of GDP.

Table 4e: Change in assets	2010	2011	2012	2015	2020
					in billion kr., Growth adjus
+ Financial wealth of households	0.0	0.1	0.3	0.7	1.2
+ Financial wealth, pension funds	-0.1	-0.1	-0.1	-0.2	-0.4
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	0.0	0.1	0.0
- Equity and debt of firms	-0.1	-0.3	-0.4	-0.5	-0.6
= Net foreign assets	0.0	0.3	0.5	0.9	1.3
Value of household dwellings stock	-0.9	-0.8	-0.9	-1.2	-1.3
- of which land makes out (in per cent point)	0.0	0.0	0.0	0.0	0.0
- of which buildings make out (in per cent point)	0.0	0.0	0.0	0.0	0.0

Figure 10.31:

Welfare measurements

For each generation, it is possible to measure the welfare effect of a given shock by measuring the change in utility of the relevant representative household of the generation (and multiplying with the number of generation members if total generational welfare changes are wanted). This is done by calculating the equivalent variation (EV) of each household, defined as follows:

$$EV_{a,t} = \left(\frac{U_{a,t}^{Count} - U_{a,t}^{Base}}{U_{a,t}^{Base}} \right) wealth_{a,t}^{Base},$$

where *Base* and *Count* denote the values in the base-line scenario and in the alternative experiment (or counterfactual scenario), respectively. $wealth_{a,t}^{Base}$ is the total wealth (financial wealth + residential wealth + NPV of future non-capital income streams) of the household member. I.e. the equivalent variation is initial wealth times the relative change in life-time utility for the household member. The interpretation is that the EV is equal to the amount of money that the household need in the base-line scenario in order to be able to obtain the same utility as it receives in the counterfactual scenario.

In an overlapping generations economy, there is no objective way of constructing a collective welfare for the whole economy as there is no single "correct" way to weigh together the welfare gains and losses of different generations. A given shock affects both all generations living at the time of the shock and all generations born after the shock. Whereas the EV for each of these generations can be calculated using the formula above, it remains an ethical judgment which discount rate to use when generations living at different times should be compared. However, the standard in DREAM is to use the bond interest rate. The reason for this choice

of discounting is that the government would face this interest rate if it were to undertake the hypothetical intertemporal reallocations which underlie the notion of an intergenerational welfare comparison. In this case it is hypothetically possible for a government to make all generations better off via intertemporal transfers whenever the aggregate welfare measure is possible. The aggregate welfare measure used here is hence the discounted sum of the equivalent variations of all present and future planning and non-planning households:

$$EV_t = \sum_{a=16}^{75} EV_{a,t} + \sum_{a=76}^{101} EV_{a,t} + \sum_{k=1}^{\infty} \prod_{j=1}^{k} \frac{1}{1+i_{t+j}} \left(EV_{16,t+k} + \sum_{n=76}^{101} EV_{n,t+k} \right),$$

where the first term collects the equivalent variation of all planning generations alive at time t, the second term collects the EV of all non-planning generations alive at time t, and the last term shows the present value of the EV of all future generations. As the economy converges to a steady state with a positive growth- and inflation-corrected interest rate, the final term also converges.

Marginal Cost of Public Funds

Using the welfare measurement described above, it is possible to derive an expression for the welfare loss of a small rise in a particular distortionary tax - the Marginal Cost of Public Funds (MCPF). The expression of the MCPF is calculated as

$$MCPF = \frac{EV_t}{NPV_t^{Lumpsum}},$$

where EV_t is defined as above, and $NPV_t^{Lumpsum}$ is the net present value of the lump-sum transfers which the tax in question is to finance (in casu the annual amount of 1 billion DKK in growth- and inflation-corrected units).

The discount rate with which to calculate the net present values is not an obvious choice, and as might be suspected, it is crucial for the size and even some times for the sign of the MCPF as various taxes have contrary effects for different generations and the over-all result hinges on the relative weight of these generations as determined by the discount rate. In DREAM's calculations the bond interest rate is chosen because it is the rate with which the government is confronted if it should try to compensate the worst-off generations by transferring resources from winning to losing generations.

In the case of the bottom-bracket tax hike, the net present value of equivalent variations of

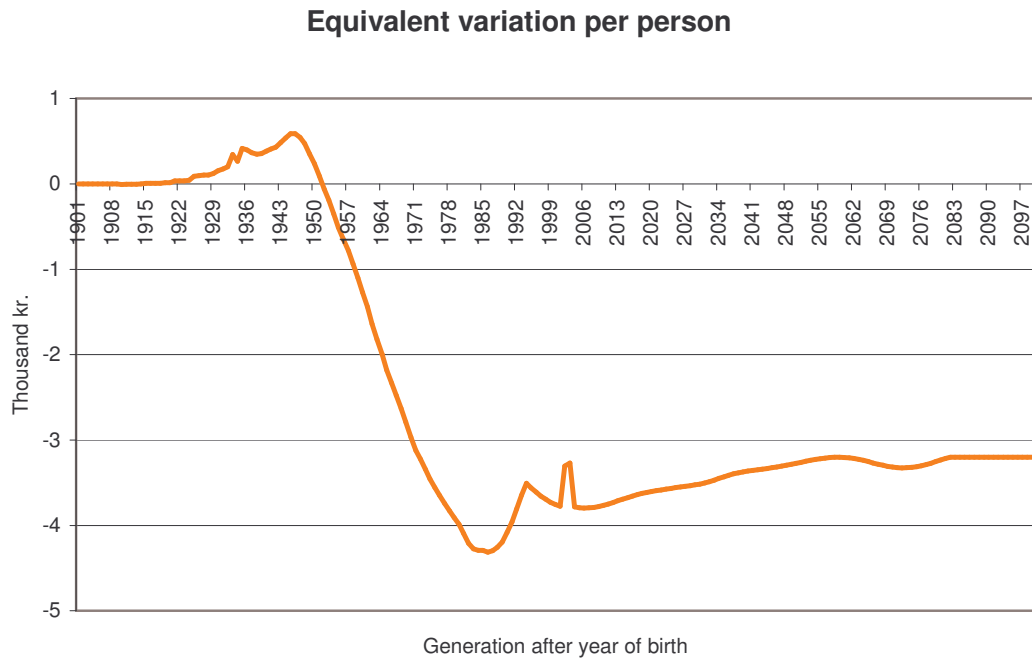**Equivalent variation per person**

Figure 10.32: Equivalent variation from lump-sum transfers financed by a bottom-bracket tax rise

all the generations is DKK billion -27.79, and the net present value of lump-sum revenues is DKK billion -101.15, which results in an MCPF value of 0.27. The interpretation is that each additional krone given out in transfers requires an additional 0.27 krone in compensation to the consumers to negate the effects following from the distortionary taxation used to finance the lump-sum transfer.

The level of the EV measures for each individual generation of those born from 1902 until 2100 can be seen in figure ...As the shock takes place in 2011, the generations born in 1909 and before are not affected at all. The generation born in 1909 is 101 years old in 2010 and is assumed to die out at the end of this year just before the shock takes place. For the remaining generations, three main effects of the shock determine their relative losses and gains: Firstly, all generations now receive an extra lump-sum transfer; by construction, all generations living at one point benefit equally from this. Secondly, all generations now receive lower wage and transfer incomes because of the higher income taxation, and for the generations on the labour market also because employment falls sligthly. The effect of this is most-felt for the middle-aged groups who have the highest income. Thirdly, all generations who have entered the economy at the time of the shock are affected by the capital losses on dwellings and

shares. All generations suffer a loss because of the fall in the value of dwellings. The effect of the adjustment in the stock market is more diverse, however: Non-planning generations are not affected by these capital gains at all by construction of the model. For the planning generations, those that have positive financial savings suffer a loss, whereas those that have net financial debts actually gain because of the adjustment in stock values because the net value of their debt is reduced.

For generations born from 1910 until 1951, the EV is positive, so that these generations are better off because of the shock. This includes all non-planning generations at the time of the shock (those born in 1934 and earlier). The reason is that all these (elderly) generations have relatively small taxable incomes for the rest of their lives so that the value of the lump-sum transfers more than outweighs the higher income tax and the net capital losses.

All generations born in 1952 or later (i.e. those that are 58 years or younger in 2010) are worse off because of the shock. Their remaining life-time taxable incomes (and for the presently living generations, the capital loss) are sufficiently high for the shock to reduce their life-time consumption possibilities. The generations who suffers the largest loss is that which is born in 1986, being 24 years old in 2011. For the youngest living generations (those born from 1987 to 1994), their total capital loss (dwellings + shares) is relatively low and their earnings during the first year is so small that initially, their net income rises because of the lump-sum transfer.

For all future generations (i.e. those born in 10995 and after), there is no capital loss, but the value of their human capital is permanently lower because of the smaller labour supply and capital stock (and because of smaller bequests from the older generations).

10.0.18 A rise in the VAT rates

Alternatively, the lumpsum transfer can be financed with a rise in the effective VAT rates. This requires a rise in the VAT rates of 0.07 percentage points from 2011. The macroeconomic effects are similar to those of the bottom-bracket tax hike: The real wage falls, causing employment and consequently investments to fall. In this case the value of firms as well as dwellings rises slightly, however. (Because the nominal wage falls/VAT rise make people demand more housing). As time passes, again the pensions sector accumulates slightly fewer funds because of smaller labour incomes, whereas free financial savings rise as households compensate for their

Table 1f: Macroeconomic development, Growth corrected	2009	2010	2011	2012	2015
					Index in fixed prices, base-li
Private consumption	100.00	100.00	100.02	99.98	99.97
Real GDP	100.00	100.00	100.00	99.98	99.97
Unemployment	100.00	100.00	100.21	100.28	100.08
Employment	100.00	100.00	99.98	99.98	99.99
Construction sector	100.00	100.00	99.85	99.82	99.88
Private non-construction sector	100.00	100.00	99.99	99.99	99.99
Public sector	100.00	100.00	100.02	100.01	100.02
Capital stock					
Construction sector	100.00	100.00	100.00	99.85	99.79
Private non-construction sector	100.00	100.00	100.00	99.94	99.88
Public sector	100.00	100.00	100.00	100.00	100.01
Net foreign assets*	17.9	23.5	29.0	34.6	51.0

* Index is assets in per cent of GDP

Figure 10.33:

Table 4e: Change in assets	2009	2010	2011	2012	2015
					in billion kr., Growth
+ Financial wealth of households	0.0	0.0	-0.1	0.3	1.0
+ Financial wealth, pension funds	0.0	0.3	0.1	0.0	-0.5
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	0.0	0.2	-0.1
- Equity and debt of firms	0.0	0.3	-0.6	-1.0	-1.4
= Net foreign assets	0.0	0.0	0.6	1.1	1.9
Value of household dwellings stock	0.0	1.0	1.1	1.1	0.6

Figure 10.34:

smaller human capital accumulation. For the government sector, revenues rise by around 0.05 per cent of GDP (indirect tax revenues rise by 0.1 per cent, whereas direct tax revenues fall by 0.05 per cent because of smaller labour incomes). On the expenditure side, the lumpsum transfers increase by 0.08 per cent of GDP whereas expenditures for other transfers fall by 0.03 per cent of GDP in the long run, mainly because the transfer indexation follows the relative fall in nominal wages.

The relative distribution of EVs for the various generations is similar to that of the bottom-bracket tax rise, cf. Figure ... : The oldest present generations gain from the shock, whereas younger and all future generations lose.

Taking a closer look at the details, there are several differences, however. One is that in this shock, only those that are at least 78 years old in 2010 gain from the shock, whereas all planning generations lose. On the other hand, gains for the oldest generations are larger,

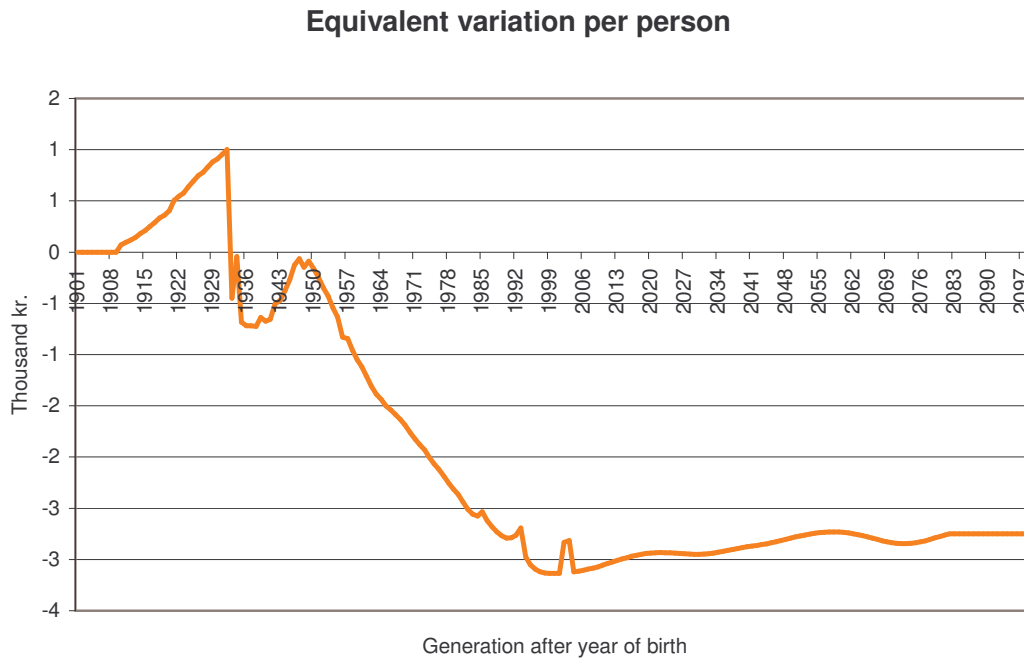**Equivalent variation per person**

Figure 10.35:

whereas the losses from younger ones are smaller. The major reason for the difference is that this shock causes also a change in the composition of consumption: As the use of dwellings is little affected by the VAT rise, demand is twisted from consumption of all other goods towards dwelling consumption. This causes the value of dwellings to rise, whereas the fall in the value of firms is much larger than in the preceding income tax shock. Consequently, non-planning generations experience a large net capital gain as they experience a rise in the value of their dwelling.

As the total decline in consumption is sligthly smaller in the VAT than in the income tax shock, the total discounted value of the EV values is also smaller numerically, and the MCPF is now equal to 0.22.

10.0.19   A corporation tax hike

Next, the lump-sum transfer is financed by an increase in the corporation tax rate (for non-oil-extracting activities) from 28 to 29.41 per cent in 2011. Again, the effects upon production are negative, but modest: Employment, GDP and investments in the private production sector all fall. The value of firms decreases by 1.5 per cent of GDP upon impact as after-tax dividends

Table 1f: Macroeconomic development, Growth corrected	2009	2010	2011	2012	2015
				Index in fixed prices, base-li	
Private consumption	100.00	100.00	99.93	99.92	99.92
Real GDP	100.00	100.00	100.01	99.96	99.96
Unemployment	100.00	100.00	100.10	100.25	100.01
Employment	100.00	100.00	100.00	99.99	100.00
Construction sector	100.00	100.00	99.75	99.60	99.75
Private non-construction sector	100.00	100.00	100.03	100.03	100.03
Public sector	100.00	100.00	100.00	100.01	100.01
Capital stock					
Construction sector	100.00	100.00	100.00	99.59	99.58
Private non-construction sector	100.00	100.00	100.00	99.83	99.84
Public sector	100.00	100.00	100.00	100.00	100.00
Net foreign assets*	17.9	23.5	29.2	34.8	51.2

Index is assets in per cent of GDP

Figure 10.36:

Table 4e: Change in assets	2009	2010	2011	2012	2015
				in billion kr., Growth	
+ Financial wealth of households	0.0	-1.3	-2.0	-0.7	2.4
+ Financial wealth, pension funds	0.0	-20.1	-17.4	-17.8	-18.9
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	4.7	4.9	4.9
- Equity and debt of firms	0.0	-21.4	-26.1	-26.0	-26.2
= Net foreign assets	0.0	0.0	2.0	2.6	4.7
Value of household dwellings stock	0.0	-0.6	0.7	0.4	-0.6

Figure 10.37:

are reduced by the tax hike. Nominal (and real) wages fall to a lower level in 2012 because of the smaller capital stock implying a lower marginal product of labour.

After the initial capital loss, households start saving more in free assets so that free financial household wealth is higher in the steady state following the shock than in the base-line scenario. The increase roughly corresponds to the rise in government debt. Pensions wealth decreases by about half the amount of the fall in firm equity. Net foreign assets consequently grow by around DKK 11 billion...

The distribution of the EVs is somewhat different from the two preceding tax experiments. The main losers from this experiment are all the generations who had positive share holdings at the time of the shock. But also future generations lose as both human capital and equity income fall in future. Only the non-planning generations gain because they do not suffer any capital loss on share holdings nor from smaller future dividends. They are still adversely
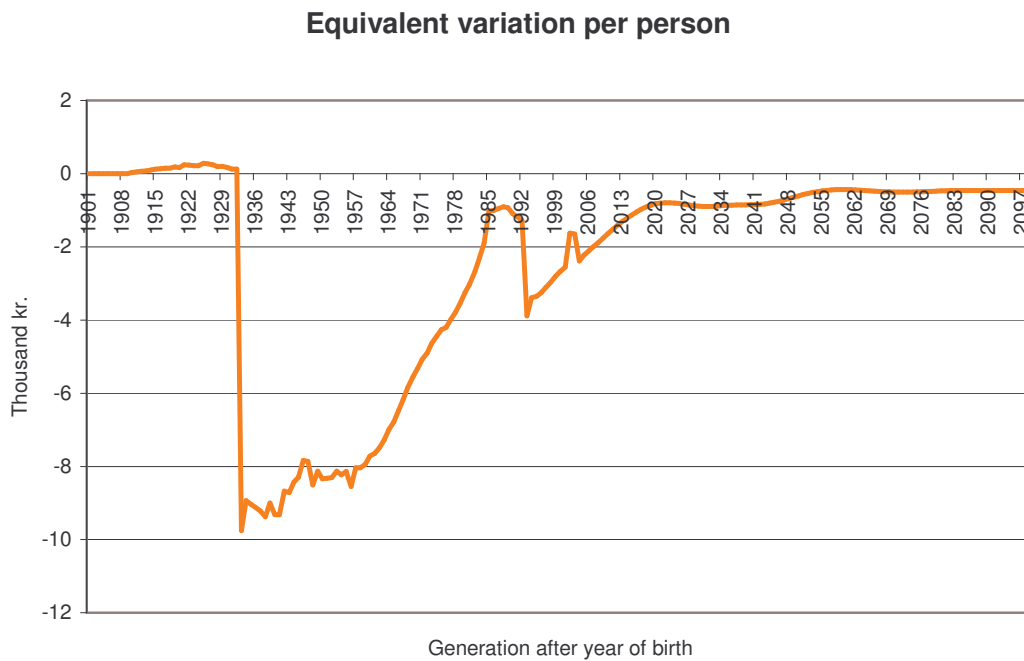
Equivalent variation per person

Figure 10.38:

affected by the capital loss on dwellings, but this is more than offset by the benefits from the lump-sum transfer. The MCPF is 0.31, reflecting the fact that almost all generations lose and the losses for the generations who are most adversely affected are somewhat higher than in the preceding experiments.

10.0.20   A rise in land taxation

In this experiment, the lumpsum transfer is financed by a rise in the tax rate on household land from 1.59 per cent to 2.38 per cent in 2011.

...

In this case, all currently living generations without exception lose, and all future generations gain from the shock. The reason is that the full cost of the tax rise in all periods is born by those generations who own the land at the time of the announcement of the tax via the adjustment in the value of land. All other generations do not bear the burden, but only receive the benefits of the lump-sum transfer. The MCPF is 0.24, reflecting the discount rate chosen.

Table 1f: Macroeconomic development, Growth corrected

	2009	2010	2011	2012	2015
					Index in fixed prices, base-li
Private consumption	100.00	100.00	97.69	99.61	99.61
Real GDP	100.00	100.00	100.21	99.95	99.94
Unemployment	100.00	100.00	100.36	100.11	99.94
Employment	100.00	100.00	100.01	100.00	100.01
Construction sector	100.00	100.00	100.60	99.53	99.71
Private non-construction sector	100.00	100.00	100.06	100.08	100.07
Public sector	100.00	100.00	99.73	99.97	99.96
Capital stock					
Construction sector	100.00	100.00	100.00	99.79	99.73
Private non-construction sector	100.00	100.00	100.00	100.09	100.08
Public sector	100.00	100.00	100.00	99.74	99.96
Net foreign assets*	17.9	23.5	29.9	35.6	52.6

* Index is assets in per cent of GDP

Figure 10.39:

Table 4e: Change in assets

	2009	2010	2011	2012	2015
					in billion kr., Growth
+ Financial wealth of households	0.0	-0.1	17.8	24.4	37.2
+ Financial wealth, pension funds	0.0	-0.9	-1.0	-1.2	-2.3
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	6.0	8.6	11.7
- Equity and debt of firms	0.0	-1.0	0.6	0.9	0.5
= Net foreign assets	0.0	0.0	10.3	13.6	22.7
Value of household dwellings stock	0.0	-145.8	-143.6	-145.2	-145.0

Figure 10.40:
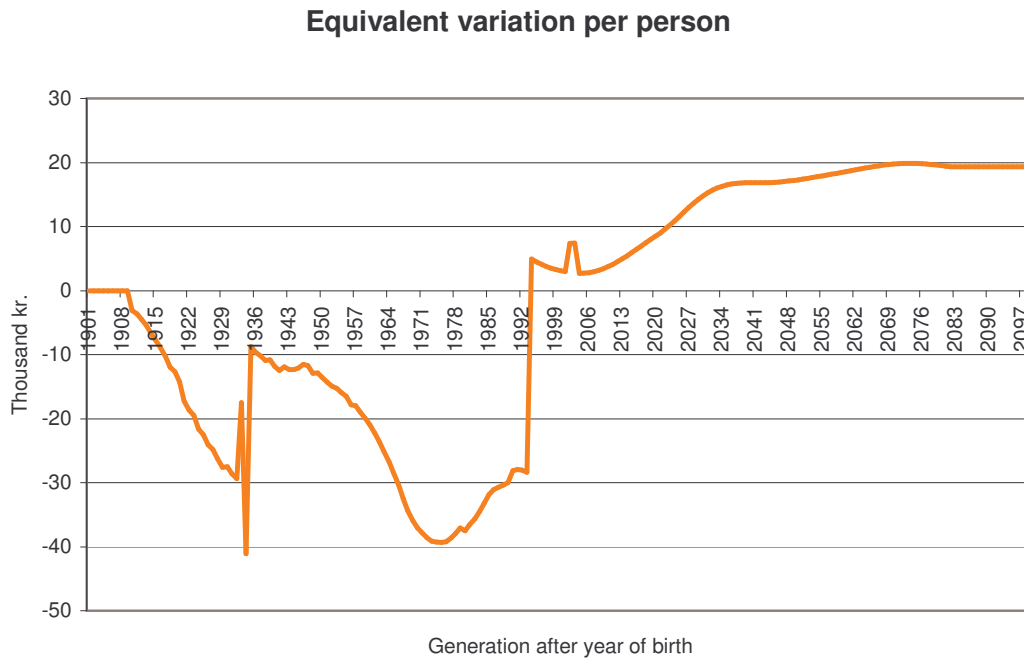
Equivalent variation per person

Figure 10.41:

10.0.21 A rise in the tax on owner-occupied dwellings

Now the lumpsum transfer is financed by a rise in the tax on owner-occupied dwellings from
0.94 per cent to 1.1 per cent in 2011 (excluding the correction factor in the tax expression).
Qualitatively, the effects are similar to those of the preceding experiment, but the size of
the gains and losses for the various generations is smaller. The MCPF also is similar to the
preceding one: 0.26.

10.0.22 A change in the tax on interest income

In this experiment the lumpsum transfer is financed by a change in the tax rate on interest
income for households. In this case, the necessary financing consists of a *reduction* in the
tax rate from 35.16 to 31.31 per cent. This implies that the tax initially is higher than its
revenue-maximizing size. That is, according to DREAM the interest income tax on households
has passed the maximum point of the Laffer curve.

The tax change works as an increase in the effective interest rate for households and stimulates
a huge increase in free financial household savings. For the pensions funds, the larger household
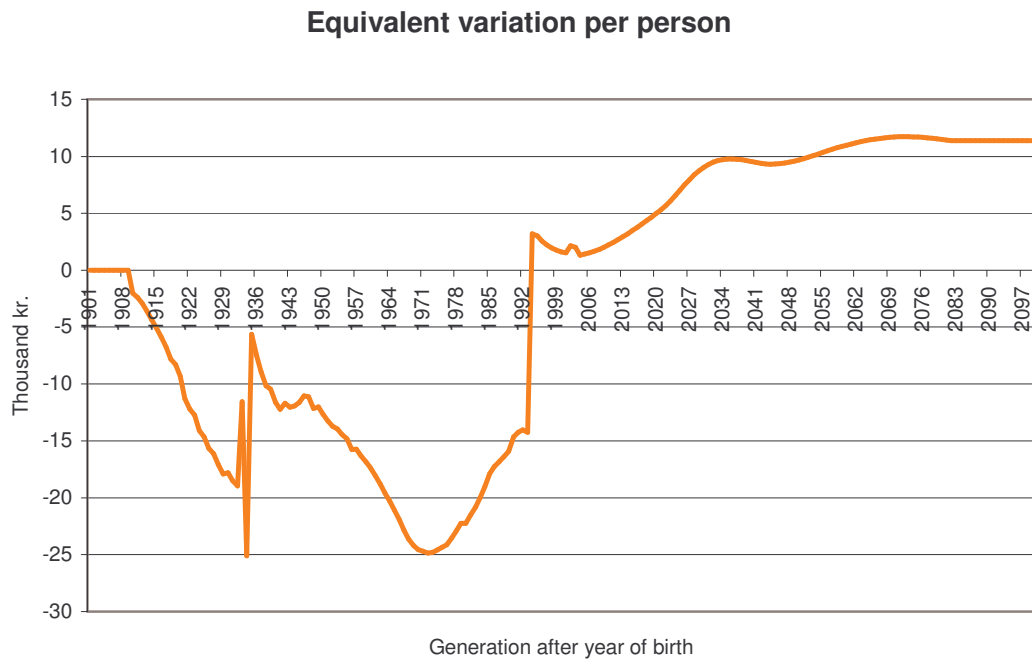
Equivalent variation per person

Figure 10.42:

Table 1f: Macroeconomic development, Growth corrected					
	2009	**2010**	**2011**	**2012**	**2015**
				Index in fixed prices, base-li	
Private consumption	100.00	100.00	98.27	99.32	99.31
Real GDP	100.00	100.00	100.05	100.05	100.01
Unemployment	100.00	100.00	100.77	100.50	99.89
Employment	100.00	100.00	99.98	99.98	100.00
Construction sector	100.00	100.00	98.42	97.49	98.23
Private non-construction sector	100.00	100.00	100.28	100.34	100.26
Public sector	100.00	100.00	99.80	99.94	99.95
Capital stock					
Construction sector	100.00	100.00	100.00	98.67	98.35
Private non-construction sector	100.00	100.00	100.00	100.30	100.36
Public sector	100.00	100.00	100.00	99.80	99.94
Net foreign assets*	17.9	23.5	30.1	36.1	54.1

Index is assets in per cent of GDP

Figure 10.43:

Table 4e: Change in assets	2009	2010	2011	2012	2015	2020
					in billion kr., Growth adjusted	
+ Financial wealth of households	0.0	-0.2	22.7	38.8	71.6	109.0
+ Financial wealth, pension funds	0.0	-3.3	-3.2	-3.6	-5.4	-10.2
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	-0.1	-0.1
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	-0.1	-0.1
- Debt of government sector	0.0	0.0	6.3	11.8	21.2	31.7
- Equity and debt of firms	0.0	-3.5	1.7	3.7	2.7	0.0
= Net foreign assets	0.0	0.0	11.4	19.7	42.2	66.9
Value of household dwellings stock	0.0	-64.5	-71.5	-78.4	-87.3	-88.5

Figure 10.44:

demand for shares implies that their portfolio shifts relatively towards bonds and so the effective returns to pensions savings falls, diminishing pensions wealth and pensions benefits in the long run.

On the housing market, the effective interest increase results in a large fall in the price on dwellings. As user-cost rises, the CPI rises slightly after 2015 and results in slightly smaller employment and production, which again effects the long-run value of firms, cf. table 4e.

The MCPF is negative: -3,93, implying that for each DKK of extra transfers, the average person receives an extra benefit equal to DKK 3,93. According to the graph, the only generations who lose are the present non-planning generations who suffer a capital loss from dwellings which more than offsets their gains from the lump-sum transfer. All other generations gain. In the steady state, the EV per person amounts to DKK 63,500.

10.0.23   A rise in the tax on pensions funds income

When the tax on capital income in the pensions funds is used to finance the extra transfers, the tax rate in question must rise from 15 to 15.76 per cent in 2011.

This shock has some of the same qualitative properties as the preceding fall in the tax on income from free financial savings. In this case, the higher tax on returns to the pensions funds decreases the effective returns to the funds and lowers the demand for and consequently the price on shares. This in turn increases the effective returns to the savings of households. Both the increase in i^H and the expectation of lower funded pensions benefits in future makes households save considerably more in financial assets, whereas the value of the stock of dwell-
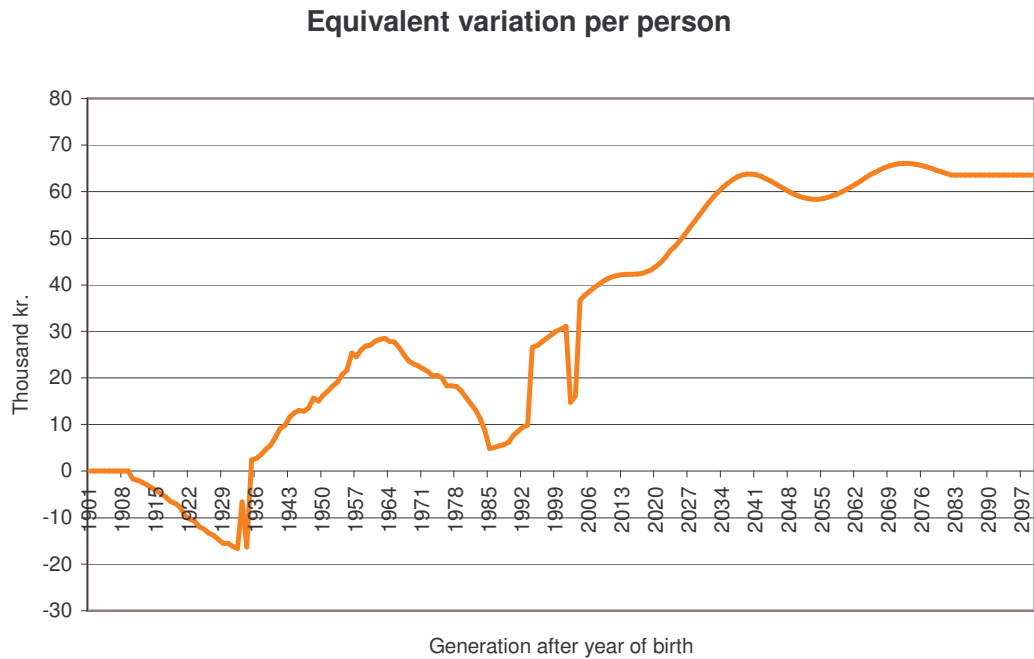
Equivalent variation per person

Figure 10.45:

ings falls upon impact and during the projection as user-costs rise. Again, this leads to a small decline in employment and production.

Net beneficients are all generations except for the current non-planning and those born from 1964 until 1993. In this case, the MCPF is again negative: -0.21, implying that the tax increase is actually beneficient in itself for the households of the economy.

Table 4e: Change in assets	2009	2010	2011	2012	2015
					in billion kr., Growth
+ Financial wealth of households	0.0	-0.1	2.0	4.0	8.9
+ Financial wealth, pension funds	0.0	-1.5	-1.4	-2.1	-4.2
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	-0.1
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	-0.1
+ Financial wealth, ATP Fund	0.0	0.0	0.0	-0.1	-0.4
- Debt of government sector	0.0	0.0	1.7	2.1	2.4
- Equity and debt of firms	0.0	-1.6	-2.5	-2.8	-3.3
= Net foreign assets	0.0	0.0	1.4	2.5	5.0
Value of household dwellings stock	0.0	-5.6	-5.6	-6.1	-7.1

Figure 10.46:

Equivalent variation per person
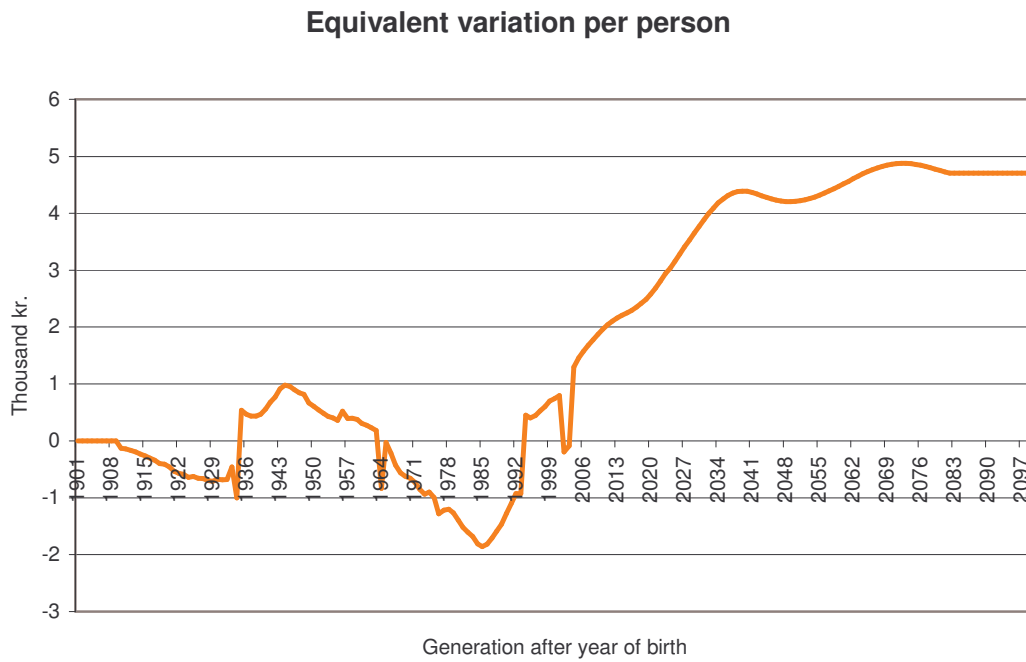
Figure 10.47:

Table 1f: Macroeconomic development, Growth corrected						
	2009	**2010**	**2011**	**2012**	**2015**	**2020**
					Index in fixed prices, base-line = 100, g	
Private consumption	100.00	100.00	99.65	99.76	99.82	99.90
Real GDP	100.00	100.00	99.99	100.00	99.99	99.99
Unemployment	100.00	100.00	100.25	100.11	99.93	100.00
Employment	100.00	100.00	99.99	100.00	100.00	100.00
Construction sector	100.00	100.00	99.28	99.32	99.86	100.17
Private non-construction sector	100.00	100.00	100.11	100.10	100.03	99.98
Public sector	100.00	100.00	99.96	99.98	99.98	99.99
Capital stock						
Construction sector	100.00	100.00	100.00	99.72	99.89	100.16
Private non-construction sector	100.00	100.00	100.00	100.12	100.10	100.00
Public sector	100.00	100.00	100.00	99.96	99.98	99.99
Net foreign assets*	17.9	23.5	29.3	35.0	51.6	77.1

* Index is assets in per cent of GDP

Figure 10.48:

Table 4e: Change in assets	2009	2010	2011	2012	2015
					in billion kr., Growth
+ Financial wealth of households	0.0	-3.2	3.8	8.1	12.7
+ Financial wealth, pension funds	0.0	-51.9	-45.0	-45.7	-46.4
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.0
- Debt of government sector	0.0	0.0	11.5	6.2	-5.3
- Equity and debt of firms	0.0	-55.1	-55.8	-49.4	-38.9
= Net foreign assets	0.0	0.0	3.0	5.5	10.5
Value of household dwellings stock	0.0	-4.8	-9.4	-10.2	-7.8

Figure 10.49:

10.0.24 A rise in the tax on resource revenue from the North Sea

MCPF: 0.15.

10.0.25 A 5-year extension of the tax freeze

In this experiment, the present Danish "tax freeze policy" is extended by 5 years (the announcement is made in 2011). The basic principle in the tax freeze is that all tax rates must stay constant, except for the tax on owner-occupied dwellings and some quantity-based indirect taxes which must stay constant in nominal terms, cf. chapter... In DREAM where these taxes are represented by ad valorem tax variables, the corresponding tax rates decline with inflation and productivity growth. In standard projections, the tax freeze is assumed to be in force only until 2010, but this experiment examines the effect of extending the gradual real fall in dwelling and indirect taxes until 2015. The resulting fall in real tax rates can be seen in table...

<Special table with tax rates here>

For the consumers, the cut in some consumption taxes is experienced as a decrease in the CPI by 0.5 per cent in the period from 2010 to 2015. This ensures a rise in the real wage, causing a higher employment of 0.1 per cent. GDP at market prices also grows by around 0.1 per cent, whereas at factor prices it grows by 0.3 per cent in the long run. Private consumption, after a rather large rise in the first year after the announcement, grows by between 0.5 and 1 per cent compared to the baseline projection.
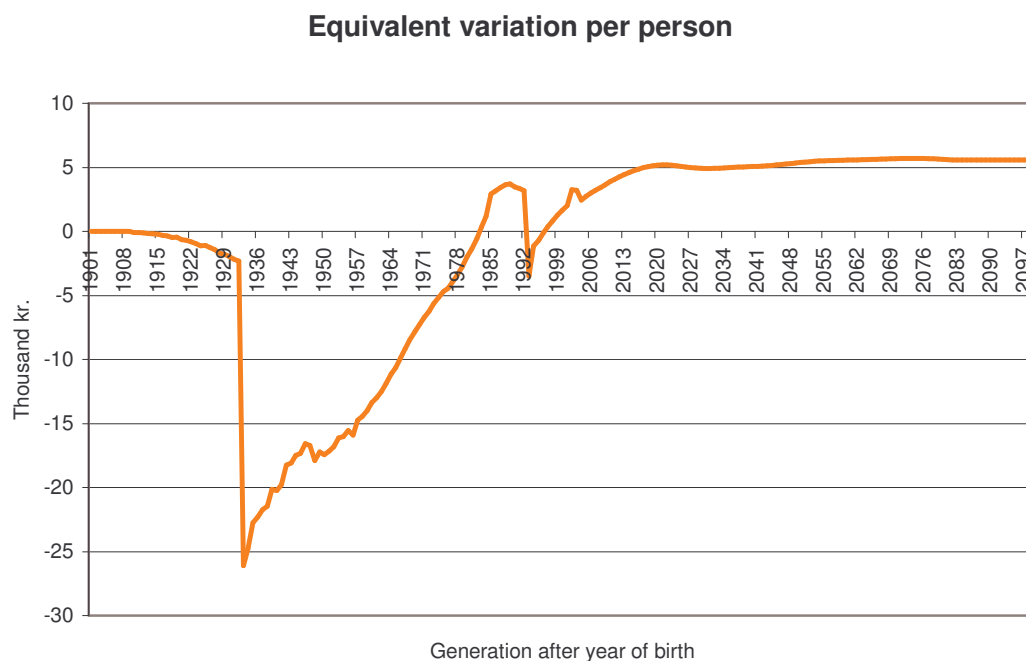
Equivalent variation per person

Figure 10.50:

Tabel 1e: Macroeconomic development						
	2003	**2010**	**2011**	**2012**	**2015**	**2020**
				Index in fixed prices, base-line = 100, not		
Private consumption	100.0	100.0	102.4	100.6	100.8	100.9
Real GDP	100.0	100.0	99.9	100.0	100.1	100.2
Unemployment	100.0	100.0	99.9	99.7	99.6	99.7
Employment	100.0	100.0	100.0	100.0	100.1	100.1
Construction sector	100.0	100.0	100.8	102.5	102.3	101.1
Private non-construction sector	100.0	100.0	100.2	100.1	100.3	100.4
Public sector	100.0	100.0	99.1	99.0	98.9	99.0
Capital stock						
Construction sector	100.0	100.0	100.0	101.5	102.3	101.4
Private non-construction sector	100.0	100.0	100.0	100.0	100.3	100.6
Public sector	100.0	100.0	100.0	99.2	99.0	99.0
Net foreign assets*	-12.7	23.5	28.0	33.2	48.5	72.9

* Index is assets in per cent of GDP

Figure 10.51:

Table 4e: Change in assets	2003	2010	2011	2012	2015
					in billion kr., Growth
+ Financial wealth of households	0.0	0.3	-23.0	-33.6	-55.3
+ Financial wealth, pension funds	0.0	4.1	3.6	4.0	6.3
+ Financial wealth, LD Fund	0.0	0.0	0.0	0.0	0.0
+ Financial wealth, SP Fund	0.0	0.0	0.0	0.0	0.1
+ Financial wealth, ATP Fund	0.0	0.0	0.0	0.0	0.1
- Debt of government sector	0.0	0.0	-12.6	-18.6	-25.9
- Equity and debt of firms	0.0	4.3	5.1	6.2	9.1
= Net foreign assets	0.0	0.0	-11.8	-17.2	-32.0
Value of household dwellings stock	0.0	73.9	76.4	83.0	96.0

Figure 10.52:

The announcement causes a one-time capital gain for all shareholders of DKK 4.3 billion and a very large capital gain on residential buildings of 73.9 billion as the future higher production and lower taxes on dwellings are capitalized. In the projection, the higher value of the dwelling stock is accompanied by a decrease in the financial wealth of households of DKK 112 billion in the long run. For the government sector, revenues naturally fall. In the first few years after the announcement, the net result is positive or neutral because of positive effects from the taxation of capital gains, but the long-run effect is a revenue loss of slightly more than a quarter of a per cent of GDP. The main negative effect comes from the revenue of indirect taxes, which fall by 0.19 per cent of GDP in the long run. The pure effect from the quantity-based taxes is a fall in revenues of 0.31 percentage points, but this is partially offset by a rise in VAT revenues of 0.05 per cent and from property (land) tax revenues of 0.08 per cent. Direct taxes fall by 0.07 per cent of GDP. Here the fall is dominated by source taxes. The major loss among these does not, as one might believe, derive from the smaller revenues from the tax on owner-occupied dwellings, but from the loss on capital income taxes on households. In the opposite direction the result is moderated by a rise in labour income taxes and the tax on pension fund income.

On the expenditure side total expenditures fall by 0.25 per cent of GDP in the long run. This mostly originates from the worsening of the fiscal position of the government which enforces a cut in collective government consumption of 0.27 per cent of GDP permanently from 2011 in order for fiscal policy to remain sustainable. A minor rise in income transfer expenditures relative to GDP is caused by the rise in nominal wages which affects indexation.

Table 2c: Change in government revenue (count-base)	2003	2010	2011	2012	2015	2020
					per cent of GDP, market pri	
Capital income	0.00	0.00	-0.01	-0.01	-0.02	-0.02
Revenue from rents, dividend income and so on	0.00	0.00	0.00	0.00	0.00	0.00
Indirect taxes	0.00	0.00	0.17	0.04	-0.15	-0.18
Direct taxes	0.00	0.00	-0.05	-0.05	-0.07	-0.08
Compulsory contributions to social security	0.00	0.00	-0.01	0.00	0.00	0.00
Optional social contributions	0.00	0.00	0.00	0.00	0.00	0.00
Imputed contribtution to civil servant pensions	0.00	0.00	0.00	0.00	0.00	0.00
Other contributions	0.00	0.00	0.00	0.00	0.00	0.00
Capital taxes	0.00	0.00	0.00	0.00	0.00	0.00
Capital transfers from foreign countries	0.00	0.00	0.00	0.00	0.00	0.00
Capital transfers from households	0.00	0.00	0.00	0.00	0.00	0.00
Lump sum transfers	0.00	0.00	0.00	0.00	0.00	0.00
Total government revenue	0.00	0.00	0.10	-0.03	-0.24	-0.27

Figure 10.53:

Table 2c: Change in government expenditures (count-base)	2003	2010	2011	2012	2015	2020	2040
				per cent of GDP, market prices			
Government consumption	0.00	0.00	-0.37	-0.31	-0.28	-0.28	-0.27
Subsidies, from DK	0.00	0.00	-0.01	0.00	0.01	0.01	0.01
Total expenditures to income transfers	0.00	0.00	-0.09	-0.04	0.01	0.03	0.04
Miscellaneous transfers	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfers to foreign countries	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government investments	0.00	0.00	-0.31	-0.10	-0.03	-0.03	-0.03
Capital transfers to foreign countries	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lump sum transfers	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total government expenditures	0.00	0.00	-0.78	-0.45	-0.30	-0.26	-0.25

Figure 10.54: