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**How are educational groups affected by
economic shocks and trends?**

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Preface

Since the early 1990s, Statistics Norway has produced model-based projections on demand and supply of labor by education. The demand and supply side has been modeled separately, but in a consistent manner so that it has been possible to compare them. The macroeconomic model MODAG has been the core model on the demand side. The last projections, stretching to 2030, were published in Bjørnstad et al. (2010). This report studies consequences of alternative economic shocks and trends measured as deviations from those projections. The project is financed by Ministry of Education and Research, Ministry of Labour, Ministry of Trade and Industry and the Labour and Welfare Service. We wish to thank these institutions for the research funds and for constructive advices during the process of producing the results and writing the report.

Abstract

Bjørnstad et al. (2010) forecast the future demand for labor by their educational attainment in Norway until 2030. The projection is based on a cyclical neutral development path in the key macroeconomic variables, in addition to several assumptions of structural character that are important in a longer perspective. In this report, we look closer at some of the assumptions made in Bjørnstad et al. (2010) and examine the consequences of changing these for the labor market by education.

A cyclically neutral development path is practical when the aim is to look into economic aspects in a longer perspective. The actual development is however characterized by various shocks hitting the economy with different strength all the time. The cyclical analysis in this report contains calculations of four such shocks that typically hit the Norwegian economy from time to time. These are, respectively, a setback in the international economy, a fall in Norwegian oil investments, a reduction in housing prices and a strengthening of the Norwegian currency.

In the long run analysis we have examined the consequences of changing some of the variables of importance in a longer perspective. We have looked at the effects of increasing the labor supply through both a higher growth in labor immigration and higher participation rates for the existing population. Further on, we have carried out calculations where the income tax and the value added tax is increased, respectively. Afterwards we have examined the effects of a worsening of the terms of trade conditions, i.e. that import prices increase more than export prices.

The results from the cyclical and the structural calculations by and large show the same pattern. On balance, persons with a low level of education are most likely to lose their job when the economic conditions worsen. Low-educated persons are to a larger extent employed in the private, exposed sectors of the economy and hence more vulnerable in a situation with falling employment. Consequently, persons with education below tertiary level are more likely to become unemployed in a cyclical downturn or when competitiveness worsens.

The results also show that persons with a low level of education have a looser attachment to the labor market and are more likely to exit the labor force as a response to rising unemployment. The results demonstrate large differences in the labor supply responses by educational level to changing unemployment levels. This phenomenon is in economic literature referred to as the discouraged workers effect and contributes to levelling out the unemployment discrepancies by education.

In all the long-term calculations, the budget balance is improved relative to the baseline in a longer perspective. This means that there is scope for a higher public expenditure growth in these calculations without violating the adopted fiscal policy rule. However, the calculations are partial in the sense that the fiscal policy does not respond to changes in the real economy. This may seem unrealistic, but is practical when the aim is to study consequences of various shocks and structural changes in isolation. In a separate calculation, we have increased the public employment level. By comparing this calculation with the other long-term calculations, one can form an impression of the total implications of the structural changes when the public authorities respond by increasing the employment level. The results from this calculation show that increasing the public employment level primarily benefits persons with a high level of education, as public sector employs a large share of highly educated persons.

The calculation where public employment is increased is useful as a supplement to the cyclical analyses as well. By comparing it to the cyclical calculations, we can consider a joint shock as indicating a fiscal policy response to business fluctuations. A set back in the private economy will generally hit low skilled workers harder, and increased public employment will typically benefit the highly educated workers. Hence, it will be a challenge to aim the fiscal policy stimulus such that it benefits the educational groups that need it the most.

Sammendrag

Bjørnstad m.fl. (2010) framskriver det framtidige behovet for arbeidskraft etter utdanning i Norge til 2030. Framskrivningen er basert på en konjunkturnøytral utvikling i sentrale makroøkonomiske variabler. I tillegg bygger den på flere viktige forutsetninger av mer strukturell karakter i et lengre perspektiv. I denne rapporten ser vi nærmere på noen av forutsetningene i Bjørnstad m.fl. (2010) og undersøker konsekvensene for behovet for arbeidskraft etter utdanning av å endre disse.

En konjunkturnøytral utviklingsbane er praktisk når målet er å se på økonomiske utviklingstrekk i et lengre perspektiv. Den faktiske utviklingen er imidlertid preget av at ulike økonomiske sjokk treffer økonomien med forskjellig styrke hele tiden. Den delen som omhandler konsekvensen av ulike konjunkturrelle sjokk, betrakter et tilbakeslag i internasjonal økonomi, fall i norske oljeinvesteringer, nedgang i boligprisene fra et negativt etterspørselskift i boligmarkedet og en styrking av den norske kronen.

I delen som analyserer endringer i forutsetningene bak den langsiktige utviklingen, ser vi på effekten av å øke tilgangen på arbeidskraft gjennom både en høyere arbeidsinnvandring og en høyere yrkesdeltakelse blant den eksisterende befolkningen. Videre har vi gjennomført beregninger hvor inntektsskatten og merverdiavgiften er økt. Til slutt ser vi på konsekvensen av en forverring av bytteforholdet overfor utlandet, det vil si økt pris på det vi importerer i forhold til det vi eksporterer.

Resultatene fra både de sykliske og strukturelle beregningene viser i det store og hele det samme mønsteret, nemlig at personer med lav utdanning er mest utsatt for å miste jobben når de økonomiske rammebetingelsene forverres. Lavt utdannede personer er i større grad sysselsatt i konkurranseutsatt sektor av økonomien og dermed mer sårbare i en situasjon med fallende sysselsetting. Følgelig er personer med utdanning under universitets- og høyskolenivå mer utsatt for å bli arbeidsledig i en nedgangskonjunktur, eller når konkurransevilkårene for privat næringsliv forverres.

Resultatene viser også at personer med lav utdanning har en løsere tilknytning til arbeidsmarkedet og i større grad vil gå ut av arbeidsstyrken som en respons på økende arbeidsledighet. Resultatene viser store forskjeller i arbeidstilbudsresponsen til skiftende arbeidsledighetsnivåer mellom utdanningsgruppene. Dette fenomenet er i økonomisk litteratur referert til som motløs arbeider-effekten, og bidrar til mindre forskjeller i ledighetsnivåene enn sysselsettingsnivåene tilsier.

I alle de langsiktige alternativberegningene bedres den offentlige budsjettbalansen i forhold til referansebanen. Dermed gis det rom for å øke den offentlige utgiftsveksten i henhold til det å følge den vedtatte handlingsregelen for finanspolitikken. Beregningene er imidlertid partielle i den forstand at finanspolitikken ikke reagerer på endringer i realøkonomien ved at skatte- og avgiftssatser og offentlig etterspørsel ikke endres. Dette kan oppfattes som urealistisk, men er praktisk når målet er å betrakte konsekvensene av ulike sjokk og strukturendringer isolert sett. I en separat beregning har vi derfor økt nivået på offentlig sysselsetting. Ved å sammenholde denne beregningen med de andre langsiktige beregningene, kan man danne seg et inntrykk av den totale konsekvensen av de strukturelle endringene når offentlige myndigheter benytter seg av de ekstra midlene til å øke tjeneste-produksjonen. Resultatet fra den siste beregningen viser at å øke offentlig sysselsetting primært gagnar personer med høy utdanning, som offentlig sektor sysselsetter en relativt stor andel av.

Beregningen med økt offentlig sysselsetting er også relevant for å spile ut mulighetsområdet ved konjunktursjokk. Finanspolitikken er uendret i disse beregningene også, og beregninger med økt offentlig sysselsetting kan kaste lys over hva utfallet blir hvis man får en finanspolitisk respons på svingningene i økonomien. Et tilbakeslag i privat sektor vil generelt ramme lavt utdannede hardt, og økt offentlig sysselsetting vil typisk bedre arbeidsmarkedet for høyt utdannede. Derfor vil det være en utfordring å innrette finanspolitikken slik at det gagnar de utdanningsgruppene som trenger det mest.

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1. Introduction

Norway has seen a considerable growth in demand for labor with higher skills and educational levels the past decades, probably because of globalization and technological progress. Labor supply has followed demand rather closely, and unemployment and wage differences have remained relatively constant. In many other OECD-countries, supply has not grown correspondingly. This has resulted in increasing differences either in unemployment or in wages between high and low skilled workers. The past trends in educational upgrading will probably continue, and further stability in the labor market requires that labor demand and supply matches also in the future. Both for future students, who must decide on education, and the authorities, who must plan the educational capacity, industrial development and welfare reforms etc., projections on demand and supply of labor by education are useful.

Statistics Norway has produced such projections since 1993, and Bjørnstad et al. (2010) present updated projections towards 2030. In this report we use the same model system to quantify the consequences of economic shocks and alternative economic trends. All calculations in this report are presented as deviations from the projections made in Bjørnstad et al. (2010), which we refer to as the baseline scenario. Economic shocks are assumed to hit the economy in 2012, and consequences are analyzed throughout 2015. Alternative economic trends are studied up until 2030.

In the next section we give a brief outline of the functioning of MODAG, which is the macroeconomic model used in Bjørnstad et al. (2010) to construct the projections and which we also use in this report. In section 3 we present the baseline scenario in Bjørnstad et al. (2010). Section 4 presents the consequences of 4 different negative economic shocks to the business cycle; a global recession, a fall in oil investments in Norway, a setback in the domestic housing market and a stronger krone exchange rate. In the long term analysis in section 5 we analyze the effects of increased labor immigration, increased labor participation, higher income tax rate, higher value added tax and deterioration in the terms of trade.

The results from both the cyclical and the structural calculations show the same pattern by and large. On balance, persons with a low level of education are most likely to lose their job when the economic framework conditions worsen. Low educated persons are to a larger extent employed in the exposed sectors of the economy and hence more vulnerable in a situation with falling employment. Consequently, persons with education below tertiary level are more likely to become unemployed in a cyclical downturn.

The results also show that persons with a low level of education have a looser attachment to the labor market and are most likely to exit the labor force as a response to rising unemployment. The results demonstrate large differences in the labor supply responses by educational level to changing unemployment levels. This phenomenon is in economic literature referred to as the discouraged workers effect and contributes to levelling out the unemployment discrepancies by education.

The calculations are partial in the sense that the fiscal policy does not respond to changes in the real economy. This may seem unrealistic, but it is practical when the aim is to study the consequences of various shocks and structural changes in isolation. However, all the long run calculations of changes in structural variables are carried out in such a way that the public budget balance is improved, providing scope for higher public expenditure growth. At the end of section 5 we present a calculation where the level of public employment is increased. By comparing this calculation with the other structural calculations, in such a way that the government deficit is roughly unchanged, one can form an impression of the joint implications of the structural changes when fiscal policy also changes in line with the fiscal rule.

The results from the last calculation show that increasing the public employment level primarily benefits persons with a high level of education as public sector employs a large share of highly educated persons.

The calculation with increased public employment is also useful as a supplement to the cyclical analyses. Fiscal policy is unaltered in these calculations as well, and the calculation with increased public employment can shed light on the outcome of a policy response to the fluctuations. A set back in the private economy will generally hit low skilled workers harder, and increased public employment will typically benefit the highly educated workers. Of course, job creation schemes can be aimed towards different groups of workers. A macroeconomic model like MODAG is however not able to address such measures. Our calculations thus indicate that it will be a challenge to aim the fiscal policy stimulus such that it benefits the educational groups that need it the most.

2. The macroeconomic model MODAG

Knowledge of how the composition of labor develops over time is of great interest, and in the recent years projection models have been developed for this purpose. It is most common to apply a macroeconomic model with numerous industries to project the skill composition of labor. To capture the interaction between the different industries, these models often contain a core of input-output relations. MODAG is a macroeconometric model for the Norwegian economy developed at Statistics Norway, and has such a core. In this section, we provide a short description of the model. Cappelen (1992) provides a more detailed presentation of an earlier version of MODAG, and Boug and Dyvi (2008) present the most recent version written in Norwegian. The standard version of MODAG operates with homogeneous labor. In the version we use here, (and in Bjørnstad et al., 2010), labor is disaggregated into five educational groups. Bjørnstad and Skjerpen (2006) describe the education-specific labor demand and wage setting.

MODAG distinguishes between 45 different products and 21 different industries. The model specifies a large number of final uses of the products, and these products have different prices depending on supply (home- or foreign-produced) and utilization (export or home market). The Norwegian National Accounts (NA) forms the conceptual framework and the empirical basis of the model. Specifically, MODAG balances all products in terms of input and output. These relationships connect – at the most detailed level in the model – the supply and use of the products to different activities in the economy. MODAG also contains a consistent account of income and capital balances within each institutional sector, and in the economy as a whole. At the same time, the input-output structure and the account-based relationships are supplemented with econometric equations describing how the agents in the economy tend to respond to different options. While the long-term relations are based on economic theory, the dynamic adjustments towards the long run are largely data determined.

The main structure of the model implies that prices – along with interest rates, exchange rates and wages – determine the demand from private consumption and investment as well as foreign demand. Public sector's income and expenditures are represented in some detail in the model. However, the public use of resources and various tax rates are exogenous. In 11 of the industries, the demand for variable input factors is based on a Cobb-Douglas production function in materials, a CES-aggregate in energy and a CES-aggregate in high- and low-educated labor. The model assumes that there is no substitution between the different types of labor within the two aggregates.¹ Total real capital is treated as a quasi-fixed input, and Hicks-neutral technological change is represented by a linear trend. For seven of the industries, individuals with vocational training at a higher secondary level are regarded as low-educated labor, while the other four – which in sum is much larger – are regarded as high-educated labor. This choice is based on the empirical results obtained by Bjørnstad and Skjerpen (2006). The assessment of high- versus low-educated workers depends on relative wages, the stock of machine capital and production volume following a linear trend, which is assumed to represent skill-biased technological change (but possibly also other factors).

The model involves a traditional Keynesian multiplier, where higher income leads to more spending, which increases production in the next round and activates further growth in employment and income. In this way, the initial change in aggregate demand causes a change in aggregate output for the economy that is a multiple of the initial change. Although several mechanisms work in the opposite direction, the operational version of the model does not contain mechanisms that ensure full resource utilization or balance in the external account or in public sector

¹ In the other industries in which the demands for variable inputs are modelled, there is no possibility for substitution between any different types of labor.

budgets. We believe this property is in line with the functioning of the Norwegian economy as long as fiscal policy is exogenous. In real life, the fiscal policy in Norway contributes extensively to stabilize the economy. Thus, in applying the model, the user must decide on a fiscal policy that contributes to this and that is sustainable.

Production in the different industries depends on the macroeconomic functioning of the Norwegian economy and on exogenous assumptions about economic development abroad, growth in industries based on natural resources and growth in public services. In addition to the level of production, demand for labor in the different industries depends on technological progress and the possibility of substitution with other inputs. In a separate sub-model, the aggregate demand for labor in each industry is further disaggregated by education using exogenous assumptions about how the employment shares within each main educational group may develop. The continuation of trends observed from the past decade regarding the composition of labor is used as a standard assumption. On the demand side the projections in Bjørnstad et al. (2010) correspond rather closely to the European joint project managed by the European Centre for the Development of Vocational Training (Cedefop) that aims to project demand and supply for different kinds of labor for EU27, Norway and Switzerland².

On the supply side of MODAG, labor force by the five educational categories is determined by linking equations for labor market participation by age and gender to the corresponding groups of individuals in working age. A discrepancy between total supply and demand, expressed by the corresponding rates of unemployment, affects wage formation. Because wages affect labor market participation rates, as well as demand for labor, this link helps in the direction of achieving consistency between the demand and supply of labor by education.

The five main groups of education are presented in Table 2.1. The levels are in accordance with the typical design of the Norwegian educational system and correspond closely with international standards for education (ISCED97). At the detailed level, each of the three upper levels of education is divided into about ten categories reaching a total of 30 educational groups. The main criterion for the division was to subdivide educational groups to present the greatest possible homogeneity within subgroups regarding supply and demand for labor.

Table 2.1. Classification by main group of education and corresponding numbers of employed in 2006, 1,000 persons

Code	Field of education	Employed
0	Total, including unknown	2,362.1
1	Primary and Lower secondary education (ISCED 0-2)	499.3
2a	Upper secondary education, general and business studies (ISCED 3 and 4)	462.7
2b	Upper secondary education, vocational programs (ISCED 3 and 4)	607.2
3	Tertiary education, lower degree (ISCED 5, lower degree)	591.7
4	Tertiary education, higher degree (ISCED 5, higher degree and ISCED 6)	177.9
9	Unknown	23.3

² Cf. Wilson et al. (2008)

3. Projections of the Norwegian economy towards 2030

In this report we study the consequences of different economic shocks and trends that deviate from the projections in Bjørnstad et al. (2010). Before we turn to the results, we here give a brief outline of these projections. They form what we call the baseline scenario, and the consequences of alternative assumptions on key variables which we will return to in the next sections are presented as deviations from this baseline.

The baseline scenario for the Norwegian economy extends to 2030, using the macro model MODAG described in previous section. The projections are based on final National Account (NA) figures up until 2006 and preliminary figures for 2007. The MODAG simulations start in 2008, but Bjørnstad et al. (2010) generated residuals so that the simulated figures should match the preliminary account figures for 2008 and 2009 fairly well. The path is based on a rather quick adjustment from the low growth observed through 2009 following the international financial crisis, to a more balanced economic development where employment, wages, consumption, prices and activity grow at rates close to the prevailing trend. This ensures that the demand for labor by education results from structural rather than cyclical conditions.

During the upswing period 2004-2007 there was an extensive labor supply growth in Norway. There are multiple explanations, but most importantly the expansion of the European Union on May 1, 2004 has increased the flow of foreign workers and immigrants seeking work in Norway, particularly from Central Eastern European and Baltic countries. In addition, participation rates have increased. A substantial share of the population in Norway of working age is participating in working life and the overall participation rate is one of the highest in the world. However, the average age in Norway is continually increasing, and as labor participation typically decreases with increased age, the future participation rate is expected to fall. As a result, the demographic situation will be less favorable as we move towards 2030. Labor immigration is however assumed to stay at a high level, and contributes to a higher overall participation rate. Even though labor supply is by assumption determined from the demand side in the baseline scenario, so that the unemployment rate is constant, total labor supply is reasonably consistent with these trends. In the projections, the participation rate falls gradually from a level of about 73 percent in 2009 and 2010 to about 69 percent towards 2020. This development is fairly in line with what we would expect in light of the cyclical movements and the demographic changes during this period. After this, the fall in the participation rate stops and increases after 2025. At the end of the period, the participation rate reaches 70 percent. The increase mainly comes from an increase in labor demand in the public health and social sector as the elderly population grows (keeping in mind that labor supply is determined by employment plus unemployment).

Figure 3.1 shows employment by sectors of the economy as a share of total employment in the baseline scenario. The sectors include the primary industries³, manufacturing⁴, private services⁵, construction industry, public sector⁶ and the

³ Primary industries consist of agriculture, forestry, hunting and fishing and fish farming.

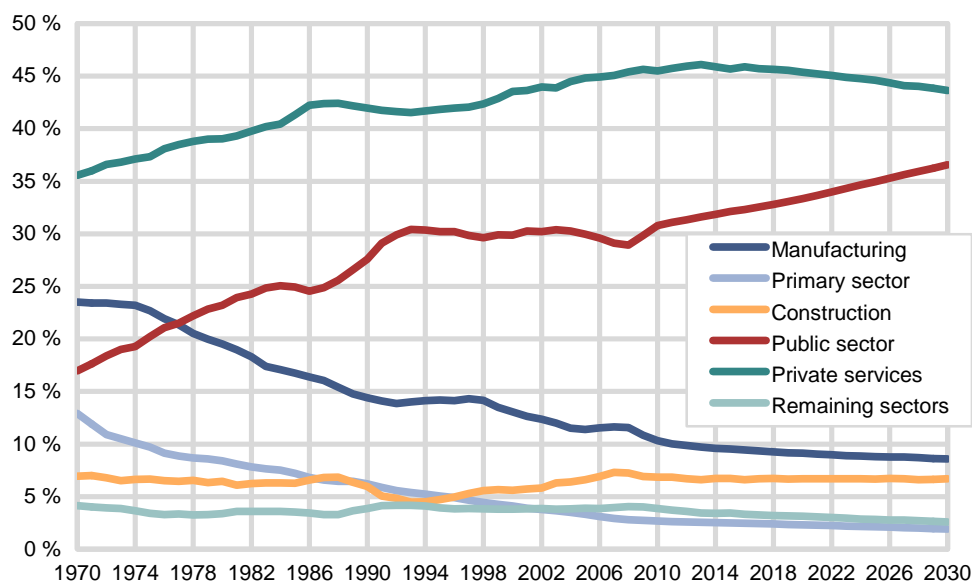
⁴ Manufacturing includes production of consumer goods, products of input and investment, industrial raw materials, machinery, ship and oil platforms and production and refining of petroleum products etc.

⁵ Private services include services in banking and insurance, retail, domestic transport and communication including air transport, housing services and other private service activities.

⁶ Central and local government including the military.

remaining industries⁷. The public sector is expected to grow both in quantity and as a share of total employment. The public sector's share of total employment rises from 30 percent in 2009 to nearly 37 percent in 2030. This growth also illustrates the demand for public health and social services as the population ages.

Figure 3.1. Employment by sector, share of total employment



The oil price was assumed to be around \$80 per barrel in the period towards 2015, and then to increase gradually to \$100 per barrel in 2030. The petroleum production in Norway has already peaked, and is expected to decline further in the years ahead. Although the revenues from the petroleum activity will remain high for many years still, the possibility of financing the rapid increase in public pension expenditures after 2025 abates. The Norwegian government adopted a fiscal policy rule in 2001, stating that the deficit in the government sector, corrected for oil and gas revenues and cyclical conditions, should amount to the expected real returns of the fund, which is presently estimated to four percent. In the projections, the government is assumed to stick to this rule. Even though the growth in public employment continues during the entire period, the growth in standards in public services is relatively moderate, also before 2020. Instead Bjørnstad et al. (2010) assumed a reduction in income tax rates up until 2025. After 2025 the returns on the fund increase less than government expenditures and the income tax rates were assumed to gradually increase again.

The growth in households' disposable real income remains relatively high through the entire baseline scenario. The growth in demand for private services also stays at a relatively high level. However, because of the growth in the public sector, the private service sector measured as a share of total employment will decline. The shares of employment in primary industries and manufacturing are projected to continue their downward trend. The remaining industries also reduce their activity relatively speaking, especially in the extraction of crude oil and natural gas. The construction industry, on the other hand, is expected to expand somewhat, also in relative terms.

Figure 3.2 shows historical and projected employment, aggregated across all industries in the economy for each of the five educational groups in per cent of total employment in the baseline scenario. The number of employed persons with unknown education grew from about 40,000 in 2000 to 180,000 in 2007. The

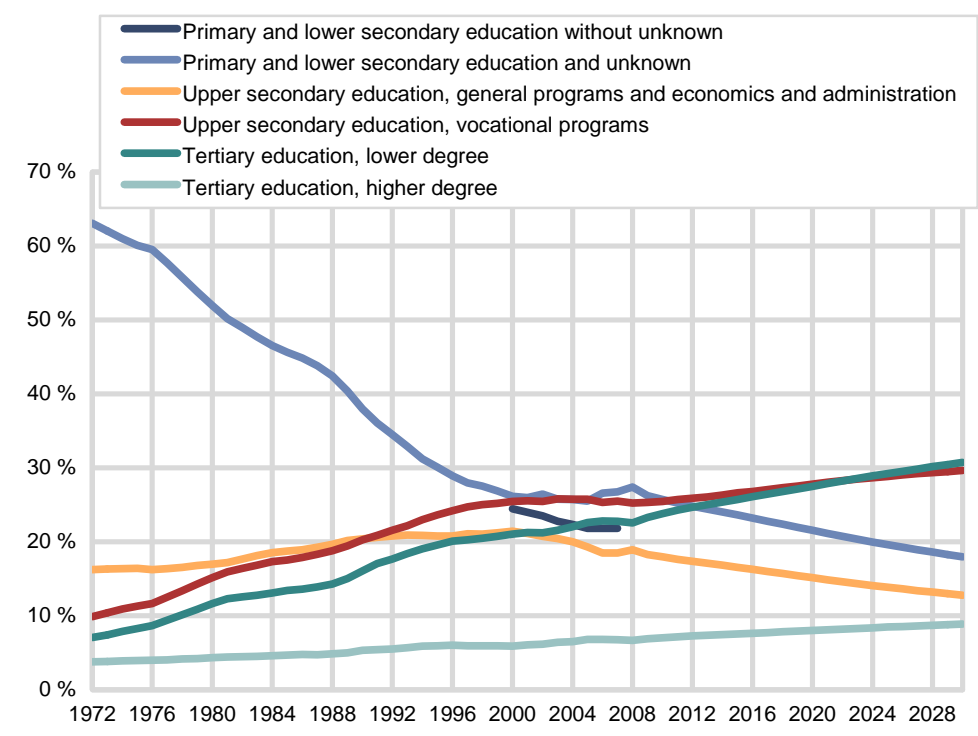
⁷ Among the remaining industries are the extraction of crude oil and natural gas, foreign shipping and production of hydro electric energy.

growth was particularly high in 2006 and 2007 and reflects the considerable labor immigration into Norway from Central Eastern European and Baltic countries. These immigrants have largely not been registered with an education at the Register of the Population's Highest Level of Education (PHE). In the estimated labor demand equations in MODAG, those with unknown education were included with primary and lower secondary education. Therefore, Bjørnstad et al. (2010) did the same in their projections. In the figure, employment numbers for this group is shown both with and without workers with unknown education, but only during the period 2000-2007.

According to the projections, past trends of increasing employment for skilled labor is assumed to continue. Analogously, demand for less-educated workers will decline. Hence, the relatively flat development in the employment of primary- and secondary-educated workers will shift in the years ahead. It seems likely that the stable shares were due to specific problems regarding the registration of immigrants' education. Many new citizens have likely been registered with only primary education when they, in fact, might have had vocational training.

In the projections, the educational upgrading continues in all sectors of the economy. While about 27 percent of the employed had a primary or lower secondary education in 2007, this share declines to 18 percent in 2030. Employees with an upper secondary vocational education are projected to increase from 25 percent to 30 percent in the same period. This rise is particularly connected to the strong employment growth in the private services sector. Employees having obtained an upper secondary vocational education are mostly regarded as skilled labor, while employees with an upper secondary education in general or business studies are regarded as unskilled. Therefore, the number of persons with general and business studies at upper secondary level is expected to decline in the future, contrary to the development until 2000. The projections show that this group will decline from 19 percent of the total employment in 2007 to 13 percent in 2030. The decline is most evident in the private services sector. Hence, employment in this sector is reorienting towards those with a vocational education, in addition to those with generally higher education.

Figure 3.2. Employment by level of education, share of total employment, 1986-2030



MODAG does not contain any detailed information on employees' fields of education. Thus, Bjørnstad et al. (2010) used a sub-model in order to disaggregate further. In this sub-model, the NAV National Register of Employers and Employees (the EE-register) was matched with the Norwegian Register of the Population's Highest Level of Education (PHE). The EE-PHE match gave data on industry-specific employment by educational field back to 1986. By calculating education-specific employment shares and assuming a continuing trend in these shares in the private sectors, industry-specific employment by field of education were projected by multiplying the shares with the NA employment figures in each industry. In the public sector, employment was distributed into educational fields according to information from three other projection models at Statistics Norway which are designed for this. They are called MAKKO, LÆRERMOD and HELSEMOD. Table 3.1 shows the projected number of employees at a national level by education in the baseline.

Table 3.1. Employment level by education in Bjørnstad et al. (2010). 1,000 persons

	2006	2025	2030
Primary and lower secondary education, only primary education in Bjørnstad et.al (2008)	499	408	381
Unknown	23	23	23
Upper secondary education, both lower and upper secondary education in Bjørnstad et.al (2008)	1,070	1,213	1,252
Programme for Specialization in General Programs	226	201	192
General programs, folk high school	58	49	47
Economics and administration	179	155	149
Electronics, mechanics work and machinery	188	240	253
Building and construction	84	123	133
Other fields of science, technique and crafts	96	117	121
Nursing and caregiving	88	125	141
Other fields	152	204	215
Tertiary education, lower degree	592	865	940
Other tertiary education	23	41	46
Preliminary examination	17	19	19
Humanities and arts	42	61	66
Education	142	187	198
Social sciences	24	42	47
Law	5	9	10
Economics and administration	116	190	210
Engineering	66	74	75
Other fields of science	28	50	56
Nursing and caregiving	73	110	125
Other fields of health and social services	55	81	89
Tertiary education, higher degree	178	252	273
Humanities and arts	22	28	30
Education	6	8	8
Social sciences	17	26	29
Law	17	25	27
Economics and administration	11	23	26
Other fields of science	34	49	52
Medicine	15	20	22
Dental studies	7	7	7
Other tertiary education	19	25	27
Graduate engineering	31	42	45
Total	2,362	2,762	2,870

4. Labor market consequences of business cycles

In this section we study the consequences of various short run economic shocks for the different educational groups. We will look at effects of a set back in the international economy, a fall in Norwegian oil investments, a reduction in housing prices from a negative demand shift in the housing market and a strengthening of the Norwegian krone. In the calculations we let the interest rate respond to the shifting economic environment (according to a Taylor-type of reaction function). However, the discretionary fiscal policy is kept unchanged. The automatic stabilizers are allowed to function. It is unlikely that the discretionary fiscal policy will remain unchanged after an economic shock, and it is at odds with the official policy. The calculations must therefore be interpreted as partial effects. The consequences of various types of fiscal stimulus depend crucially on exactly which policy is conducted. If we had chosen one particular set of policy responses, these changes would camouflage the consequences of the shocks we are looking at. Therefore, we believe that the best way to illustrate the consequences of the shocks is to perform such partial analysis as we do here. We also refer to section 5.6, where we demonstrate the consequences of increasing the public employment by 1 percent in a separate calculation. By combining the results from the calculation with increased public employment with the shifts in 4.1 to 4.4, one can get an idea of the overall effects of the shifts when the authorities respond to fluctuations by increasing the public employment level relative to the baseline scenario.

The analyses contain tables expressing labor market effects to various shocks. Notice that the total effect on employment will differ slightly between some of the tables describing the same model-exercise. The reason for this is that the employment figures in the tables refer to different employment definitions. In the tables where we present the macroeconomic consequences, we use the employment definition as in the National Accounts (NA). In the tables where we present consequences for employment within each educational group, we use the definition as in the Labor Force Survey (LFS). While NA covers all persons employed in Norway, LFS only shows employment among the registered population.

4.1. Effects of a reduced international demand

In the projections from Bjørnstad et al. (2010), the international market growth is assumed to pick up rapidly from the negative sentiment in 2009. From 2011 the international markets for Norwegian exports grow by approximately 5.5 percent annually throughout the projection period, which is on level with the observed growth in recent decades. However, the cyclical upturn in the global economy is uncertain and growth may well remain at a lower level. It is therefore relevant to assess how a weaker global growth scenario may influence the projections for labor demand.

We assume that the demand in the international markets is 10 percent weaker than in the baseline from 2012 to 2015. This is a quite large set back to the global economy and in line with the development in 2009. In these uncertain times following the global financial crisis, this might however not be a completely unrealistic scenario, and events during 2011 seem to make this alternative more likely. However, one should not put too much emphasis on the exact size of the shift, but regard it as an illustration of some potential consequences. The krone exchange rates against other currencies are the same as in the baseline scenario, while the Norwegian money market rate is determined by a separate relationship within the model.

Table 4.1.1 summarizes the macroeconomic development when the demand in the exports markets are 10 percent weaker relative to the development in the baseline scenario. The table shows deviations from the baseline scenario. Reduced demand in Norwegian export markets cause exports to be lower than in the baseline scenario throughout the period we are studying. Traditional exports are 6 percent

lower the first year and are reduced further the coming years. Lower manufacturing production reduces the level of investment and employment in this sector. However, the production decreases more than employment, so that labor productivity falls. This, together with a higher unemployment rate, causes wage growth to slow down in manufacturing. Since manufacturing is the wage leader (in line with the Scandinavian model of inflation, cf. Aukrust (1977)), this feeds through to the rest of the economy and overall wage per hour is substantially lower in 2015 compared to the baseline scenario.

Table 4.1.1. Effects of lower international demand. Deviation from the baseline scenario in percent if not stated otherwise

	2012	2013	2014	2015
Consumption in households etc.	-0.2	-0.4	-0.5	-0.3
Gross fixed investment	-0.2	-0.5	-0.4	-0.2
Mainland private sector	-0.4	-0.8	-0.7	-0.3
Manufacturing	-0.5	-1.5	-1.7	-1.4
Residential housing	0.0	0.1	0.3	1.1
Exports	-2.6	-3.8	-4.0	-4.1
Traditional goods	-6.0	-8.6	-8.8	-8.8
Imports	-1.9	-2.8	-3.0	-3.1
Mainland GDP	-0.8	-1.2	-1.3	-1.1
Private sector	-1.0	-1.5	-1.6	-1.4
Manufacturing	-2.1	-3.4	-3.4	-3.3
Employment (in 1,000)	-12.0	-20.9	-23.6	-24.2
Labor supply (in 1,000) ¹	-2.7	-6.4	-8.8	-9.7
Unemployment rate (level) ¹	0.4	0.5	0.6	0.5
Wage per hour	-0.2	-0.8	-1.6	-2.4
Consumer price index	-0.1	-0.4	-1.0	-1.7
Export prices, traditional goods	0.2	-0.1	-0.3	-0.7
Household's disposable real income	-0.3	-0.6	-0.7	-0.7
Money market rate (level) ²	-0.3	-1.1	-2.0	-2.4
Export market indicator	-10.0	-10.0	-10.0	-10.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

Overall employment is reduced by 12,000 persons in 2012, increasing to 24,200 persons in 2015, compared to our baseline scenario. As a result of increasing unemployment and lower wage growth, the labor force is also reduced. Compared to the 2010-projections, there are almost 10,000 fewer persons supplying labor in 2015. This dampens the effect of the reduction in employment on the unemployment level. The unemployment rate is 0.5 percentage point higher in 2015 compared to Bjørnstad et al. (2010).

Lower wage growth curbs inflation, and consumer prices are lower than in the original scenario. As a response to lower inflation and rising unemployment, Norges Bank cuts the interest rate. Nevertheless, both real wages and household's disposable real income are reduced and consumption falls throughout the calculation period. This generates further negative impulses to the activity level. However, lower wage growth causes the cost-competitiveness to improve, especially from 2013 to 2015, which dampens the effect of reduced demand for the exposed sector. Besides, low real interest rates give positive impulses to residential housing investment, which is higher in the alternative scenario in 2015 and dampens the negative effect on GDP. Moreover, some of the demand deficiency from the household and business sector hits the imports market, and reduced imports also lower the negative effect on the activity level.

Altogether, the negative impulses dominate the economic development in the case of lower international demand. According to the calculations, mainland GDP is appreciably lower than in the baseline scenario. The decline in exports is however not as pronounced as the annual decline of 10 percent in the market growth abroad. The main reason for this is an improvement in cost competitiveness as a result of a lower real wage development.

Table 4.1.2. Effects of lower international demand on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2013	2014	2015
Total employment	-12.0	-20.9	-23.6	-24.2
Manufacturing	-2.7	-5.0	-5.5	-5.6
Primary sector	0.0	-0.2	-0.3	-0.5
Construction industry	-0.1	-0.2	0.0	0.3
Public sector	0.0	0.0	0.0	0.0
Private services	-9.1	-15.5	-17.7	-18.3
Remaining sectors	0.0	-0.1	-0.1	-0.1

Table 4.1.3. Effects of lower international demand on employment by sector. Deviation from the baseline scenario in percent

	2012	2013	2014	2015
Total employment	-0.5	-0.8	-0.9	-0.9
Manufacturing	-1.0	-1.9	-2.1	-2.2
Primary sector	0.0	-0.2	-0.5	-0.7
Construction industry	-0.1	-0.1	0.0	0.1
Public sector	0.0	0.0	0.0	0.0
Private services	-0.7	-1.3	-1.4	-1.5
Remaining sectors	0.0	-0.1	-0.1	-0.1

Moving on to look more closely at the labor market, Table 4.1.2 shows the deviation from the employment levels by sectors compared to Bjørnstad et al. (2010) in 1,000 persons in the case of lower market growth. Table 4.1.3 further expresses these deviations in percent. The manufacturing industry, which is aimed to a relatively large scale at the export market, cuts the workforce by 2,700 persons the first year compared to the original projections. By 2015, the decline is more than twice as strong and there are 5,600 fewer jobs in the manufacturing sector. This amounts to 2.2 percent lower employment in manufacturing.

The employment reductions are considerable also in the private services. This is the biggest sector of the economy and almost half of those employed work in private sector service industries. In 2012 employment is 9,100 persons lower than in the original projections and in 2015 the reduction is doubled. The decline is due to many factors. For example, exports comprise both goods and services. When the global demand is reduced, the trade of services is hit. Moreover, weak developments in household consumption have the effect of limiting employment in the private sector. Developments in household consumption are particularly important for retail trade, one of the largest service industries.

The industries that are not directly affected by the weaker international demand are to varying extent influenced through changes in other variables such as consumption, the interest rates and price effects as we move towards 2015. Many of these changes contribute to improved market conditions and the resulting effects on employment by sectors are complex. Despite the weak development in household's disposable real income in these calculations, housing investment is now at a higher level. This is mainly due to lower real interest rates, which boost the demand for dwellings. The construction industry therefore increases the production and employs more people when the international economy is in recession. Public sector is sheltered from the international downturn and is unaffected by the weak development since we have assumed no fiscal policy responses.

Table 4.1.4 gives the effects of the reduction in international demand on the employment deviations by education. As can be seen, the decline in total employment is twice as strong in 2015 compared to 2012. Because of the high costs associated with dismissals and signing of new appointments, enterprises often choose to keep their workforce as long as possible when demand drops. In a cyclical downturn, there are thus idle resources within the enterprises and production can be raised by productivity growth. This is why labor productivity falls markedly in the beginning of a cyclical downturn, while developments in employment reflect the production developments with a time lag. In line with this, the enterprises continue to scale down in a high degree, despite that the production decline is moderated in the end of the calculation period.

Table 4.1.4. Effects of lower international demand on employment by education. Deviation from the baseline scenario

	2012	2013	2014	2015	2012	2013	2014	2015
	In 1,000				Percent			
Primary and lower secondary education	-3.8	-6.6	-7.4	-7.5	-0.7	-1.3	-1.5	-1.5
Upper secondary education, general and business studies	-2.6	-4.6	-5.3	-5.4	-0.6	-1.0	-1.1	-1.2
General programs ¹	-1.5	-2.7	-3.0	-3.1	-0.5	-0.9	-1.1	-1.1
Economics and administration	-1.1	-1.9	-2.2	-2.3	-0.6	-1.1	-1.2	-1.3
Upper secondary education, vocational programs	-3.0	-5.3	-5.9	-6.1	-0.4	-0.8	-0.9	-0.9
Electronics, mechanics work and machinery	-1.4	-2.4	-2.7	-2.8	-0.7	-1.2	-1.3	-1.3
Building and construction	-0.3	-0.5	-0.5	-0.5	-0.3	-0.5	-0.5	-0.5
Other fields of science, technique and crafts	-0.5	-0.9	-1.0	-1.0	-0.5	-0.8	-1.0	-1.0
Nursing and caregiving	-0.1	-0.2	-0.3	-0.3	-0.1	-0.2	-0.2	-0.2
Other fields	-0.7	-1.2	-1.5	-1.5	-0.4	-0.7	-0.8	-0.9
Tertiary education, lower degree ..	-2.0	-3.4	-3.8	-4.0	-0.3	-0.5	-0.5	-0.6
Preliminary examination	-0.1	-0.1	-0.2	-0.2	-0.5	-0.8	-0.9	-0.9
Humanities and arts	-0.2	-0.3	-0.3	-0.3	-0.3	-0.6	-0.6	-0.6
Education	-0.2	-0.3	-0.3	-0.3	-0.1	-0.2	-0.2	-0.2
Social sciences	-0.1	-0.2	-0.2	-0.3	-0.4	-0.7	-0.8	-0.8
Law	0.0	0.0	-0.1	-0.1	-0.4	-0.7	-0.8	-0.8
Economics and administration	-0.6	-1.0	-1.2	-1.3	-0.4	-0.7	-0.8	-0.8
Other fields of science	-0.2	-0.3	-0.3	-0.4	-0.5	-0.8	-0.9	-0.9
Nursing and caregiving	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
Other fields of health and social services	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2
Engineering	-0.4	-0.7	-0.8	-0.8	-0.6	-1.0	-1.1	-1.1
Other tertiary education	-0.1	-0.2	-0.2	-0.2	-0.3	-0.5	-0.6	-0.6
Tertiary education, higher degree ..	-0.6	-1.0	-1.2	-1.2	-0.3	-0.5	-0.6	-0.6
Humanities and arts	0.0	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4
Education	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.3	-0.3
Social sciences	0.0	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3
Law	0.0	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.3
Economics and administration	-0.1	-0.1	-0.1	-0.1	-0.5	-0.7	-0.9	-0.9
Other fields of science	-0.2	-0.3	-0.3	-0.3	-0.4	-0.7	-0.8	-0.7
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	-0.2	-0.3	-0.4	-0.4	-0.6	-0.9	-1.0	-1.0
Other tertiary education	-0.1	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.5
Total	-12.1	-20.9	-23.6	-24.2	-0.5	-0.8	-0.9	-0.9

¹ Programme for Specialization in General Programmes and folk high schools

The reductions in employment are unevenly distributed among the different educational levels. The strongest employment effects are found among those with education below upper secondary level. There are 3,800 fewer employed with this level of education in 2012, and in 2015 this has doubled to almost 7,500 persons. The employment reductions are also significant among persons with an upper secondary education, either in general and business studies or vocationally trained. In percentages, the effects are strongest for persons with general and business studies. This is in line with the modelling of the demand for labor in MODAG, where employees with an upper secondary vocational education are regarded as skilled in several industries. By contrast, the employment effects are relatively moderate for persons with tertiary education.

Compared to the baseline, the percentage decline in the employment of persons with education below upper secondary level is about 2.5 times stronger than for the groups with a tertiary education in 2015. This must be viewed in light of the development within the different sectors of the economy. Both the two large industries in private services – *wholesale and retail trade* and *other private services* – and the manufacturing industry employ a relatively high share of the unskilled workers. These are all cyclically sensitive industries where employment reductions are severe. Moreover, the

public sector employs a substantial share of the skilled workforce. This sector is by assumption completely unaffected by the global demand deficiency in our analysis.

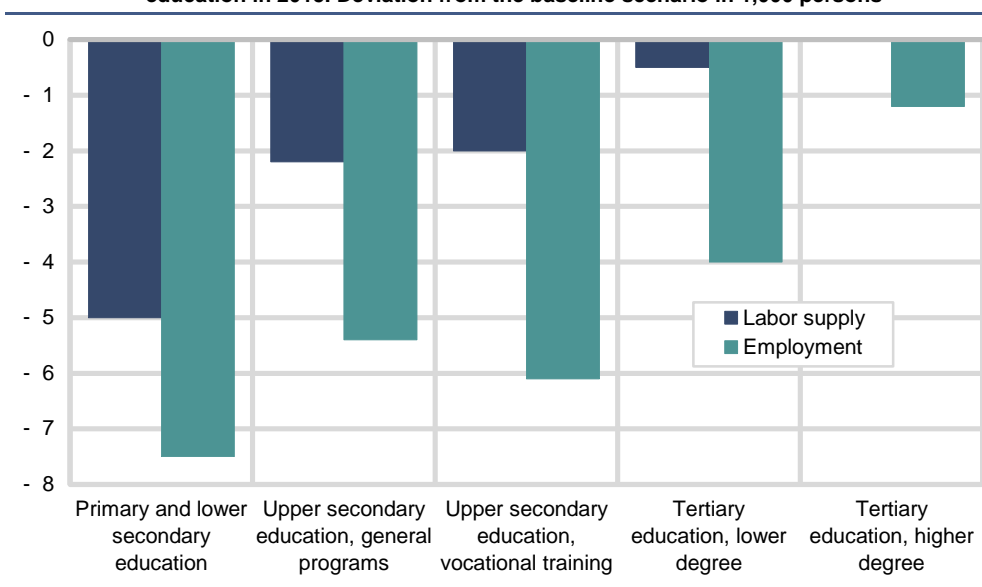
At the upper secondary level, the employment reductions are most severe among persons with specialization in general programs along with persons with specialization in economics and administration and in electronics, mechanics work and machinery. The effects are moderate for those with specialization in nursing and caring, because they are mainly employed in public sector. The employment effects for candidates specializing in building and construction are relatively modest, but as a substantial share of these are employed in the manufacturing industry, overall demand for this group is reduced despite of a higher building activity.

At the lower tertiary level, candidates with specialization in engineering, other fields of science and preliminary examination are most severely affected by the downscale. Within the higher tertiary level, this concerns graduate engineers and candidates specializing in economics and administration. The groups who are least affected are mostly employed in the public sector.

Table 4.1.5. Effects of lower international demand on the labor market by educational levels. Deviation from the baseline scenario

	2012	2013	2014	2015
Labor supply, total, 1,000 persons	-2.7	-6.4	-8.8	-9.7
Primary and lower secondary education	-2.0	-3.7	-4.6	-5.0
Upper secondary education, general and business studies	-0.4	-1.3	-2.0	-2.2
Upper secondary education, vocational training	-0.2	-1.1	-1.8	-2.0
Tertiary education, lower degree	-0.1	-0.3	-0.5	-0.5
Tertiary education, higher degree	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	9.3	14.5	14.8	14.5
Primary and lower secondary education	1.8	2.9	2.9	2.5
Upper secondary education, general and business studies	2.3	3.3	3.3	3.2
Upper secondary education, vocational training	2.8	4.2	4.1	4.1
Tertiary education, lower degree	1.9	3.0	3.4	3.5
Tertiary education, higher degree	0.6	1.0	1.2	1.2
Unemployment rate, percentage points	0.4	0.5	0.6	0.5
Primary and lower secondary education	0.4	0.7	0.7	0.6
Upper secondary education, general and business studies	0.5	0.8	0.8	0.8
Upper secondary education, vocational training	0.4	0.6	0.6	0.6
Tertiary education, lower degree	0.3	0.4	0.5	0.5
Tertiary education, higher degree	0.3	0.4	0.5	0.5

Figure 4.1.1. Effects of lower international demand on labor supply and employment by level of education in 2015. Deviation from the baseline scenario in 1,000 persons



The labor supply responses by the educational levels vary both as a result of the development in the unemployment level and as a consequence of the wage progress for the different educational groups. The first effect is known as the discouraged worker effect, and in the modelling of labor force participation rates by education, this effect is much stronger among low-skilled persons. While empirical results indicate that persons with education below upper secondary level are quite sensitive to fluctuations in the unemployment rate, there are found no such adjustment among persons with tertiary education. For persons with upper secondary education there are some discouraged workers effects. When the wage growth is reduced, the wage drops below the reservation wage for some workers, causing labor participation to fall. This effect is strongest among less-educated workers as well.

Table 4.1.5 indicates how the labor market for the different educational groups is influenced, while Figure 4.1.1 illustrates the effects in employment and labor supply by educational level in 2015. The employment reductions are greatest for the group with education below upper secondary level, increasing the level of unemployment among these persons. However, the labor supply reduction is quite big in this segment – 5,000 persons have exited the labor market by 2015. This corresponds to 1.1 percent of the labor supply for persons with the lowest level of education in the original scenario.

The development is quite similar for both educational groups at upper secondary level, with considerable reductions in the employment level and almost identical responses in the labor supply. However, there are fewer persons in the labor force with general and business studies than with vocational training, and the resulting effect on the unemployment rate is thus greater for those with general and business studies. Compared to the baseline scenario, the unemployment rate is 0.8 percentage points higher among persons with this competence in 2015.

The situation on the labor market is quite different among the tertiary educated workers. The employment decreases are smaller and the labor supply is almost unaltered. By and large, the unemployment increase therefore corresponds to the employment reduction for these two groups. The unemployment rate in 2015 is 0.5 percentage points higher for both groups at the tertiary level.

4.2. Effects of reduced oil investments

Investments in the petroleum sector have comprised between 6 and 10 percent of GDP Mainland Norway since the beginning of the 1980s. According to Eika et al. (2010), 20 percent of the investments in the petroleum industry in 2006 were supplied directly from the manufacturing industry. To complete these deliveries, the manufacturing industry made use of considerable amounts of input from other industries, in addition to imports. Adjusted for this, the supplies from the industry amounted to 11 percent, while the service industry delivered 27 percent of the investments in 2006. Petroleum investments thus represent an important demand component in the Norwegian economy. In this calculation, investments in the petroleum sector are reduced by 15 percent compared to the baseline scenario in 2012, which corresponds to about 1 percent of mainland GDP this year. The reduction is held at 15 percent during the period 2012-2015. Such a scenario is not unlikely – since the mid-70s, the petroleum investments share of GDP have varied between 4 and 10 percent, reflecting large fluctuations in the annual investment levels. Table 4.2.1 indicates the consequences of this reduction on the Norwegian economy. It is assumed that the oil and gas production in the period we look at here is unaffected by the lower investment level.

Table 4.2.1. Effects of reduced petroleum investments. Deviation from the baseline scenario in percent if not stated otherwise

	2012	2013	2014	2015
Consumption in households etc.	-0.1	-0.2	-0.3	-0.3
Gross fixed investment	-3.6	-3.4	-3.2	-2.9
Mainland private sector	-0.4	-0.5	-0.3	-0.2
Manufacturing	-0.2	-0.4	-0.3	-0.2
Residential housing	0.0	0.0	0.1	0.3
Exports	0.4	0.4	0.5	0.5
Traditional goods	0.1	0.2	0.3	0.4
Imports	-0.9	-0.9	-0.9	-0.8
Mainland GDP	-0.4	-0.4	-0.3	-0.3
Private sector	-0.5	-0.5	-0.4	-0.3
Manufacturing	-0.9	-0.7	-0.5	-0.4
Employment (in 1,000)	-7.7	-6.6	-5.8	-5.7
Labor supply (in 1,000) ¹	-1.7	-2.5	-2.3	-1.9
Unemployment rate (level) ¹	0.2	0.2	0.1	0.1
Wage per hour	-0.1	-0.2	-0.3	-0.3
Consumer price index	0.0	0.1	0.1	0.0
Export prices, traditional goods	0.2	0.4	0.6	0.6
Household's disposable real income	-0.3	-0.4	-0.4	-0.4
Money market rate (level) ²	-0.1	-0.2	-0.2	-0.3
Import-weighted krone exchange rate (I44)	0.3	0.7	0.9	1.0
Gross petroleum investments	-15.0	-15.0	-15.0	-15.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

The immediate effect of reduced petroleum investment is a reduction in imports and production. Both manufacturing and private services deliver to the petroleum sector, so production and employment fall in these industries. The activity slow-down leads to lower employment and higher unemployment.

The increase in unemployment is curbed by a somewhat reduced labor supply, and the effect on the unemployment level in 2015 is only 0.1 percentage point. Weakened business sector profitability and somewhat higher unemployment curb wages, which are reduced by 0.3 percent in 2014 and 2015. Consumption and investments in mainland industries are gradually reduced as well, bringing production and demand further down. An easing of monetary policy works in the opposite direction, counteracting the negative effects of the reduced investments on the economy. This stimulates consumption and business investments, in addition to weakening the exchange rate. The competitiveness of the exposed sector is further improved by lower wage costs, and the level of exports is thus higher in this scenario. Inflation is virtually unchanged, since the effects of reduced wage growth are countered by a rise in import prices due to the weaker krone exchange rate.

Table 4.2.2. The effects of reduced petroleum investments on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2013	2014	2015
Total employment	-7.7	-6.6	-5.8	-5.7
Manufacturing	-1.1	-1.1	-0.9	-0.8
Primary sector	0.0	0.0	0.0	0.0
Construction industry	-0.7	-0.1	0.2	-0.4
Public sector	0.0	0.0	0.0	0.0
Private services	-5.9	-5.3	-4.9	-4.4
Remaining sectors	0.0	-0.1	-0.1	-0.1

Table 4.2.3. The effects of reduced petroleum investments on employment by sector. Deviation from the baseline scenario in percent

	2012	2013	2014	2015
Total employment	-0.3	-0.2	-0.2	-0.2
Manufacturing	-0.4	-0.4	-0.4	-0.3
Primary sector	0.0	0.0	0.0	0.0
Construction industry	-0.4	-0.1	0.1	-0.2
Public sector	0.0	0.0	0.0	0.0
Private services	-0.5	-0.4	-0.4	-0.4
Remaining sectors	0.0	-0.1	-0.1	-0.1

As Table 4.2.2 and Table 4.2.3 indicate, the employment effects are dispersed. In line with the analysis in Eika et al. (2010), employment in private services and in the manufacturing industry is most affected. The downscale of 800 persons in manufacturing amounts to a 0.3 percent employment reduction in this industry. The private services industry reduces the workforce by 4,400 persons, so most of the cutbacks are related to the downscale in this industry. The activity in the construction industry is, naturally, also lowered when investments drop.

Table 4.2.4. The effects of reduced petroleum investments on employment by education. Deviation from the baseline scenario

	2012	2013	2014	2015	2012	2013	2014	2015
	In 1,000				Percent			
Primary and lower secondary education	-2.4	-2.1	-1.9	-1.8	-0.5	-0.4	-0.4	-0.4
Upper secondary education, general and business studies	-1.6	-1.5	-1.4	-1.3	-0.3	-0.3	-0.3	-0.3
General programs ¹	-0.9	-0.9	-0.8	-0.7	-0.3	-0.3	-0.3	-0.3
Economics and administration	-0.6	-0.6	-0.6	-0.5	-0.4	-0.3	-0.3	-0.3
Upper secondary education, vocational programs	-1.9	-1.5	-1.2	-1.4	-0.3	-0.2	-0.2	-0.2
Electronics, mechanics work and machinery	-0.8	-0.7	-0.6	-0.6	-0.4	-0.3	-0.3	-0.3
Building and construction	-0.4	-0.2	-0.1	-0.3	-0.4	-0.2	-0.1	-0.3
Other fields of science, technique and crafts	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1
Nursing and caregiving	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
Other fields	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
Tertiary education, lower degree ..	-1.4	-1.1	-1.0	-0.9	-0.2	-0.2	-0.1	-0.1
Preliminary examination	-0.1	0.0	0.0	0.0	-0.3	-0.3	-0.2	-0.2
Humanities and arts	-0.1	-0.1	-0.1	-0.1	-0.3	-0.2	-0.2	-0.2
Education	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Social sciences	-0.1	-0.1	-0.1	-0.1	-0.3	-0.3	-0.2	-0.2
Law	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.2	-0.2
Economics and administration	-0.4	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2
Other fields of science	-0.1	-0.1	-0.1	-0.1	-0.4	-0.3	-0.2	-0.2
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields of health and social services	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0
Engineering	-0.3	-0.2	-0.2	-0.2	-0.4	-0.3	-0.3	-0.2
Other tertiary education	-0.1	0.0	0.0	0.0	-0.2	-0.2	-0.1	-0.1
Tertiary education, higher degree ..	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1
Humanities and arts	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.1
Education	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.1
Social sciences	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.1
Law	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.1	-0.1
Economics and administration	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.2	-0.2
Other fields of science	-0.1	-0.1	-0.1	-0.1	-0.3	-0.2	-0.2	-0.2
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	-0.1	-0.1	-0.1	-0.1	-0.4	-0.3	-0.3	-0.2
Other tertiary education	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Total	-7.8	-6.6	-5.8	-5.6	-0.3	-0.3	-0.2	-0.2

¹ Programme for Specialization in General Programmes and folk high schools

Table 4.2.4 shows how the employment reductions are spread across the different educational levels and groups. The employment reductions in manufacturing, private services and the construction industry affect demand for unskilled manpower to a large extent. As in the previous calculation, the employment reductions are most severe for persons with education below upper secondary level. At the upper secondary level, the cut backs primarily affect candidates with general and business studies as well as the vocationally trained who are employed to a large extent in the manufacturing industry and in the construction industry.

At the tertiary level, the demand reductions are smaller. They are however still present among several disciplines. This must be seen in connection to the development in the service industry particularly. A substantial share of the

candidates holding a specialization in law, social sciences and other tertiary education at the lower tertiary level are for example employed in this sector, as well as candidates holding a lower or higher degree in other fields of science and in economics and administration. The manufacturing industry employs a substantial share of both engineers and graduate engineers. Moreover, the service industry employs many with this competence. The demand reductions among graduate engineers are thus driven by both the manufacturing downscale and the downscale in the service industry.

Table 4.2.5. The effects of reduced petroleum investments on the labor market by educational levels. Deviation from the baseline scenario

	2012	2013	2014	2015
Labor supply, total, 1,000 persons	-1.7	-2.5	-2.3	-1.9
Primary and lower secondary education	-1.3	-1.2	-1.1	-1.0
Upper secondary education, general and business studies	-0.2	-0.6	-0.5	-0.4
Upper secondary education, vocational training	-0.1	-0.6	-0.5	-0.4
Tertiary education, lower degree	-0.1	-0.2	-0.1	-0.1
Tertiary education, higher degree	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	6.0	4.1	3.5	3.8
Primary and lower secondary education	1.1	0.9	0.8	0.9
Upper secondary education, general and business studies	1.3	0.9	0.8	0.8
Upper secondary education, vocational training	1.8	0.9	0.8	1.0
Tertiary education, lower degree	1.3	1.0	0.8	0.8
Tertiary education, higher degree	0.5	0.4	0.3	0.3
Unemployment rate, percentage points	0.2	0.2	0.1	0.1
Primary and lower secondary education	0.2	0.2	0.2	0.2
Upper secondary education, general and business studies	0.3	0.2	0.2	0.2
Upper secondary education, vocational training	0.3	0.1	0.1	0.1
Tertiary education, lower degree	0.2	0.1	0.1	0.1
Tertiary education, higher degree	0.2	0.2	0.1	0.1

Figure 4.2.1. The effects of reduced petroleum investments on labor supply and employment by level of education in 2015. Deviation from the baseline scenario in 1,000 persons

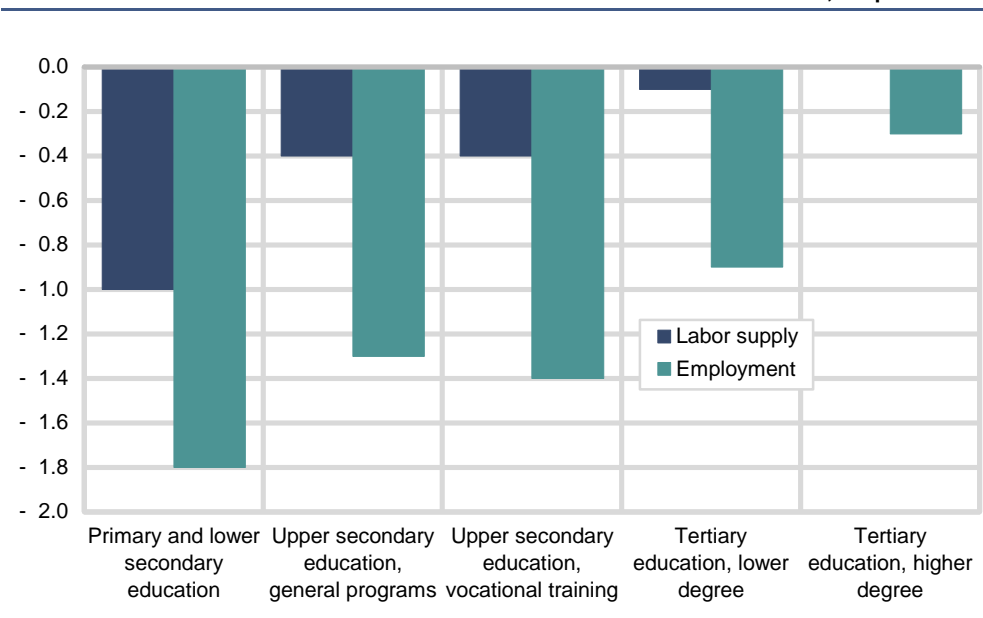


Table 4.2.5 and Figure 4.2.1 indicate a pattern of the labor market responses when the petroleum investments are reduced that resembles the case of lower international demand. The employment reductions are most severe among unskilled workers. 1,800 persons with education below upper secondary level have been discharged in 2015. This corresponds to an employment decline of 0.3 percent relative to the baseline, the same as for persons with general and business studies. The decline of 1,400 persons with vocational training further corresponds to 0.2 percent, as this group is larger in numbers.

The labor supply responses are considerable among unskilled workers, while they are almost non-existent among persons with education at tertiary level. This makes the effects on the unemployment by educational levels more similar. All in all, the increases in unemployment rates by educational levels are quite equal in the calculation period.

4.3. Effects of a drop in housing prices

The housing prices vary greatly over time. In the years 2004-2007, average growth in housing prices were over 11 percent, while they fell in 2008 and grew by around 2 percent in 2012. In this calculation we have given a temporary shock to the housing price equation. This causes housing prices to be substantially lower than in the baseline in the entire calculation period.

There are two direct effects on the economy from a reduction in housing prices. First, the price mechanism is important for the entrepreneurs' production decisions. The price fall therefore leads to a pronounced drop in housing investments. However, as it takes time for the investments to fully adapt to the price changes, and the adjustment process is slow. As Table 4.3.1 shows, housing investments fall by 3.5 percent the first year and drop to 13 percent the second year, compared to the baseline scenario. In 2015, housing investments are as much as 26.5 percent lower than the original projections. Second, the price fall brings the household sector's housing wealth down, and this curbs consumption.

Table 4.3.1. Effects of a drop in housing prices. Deviation from the baseline scenario in percent if not stated otherwise

	2012	2013	2014	2015
Consumption in households etc.	-2.0	-3.7	-4.0	-3.3
Gross fixed investment	-0.9	-3.2	-5.5	-6.4
Mainland private sector	-1.6	-5.6	-9.6	-10.8
Manufacturing	-0.2	-0.6	-0.9	-0.8
Residential housing	-3.5	-13.1	-22.9	-26.5
Exports	0.0	0.1	0.3	0.5
Traditional goods	0.1	0.3	0.7	1.1
Imports	-1.4	-2.9	-3.5	-3.2
Mainland GDP	-0.8	-1.8	-2.2	-2.0
Private sector	-1.0	-2.2	-2.7	-2.4
Manufacturing	-0.4	-0.9	-0.9	-0.5
Employment (in 1,000)	-9.1	-21.3	-26.8	-23.6
Labor supply (in 1,000) ¹	-2.1	-5.9	-8.8	-8.8
Unemployment rate (level) ¹	0.3	0.6	0.7	0.6
Wage per hour	-0.1	-0.3	-0.7	-1.0
Consumer price index	0.1	0.2	0.4	0.4
Export prices, traditional goods	0.1	0.6	1.4	2.1
Household's disposable real income	-0.4	-1.0	-1.5	-1.6
Money market rate (level) ²	0.0	-0.2	-0.5	-0.7
Import-weighted krone exchange rate (I44)	0.2	0.9	2.2	3.2
House price index	-15.2	-24.8	-25.8	-21.3

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

The consumption fall brings the level of production down in the private sector, especially in private services. Manufacturing production is reduced as well, albeit to a lesser extent. Unemployment increases and in 2012, the unemployment level is 0.6 percent higher. This prompts Norges Bank to cut the key rate, which in turn leads to a weaker krone exchange rate and improves the competitiveness of the exposed sector. This contributes to increased exports, which stimulates the manufacturing activity. However, the negative effects from the demand deficiency dominate the development in the manufacturing industry, which is 0.5 percent weaker in 2015 compared to the baseline scenario. The interest rate reduction also curbs the decline in the household sector's income and in overall investment.

The unemployment rise slows the wage growth, bringing consumption and GDP further down. Thus employment also falls and the rise in unemployment is doubled

from 2012 to 2015. The effects on demand and activity from a fall in house prices are considerable; in 2015 mainland GDP is 2 percent lower than in the baseline scenario, while consumption is 3.3 percent lower. Despite of the wage decline, inflation is now higher. This is primarily due to imported inflation from a weaker krone exchange rate. The household sector thus experience a considerable decline in real wages. This brings the demand for dwellings further down, putting further downward pressure on the housing prices. As Table 4.3.1 indicates, the housing prices are markedly lower in 2015, compared to the baseline scenario.

Table 4.3.2. Effects of a drop in housing prices on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2013	2014	2015
Total employment	-9.1	-21.3	-26.8	-23.6
Manufacturing	-0.5	-1.2	-1.4	-0.8
Primary sector	0.0	0.0	-0.1	-0.1
Construction industry	-0.9	-2.6	-2.9	-1.8
Public sector	0.0	0.0	0.0	0.0
Private services	-7.7	-17.5	-22.5	-21.2
Remaining sectors	0.0	0.1	0.2	0.3

Table 4.3.3. Effects of a drop in housing prices on employment by sector. Deviation from baseline scenario in percent

	2012	2013	2014	2015
Total employment	-0.3	-0.8	-1.0	-0.9
Manufacturing	-0.2	-0.5	-0.6	-0.3
Primary sector	0.0	-0.1	-0.2	-0.2
Construction industry	-0.5	-1.5	-1.6	-1.0
Public sector	0.0	0.0	0.0	0.0
Private services	-0.6	-1.4	-1.8	-1.7
Remaining sectors	0.0	0.1	0.2	0.4

Table 4.3.2 and 4.3.3 indicate the employment effects in the case of a fall in housing prices. The construction industry is particularly influenced by the investment decline, and in 2014, the construction employment is reduced by almost 3,000 persons. This corresponds to 1.6 percent lower employment. Because of lower wages and higher prices compared to the baseline, labor is gradually becoming cheaper compared to other factors of input in production. This contributes to a certain moderation in the employment downscale in the construction industry from 2014 to 2015. Still, the level of employment is 1 percent lower in 2015 compared to the baseline scenario. The manufacturing industry is also lower in this calculation, but lower interest rate and weaker krone exchange rate have contributed to reducing the downscale by 2015. The service industry is mostly affected by the fall in housing prices and the succeeding developments in wages and income. There are signs of improvement in this industry, too, but consumption is still appreciably lower in 2015 and employment is reduced by 1.7 percent compared to the baseline scenario in this sector.

As Table 4.3.4 reveals, the decline in the private service industry brings down the demand for persons with education below upper secondary level and persons with general and business studies at upper secondary level. At the tertiary level, most fields are affected by the downscale, and especially those with a lower degree in preliminary studies, social sciences and other fields of science. At the highest educational level this applies for persons with specialization in economics and administration and in other fields of science. There are large discrepancies in the demand development between these educational fields and those who are educated within education and health.

The downscale in the construction industry brings down the demand for vocationally trained in this field, while the downscale in manufacturing affects most other vocational fields along with engineers and graduate engineers. Moreover, the development in these industries amplifies the employment decline for unskilled persons and persons with specialization in other fields of science in addition to persons with a higher degree in economics and administration.

Table 4.3.4. Effects of a drop in housing prices on employment by level of education. Deviation from the baseline scenario

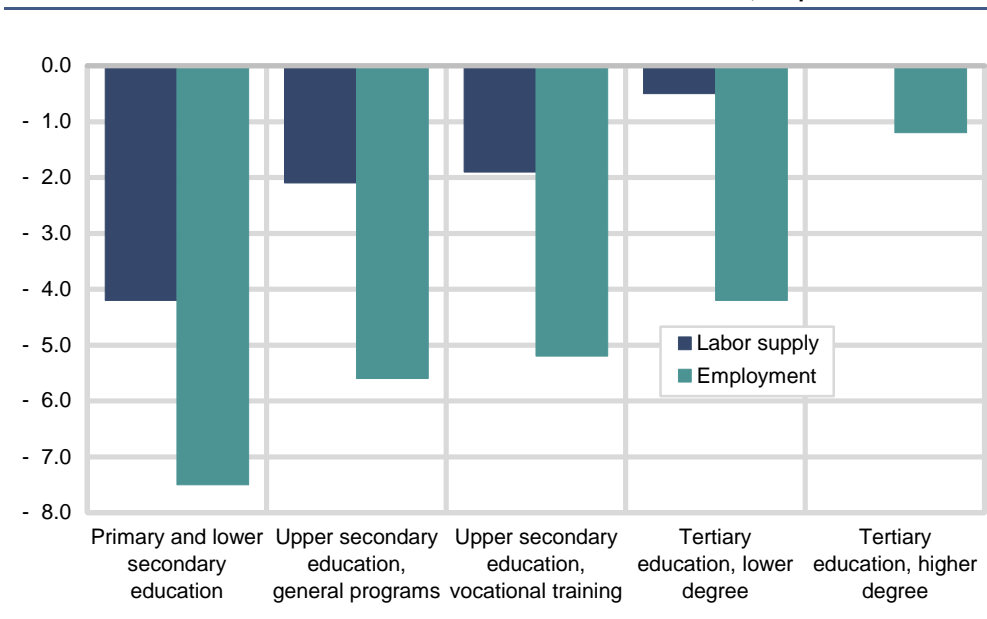
	2012	2013	2014	2015	2012	2013	2014	2015
	In 1,000				Percent			
Primary and lower secondary education	-3.0	-6.8	-8.5	-7.5	-0.6	-1.3	-1.7	-1.5
Upper secondary education, general and business studies	-2.1	-4.7	-6.1	-5.6	-0.4	-1.0	-1.3	-1.2
General programs ¹	-1.2	-2.7	-3.5	-3.2	-0.4	-0.9	-1.2	-1.2
Economics and administration	-0.9	-2.0	-2.6	-2.3	-0.5	-1.1	-1.4	-1.3
Upper secondary education, vocational programs	-2.1	-5.2	-6.4	-5.1	-0.3	-0.8	-0.9	-0.7
Electronics, mechanics work and machinery	-0.8	-1.9	-2.3	-1.8	-0.4	-0.9	-1.1	-0.8
Building and construction	-0.4	-1.1	-1.3	-1.0	-0.4	-1.1	-1.3	-1.0
Other fields of science, technique and crafts	-0.3	-0.7	-0.9	-0.8	-0.3	-0.7	-0.9	-0.7
Nursing and caregiving	-0.1	-0.2	-0.3	-0.3	-0.1	-0.2	-0.3	-0.3
Other fields	-0.5	-1.3	-1.6	-1.4	-0.3	-0.7	-0.9	-0.8
Tertiary education, lower degree ..	-1.5	-3.5	-4.6	-4.2	-0.2	-0.5	-0.6	-0.6
Preliminary examination	-0.1	-0.2	-0.2	-0.2	-0.4	-0.9	-1.1	-1.0
Humanities and arts	-0.1	-0.3	-0.4	-0.4	-0.3	-0.7	-0.9	-0.8
Education	-0.1	-0.4	-0.5	-0.4	-0.1	-0.2	-0.3	-0.3
Social sciences	-0.1	-0.3	-0.3	-0.3	-0.4	-0.8	-1.1	-1.0
Law	0.0	-0.1	-0.1	-0.1	-0.3	-0.8	-1.0	-0.9
Economics and administration	-0.5	-1.1	-1.5	-1.4	-0.3	-0.8	-1.0	-0.9
Other fields of science	-0.1	-0.3	-0.4	-0.4	-0.4	-0.9	-1.1	-1.0
Nursing and caregiving	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
Other fields of health and social services	-0.1	-0.2	-0.2	-0.2	-0.1	-0.2	-0.3	-0.3
Engineering	-0.2	-0.6	-0.7	-0.6	-0.3	-0.8	-1.0	-0.8
Other tertiary education	-0.1	-0.1	-0.2	-0.2	-0.2	-0.5	-0.6	-0.5
Tertiary education, higher degree ..	-0.4	-1.0	-1.4	-1.2	-0.2	-0.5	-0.7	-0.6
Humanities and arts	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.5
Education	0.0	0.0	0.0	0.0	-0.2	-0.4	-0.5	-0.4
Social sciences	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.5
Law	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	-0.6	-0.5
Economics and administration	0.0	-0.1	-0.2	-0.1	-0.3	-0.8	-1.0	-0.9
Other fields of science	-0.1	-0.3	-0.4	-0.3	-0.3	-0.7	-0.9	-0.8
Medicine	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	-0.1	-0.3	-0.3	-0.3	-0.3	-0.7	-1.0	-0.8
Other tertiary education	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.5
Total	-9.1	-21.2	-26.9	-23.6	-0.4	-0.8	-1.0	-0.9

¹ Programme for Specialization in General Programmes and folk high schools

Table 4.3.5. Effects of a drop in housing prices on the labor market by level of education. Deviation from the baseline scenario

	2012	2013	2014	2015
Labor supply, total, 1,000 persons	-2.1	-5.9	-8.8	-8.8
Primary and lower secondary education	-1.6	-3.6	-4.7	-4.2
Upper secondary education, general and business studies	-0.3	-1.1	-1.9	-2.1
Upper secondary education, vocational training	-0.2	-0.9	-1.7	-1.9
Tertiary education, lower degree	-0.1	-0.3	-0.5	-0.5
Tertiary education, higher degree	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	7.0	15.4	18.0	14.9
Primary and lower secondary education	1.4	3.2	3.8	3.2
Upper secondary education, general and business studies	1.8	3.7	4.2	3.5
Upper secondary education, vocational training	2.0	4.3	4.6	3.2
Tertiary education, lower degree	1.4	3.2	4.1	3.7
Tertiary education, higher degree	0.4	1.0	1.3	1.2
Unemployment rate, percentage points	0.3	0.6	0.7	0.6
Primary and lower secondary education	0.3	0.7	0.9	0.8
Upper secondary education, general and business studies	0.4	0.9	1.0	0.9
Upper secondary education, vocational training	0.3	0.6	0.7	0.5
Tertiary education, lower degree	0.2	0.5	0.6	0.5
Tertiary education, higher degree	0.2	0.4	0.6	0.5

Figure 4.3.1. Effects of a drop in housing prices on the labor supply and employment by level of education. Deviation from the baseline scenario in 2015 in 1,000 persons



The demand deficiency caused by the fall in house prices hits the educational groups with varying strength. Table 4.3.5 summarizes the dynamic development in the labor supply, the unemployment level and the unemployment rate from 2012 to 2015 resulting from a drop in housing prices, while Figure 4.3.1 provide an illustration of the labor market situation in the last year of the calculation. As in the other shifts, the employment reduction is largest for persons with education below upper secondary level and for persons who have obtained a degree in general and business studies at upper secondary level. The decline of 7,500 persons with primary and lower secondary education corresponds to 1.2 percent of the employment in the baseline scenario in 2015, while 5,600 fewer employed with general and business studies corresponds to a decline of 1.3 percent. The employment effects are smaller for vocationally trained – employment is reduced by 5,200 persons with this competence in 2015, and as this group is much larger than the other two, this corresponds to 0.7 percent of the employment level in the baseline scenario. At tertiary level, employment is reduced by 4,200 persons with lower degree and 1,200 with higher degree. This constitutes a reduction of 0.6 percent for both educational groups.

Even though the labor force is reduced more for the least educated groups, this is not enough to even out the differences in the employment levels by education. The unemployment rates increase by almost 1 percentage point for persons with primary and lower secondary education and for those with general and business studies at upper secondary level. The effect of the labor supply decline has, on the other hand, levelled out the unemployment rate differences between the remaining groups – all unemployment rates increase by 0.5 percentage points in 2015 when we compare them with these groups’ unemployment rates in the baseline.

4.4. Effects of a stronger krone exchange rate

We now examine the effects of a strengthening of the national currency. In this calculation, we have let the krone exchange rate appreciate gradually against other currencies to about 5 percent in 2015, compared to the baseline scenario. The krone exchange rate against euro reaches 7.52 in 2015, which is close to the exchange rate in 2002. Measured with the import weighted krone exchange rate, the krone is about 10 percent stronger than in 2002.

Table 4.4.1. Effects of a krone appreciation. Deviation from the baseline scenario in percent if not stated otherwise

	2012	2013	2014	2015
Consumption in households etc.	0.1	0.2	0.6	1.3
Gross fixed investment	0.0	0.0	0.1	0.4
Mainland private sector	0.0	0.0	0.2	0.7
Manufacturing	0.0	0.0	0.3	0.7
Residential housing	0.0	-0.1	0.0	0.6
Exports	-0.1	-0.2	-0.4	-0.5
Traditional goods	-0.2	-0.4	-0.7	-1.0
Imports	0.0	0.1	0.3	0.7
Mainland GDP	-0.1	0.0	0.1	0.3
Private sector	-0.1	0.0	0.1	0.3
Manufacturing	-0.2	-0.3	-0.3	-0.3
Employment (in 1,000)	-2.0	-3.9	-5.1	-5.4
Labor supply (in 1,000) ¹	-0.4	-1.6	-2.7	-3.6
Unemployment rate (level) ¹	0.1	0.1	0.1	0.1
Wage per hour	-0.2	-0.7	-1.3	-2.0
Consumer price index	-0.5	-1.2	-2.1	-3.1
Export prices, traditional goods	-0.8	-1.6	-2.5	-3.9
Household's disposable real income	0.4	0.7	1.1	1.7
Money market rate (level) ²	-0.8	-1.5	-2.1	-2.6
Import-weighted krone exchange rate (I44)	-1.2	-2.1	-3.3	-4.9

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

The immediate effect of a stronger krone exchange rate is that imports become cheaper in krone terms. Norwegian producers who are selling their products on the world market now receive less for their products in krone terms. Domestically produced goods for which prices are determined in the world market thus become cheaper, bringing the consumer prices down. Together with a weak development in the labor market, the price reduction lead to slower wage growth. However, prices fall more than wages, so the real wage is higher in this calculation compared to the baseline scenario. This boosts consumption, which is increased by 1.3 percent in 2015.

When the krone exchange rate appreciates, Norwegian exports oriented industry experience a deterioration of the cost competitiveness relative to international firms. Exports slow down, and with lowered production there is less need for inputs, both labor and real capital. As a result, employment levels are cut back and unemployment rises. In response to the increased unemployment rate, Norges Bank cuts the key rate sharply and money market rates are reduced by 2.6 percentage points in 2015. This gives positive impulses to the household sector as well as raising investments in the business sector, and the investment level is raised towards 2015.

When import goods become cheaper in Norway, consumers and manufacturers shift to some extent away from goods produced in Norway and over to imported products. Norwegian manufacturers thus lose market shares in both the domestic and the world market.

The reduction in the export prices is caused by several factors. Norwegian producers have lower costs due to reduced wage growth and lower prices on imported inputs of production. Moreover, the producers cut their prices further than what is implied by the cost reduction alone. This is however not enough to prevent the market shares from falling compared to the baseline scenario.

The strengthened currency causes mainland GDP to be reduced by around 0.1 per cent in 2012 relative to the baseline scenario. As consumption and investment pick up, however, the activity level increases. In 2015, mainland GDP is up by 0.3 percent. Employment, on the other hand, gradually falls. Exposed businesses are the hardest hit, and value added in manufacturing is 0.3 percent lower than in the

baseline scenario. Consumer prices are continuously dropping relative to the baseline scenario.

Table 4.4.2. Effects of a krone appreciation on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2013	2014	2015
Total employment	-2.0	-3.9	-5.1	-5.4
Manufacturing	-0.6	-1.2	-1.7	-2.2
Primary sector	-0.1	-0.2	-0.4	-0.6
Construction industry	-0.1	-0.1	0.1	0.1
Public sector	0.0	0.0	0.0	0.0
Private services	-1.1	-2.3	-2.9	-2.5
Remaining sectors	0.0	-0.1	-0.2	-0.3

Table 4.4.3. Effects of a krone appreciation on employment by sector. Deviation from the baseline scenario in percent

	2012	2013	2014	2015
Total employment	-0.1	-0.1	-0.2	-0.2
Manufacturing	-0.2	-0.5	-0.7	-0.9
Primary sector	-0.1	-0.3	-0.6	-0.8
Construction industry	-0.1	0.0	0.0	0.1
Public sector	0.0	0.0	0.0	0.0
Private services	-0.1	-0.2	-0.2	-0.2
Remaining sectors	0.0	-0.1	-0.2	-0.3

Table 4.4.2 and Table 4.4.3 indicate the employment development by sector in the case of a stronger krone exchange rate. The downscale is most severe in manufacturing, where employment is 0.9 percent lower in 2015. Although the level of consumption is higher in this scenario, the difference is not substantial before 2014. Due to a negative development in the exports of services, the gross product in private services industry is not higher than in the original scenario until 2015. Employment is replaced by other inputs of production due to lower import prices and reduced user cost of capital, and hence the employment level in the private services industry is lower than in the baseline scenario throughout the period we are analyzing. Labor productivity in the private services industry is consequently higher in this scenario. On the contrary, the employment level in the construction industry is somewhat higher in 2014 and 2015 than in the baseline scenario. Increased investments, especially in 2015, result in production growth in the construction industry. This has however yet to increase employment to a large extent.

Table 4.4.4 gives an outline of the employment development following the krone appreciation. The effects on employment follow the same pattern as the prevailing calculations; with most negative outcome for the unskilled workers, as these are well represented in the cyclically vulnerable industries. Almost 30 percent of the workers with vocational education from upper secondary school in electronics, mechanics work and machinery and other fields of science are employed in the manufacturing industry, and in 2015, demand for these candidates are 0.3 and 0.2 percent lower, respectively. The reductions in the manufacturing industry also hit persons with general education programs from upper secondary school in addition to engineers and graduate engineers at tertiary level. The service industry employs a grand share of persons with economic and administrative education at all levels, and demand for these candidates are significantly lower in 2015, too. There are also some effects among highly educated teachers. These individuals are mostly employed by the public sector, but are also represented in the business activities.

Table 4.4.4. Effects of a krone appreciation on employment by education. Deviation from the baseline scenario

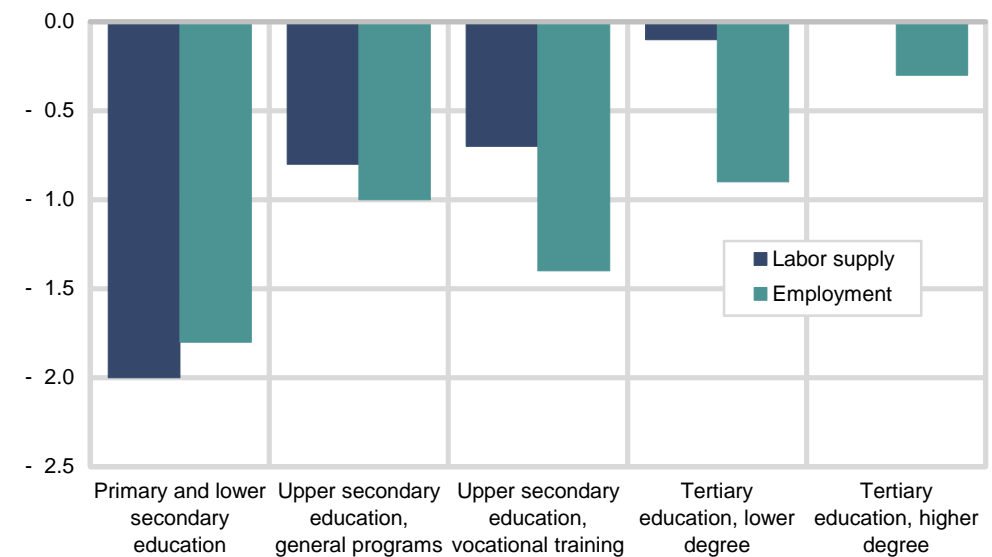
	2012	2013	2014	2015	2012	2013	2014	2015
	In 1,000				Percent			
Primary and lower secondary education	-0.7	-1.2	-1.7	-1.8	-0.1	-0.2	-0.3	-0.4
Upper secondary education, general and business studies	-0.4	-0.8	-1.0	-1.0	-0.1	-0.2	-0.2	-0.2
General programs ¹	-0.2	-0.5	-0.6	-0.6	-0.1	-0.2	-0.2	-0.2
Economics and administration	-0.2	-0.4	-0.5	-0.5	-0.1	-0.2	-0.3	-0.3
Upper secondary education, vocational programs	-0.5	-0.9	-1.2	-1.3	-0.1	-0.1	-0.2	-0.2
Electronics, mechanics work and machinery	-0.2	-0.4	-0.5	-0.6	-0.1	-0.2	-0.2	-0.3
Building and construction	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Other fields of science, technique and crafts	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-0.2	-0.2
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields	-0.1	-0.2	-0.3	-0.4	-0.1	-0.1	-0.2	-0.2
Tertiary education, lower degree ..	-0.3	-0.7	-0.9	-0.9	0.0	-0.1	-0.1	-0.1
Preliminary examination	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2
Humanities and arts	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Education	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
Social sciences	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
Law	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Economics and administration	-0.1	-0.2	-0.3	-0.3	-0.1	-0.2	-0.2	-0.2
Other fields of science	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields of health and social services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Engineering	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.3
Other tertiary education	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
Tertiary education, higher degree ..	-0.1	-0.2	-0.3	-0.3	-0.1	-0.1	-0.1	-0.1
Humanities and arts	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Education	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Social sciences	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Law	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Economics and administration	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2
Other fields of science	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3
Other tertiary education	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Total	-2.0	-3.8	-5.1	-5.4	-0.1	-0.1	-0.2	-0.2

¹ Programme for Specialization in General Programmes and folk high schools

Table 4.4.5. Effects of a krone appreciation on the labor market by level of education. Deviation from the baseline scenario

	2012	2013	2014	2015
Labor supply, total, 1,000 persons	-0.4	-1.6	-2.7	-3.6
Primary and lower secondary education	-0.3	-0.9	-1.5	-2.0
Upper secondary education, general and business studies	-0.1	-0.4	-0.6	-0.8
Upper secondary education, vocational training	0.0	-0.3	-0.5	-0.7
Tertiary education, lower degree	0.0	-0.1	-0.1	-0.1
Tertiary education, higher degree	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	1.5	2.2	2.4	1.8
Primary and lower secondary education	0.3	0.3	0.1	-0.2
Upper secondary education, general and business studies	0.3	0.4	0.4	0.2
Upper secondary education, vocational training	0.5	0.7	0.7	0.7
Tertiary education, lower degree	0.3	0.6	0.8	0.8
Tertiary education, higher degree	0.1	0.2	0.3	0.3
Unemployment rate, percentage points	0.1	0.1	0.1	0.1
Primary and lower secondary education	0.1	0.1	0.1	0.0
Upper secondary education, general and business studies	0.1	0.1	0.1	0.1
Upper secondary education, vocational training	0.1	0.1	0.1	0.1
Tertiary education, lower degree	0.0	0.1	0.1	0.1
Tertiary education, higher degree	0.0	0.1	0.1	0.1

Figure 4.4.1. Effects of a krone appreciation on labor supply and employment by level of education in 2015. Deviation from the baseline scenario in 1,000 persons



The employment decline according to educational level following the krone appreciation is about the same as in the case of lower petroleum investments. Due to varying dynamics in wages and unemployment among other factors, the labor supply responses are however stronger among the unskilled workers in this scenario. The pattern is the same as earlier– the discouraged workers effect is stronger among the unskilled workers and the resulting changes in unemployment rates are pretty similar among the various groups of education. For the group with education below upper secondary level, the labor supply decline is stronger than the decline in employment. This results in a weakly falling unemployment level among these persons. All other educational groups face higher unemployment levels.

5. Long term analysis

We now turn to the long term analysis. We study consequences for the projections towards 2030 of assuming other values of key variables and trends than in the baseline. One important motivation for this analysis is the ambiguity of the growth in future labor supply, both because of uncertain forecasts on immigration and on the participation rate. In section 5.1 and 5.2 we study the effects of these two factors, respectively. Another important motivation for this analysis is that the growing elderly population will put pressure on public finances. Assumptions on how the growing costs in public services are financed involve different consequences for the economic development in the longer term. In the baseline, standards of public services were assumed to grow moderately. To finance this growth in a period where the number of elderly grows strongly after 2025, income tax increases were assumed at the end of the . In section 5.3 and 5.4 we analyse the effects of an increase in the income tax rate and the VAT rate, respectively. In section 5.5 we look closer at one important economic trend that has been very beneficial to the Norwegian economy in recent years, namely the considerable improvement in terms of trade. Norwegian export prices have increased much more than import prices. To a certain extent, this trend is assumed to continue in the baseline scenario. In section 5.5 we consider a worsening of terms of trade conditions. For illustration purposes, all shift-analyses in this section are carried out in 2012 and kept throughout the projection period.

The fiscal policy, in terms of purchases from private sector in real terms, man hours in public sector, tax rates and rules for transfers, is not changed from the baseline unless this is the point of interest in the alternative simulation. However, structural changes affect public finances and hence the scope for growth in public expenses that is in line with the fiscal rule. In a separate calculation (Section 5.6), we have increased the public employment 1 percent from 2012 and hence raised the public level of expenses. The consequences would be of about corresponding strength if the public employment were reduced.

In Table 5.0.1 we show the effect on non-oil government deficit for each of the calculations in this section. By combining the results from the calculation with increased public employment and the shifts in 5.1 to 5.5, and scaling the latter so that the government deficit is roughly unchanged, one can get an idea of the overall effects of the shifts when fiscal policy also changes in line with the fiscal rule. For example, if you triple the results of increased public spending and add the results from section 5.3 (higher income tax rate), government deficit is only moderately affected according to Table 5.0.1. Furthermore, mainland GDP in 2030 is reduced by 0.8 percent compared to the level in the baseline scenario. Employment is increased by almost 11,000 persons.

Table 5.0.1. Non-oil government deficit. Deviations from Bjørnstad et al. (2010) in billion kroner

	2015	2020	2025	2030
Section 5.1: Increased labor immigration	0.9	-3.2	-7.6	-12.0
Section 5.2: Increased labor participation	-1.6	-15.5	-10.8	-16.2
Section 5.3: Higher income tax	-11.7	-17.8	-22.7	-29.3
Section 5.4: Higher value added tax	-16.5	-11.9	-20.4	-26.9
Section 5.5: Detoriation in terms of trade	4.6	-3.1	-3.8	-4.8
Section 5.6: Increased public employment	2.5	5.9	6.5	9.1

As in section 4 we notice that the total effect on employment will differ slightly between some of the tables describing the same shift-analysis. The reason for this is that the tables presenting results covering educational groups refers to the employment definition in the LFS, while in the tables of aggregated effects we use the definition as in the NA. While NA covers all persons employed in Norway, LFS only shows employment among the registered population.

5.1. Effects of increased labor immigration

Demographic changes are important for the economy and the development in the labor market. Statistics Norway publishes population forecasts annually, and the projections in Bjørnstad et al. (2010) were based on the medium growth alternative from forecasts made in June 2009. In these projections, the number of persons increases from about 4.9 million in 2009 to 5.9 million in 2030. However, the degree of uncertainty in the projections is high, especially concerning the future immigration flows.

In this calculation, we have increased the labor immigration compared to the baseline. This has been done by raising the population of men aged 41–66 with vocational education by 3,000 persons every year until 2030. We thus assume that this additional immigration flow mainly consists of craftsmen. As a result, the labor force grows steadily by about 2,000 persons each year compared to the baseline scenario. Consequently, there are an additional 39,000 people offering labor in 2030, as can be seen in Table 5.1.1. In MODAG, the enterprises' demand for labor is not directly affected by the labor immigration in itself. Vacancies are not modelled. Raising the labor supply will therefore not increase the level of employment directly even in a situation where there is scarcity of labor. In the first round, the labor supply increase thus raises the level of unemployment correspondingly. This moderates the wage growth, which is lower than the baseline scenario throughout the calculation period. The firms' production costs are thereby reduced, which boosts production. On the other hand, lower wage growth reduces the household's disposable real income, and this suppresses the consumption growth and hence employment.

Table 5.1.1. Effects of increased labor immigration. Deviation from the baseline scenario in percent if not stated otherwise³

	2012	2015	2020	2025	2030
Consumption in households etc.	0.0	-0.1	0.4	1.0	1.5
Gross fixed investment	0.0	0.2	1.1	2.2	3.2
Mainland private sector	0.0	0.3	0.7	3.3	4.6
Manufacturing	0.0	0.2	1.1	1.8	2.6
Residential housing	0.0	0.5	3.0	5.6	7.4
Exports	0.0	0.2	0.5	0.7	1.0
Traditional goods	0.0	0.3	0.9	1.2	1.3
Imports	0.0	-0.1	0.2	0.7	0.9
Mainland GDP	0.0	0.1	0.6	1.2	1.7
Private sector	0.0	0.2	0.8	1.5	2.2
Manufacturing	0.0	0.3	1.2	1.8	2.4
Employment (in 1,000)	0.2	2.0	9.1	16.4	23.8
Labor supply (in 1,000) ¹	2.5	8.0	18.8	28.8	38.8
Unemployment rate (level) ¹	0.1	0.2	0.3	0.4	0.5
Wage per hour	-0.1	-0.3	-0.8	-1.2	-1.8
Consumer price index	0.0	0.1	-0.1	-0.6	-1.2
Export prices, traditional goods	0.1	0.6	1.0	0.8	0.3
Household's disposable real income	0.0	-0.2	0.1	0.5	0.9
Money market rate (level) ²	0.0	-0.2	-0.6	-0.8	-1.0
Import-weighted krone exchange rate (I44)	0.1	1.0	1.7	1.5	1.2
Population, men 41-66, voc. ed. (in 1,000)	3.0	12.0	27.0	42.0	57.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

³ Corrected 11 January 2012.

Despite that the wage rate is quite a bit lower in this scenario, the inflation rate is falling, and the effect on the real wage is not as strong. Nevertheless, real wage is lower than the projections in Bjørnstad et al. (2010) in the entire projection period. In response to the increased unemployment rate, Norges Bank cuts the key rate. This reduces the interest payments for the household sector, in such a way that the household's disposable real income gradually becomes higher than in the baseline scenario. Cutting the interest rate also stimulates business investment, and particularly housing investments.

The reduced wage rate and the weak labor market development moderate the increase in the labor supply. Without these adjustments, the labor supply growth would have been even stronger. Together with the employment growth, this implies that the overall unemployment rate is 0.5 percent higher in this calculation. The mainland economic activity is however raised by 1.7 percent in 2030 relative to the baseline scenario. The activity growth is primarily caused by higher consumption growth in addition to higher business sector production and investment.

Table 5.1.2. Effects of increased labor immigration on employment by sector. Deviation from the projections in Bjørnstad et al. (2010) in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	0.2	2.0	9.1	16.4	23.8
Manufacturing	0.1	0.8	2.3	3.4	4.5
Primary sector	0.0	0.0	-0.1	-0.2	-0.4
Construction industry	0.1	0.3	0.9	1.9	3.4
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	0.0	0.8	5.3	10.4	15.1
Remaining sectors	0.0	0.2	0.6	0.9	1.2

Table 5.1.3. Effects of increased labor immigration on employment by sector. Deviation from the projections in Bjørnstad et al. (2010) in percent

	2012	2015	2020	2025	2030
Total employment	0.0	0.1	0.3	0.6	0.8
Manufacturing	0.0	0.3	0.9	1.4	1.8
Primary sector	0.0	0.0	-0.1	-0.4	-0.7
Construction industry	0.1	0.1	0.5	1.0	1.7
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	0.0	0.1	0.4	0.8	1.2
Remaining sectors	0.0	0.2	0.7	1.2	1.6

The interest rate reduction weakens the NOK against our trade partners' currencies. As a consequence, the competitiveness is further improved for the exposed sector. This contributes to increased employment in the manufacturing industry. As can be seen in Table 5.1.2 and Table 5.1.3, the employment in the construction industry is also raised through a higher level of investment compared to the baseline scenario. The employment level in the private service industries is also higher due to increased consumption. The overall employment increase is however not enough to employ all the additional people who are seeking a job. The unemployment rate is therefore higher than the original projections in the entire period. The level of activity is however also higher in this calculation.

As the employment levels for the cyclically sensitive industries are higher when the labor immigration increases, the employment effects are relatively strong for the educational groups that are highly represented in these industries, i.e. persons with vocational education at upper secondary level in electronics, mechanics work and machinery, building and construction and other fields of science. Persons with economics and administration at the tertiary level and engineers also face higher demand for their competence. Moreover, the employment growth is relatively broadly based, leaving most fields of education affected to some degree. Even persons with specialization within health and education are employed in business activities, and thus employed in a higher extent than in the original projections. The exception, here as in the other calculations, is the fields of education with a particularly high representation in the public sector. This accounts especially for dentists and doctors at the highest level of education.

Table 5.1.4. Effects of increased labor immigration on employment by education. Deviation from the baseline scenario²

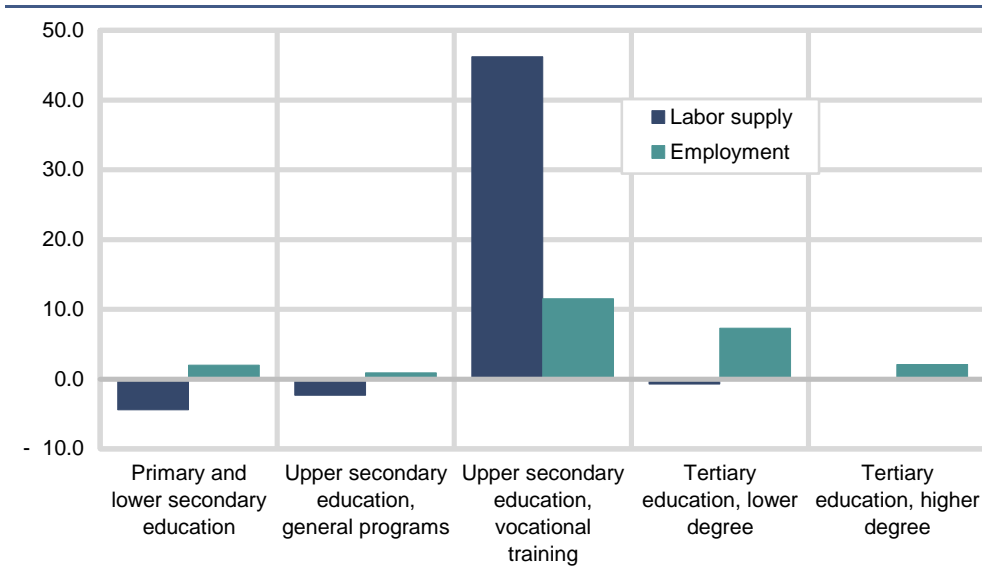
	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	-0.1	0.0	1.0	1.7	2.2	0.0	0.0	0.2	0.4	0.6
Upper secondary education, general and business studies	-0.1	-0.1	0.4	0.8	1.0	0.0	0.0	0.1	0.2	0.3
General programs ¹	0.0	-0.1	0.2	0.4	0.5	0.0	0.0	0.1	0.2	0.2
Economics and administration	0.0	0.0	0.2	0.4	0.5	0.0	0.0	0.1	0.3	0.4
Upper secondary education, vocational programs	0.2	1.2	4.4	8.0	11.7	0.0	0.2	0.6	1.0	1.4
Electronics, mechanics work and machinery	0.1	0.5	1.8	3.1	4.4	0.0	0.2	0.8	1.3	1.8
Building and construction	0.0	0.2	0.7	1.3	2.1	0.0	0.2	0.6	1.1	1.6
Other fields of science, technique and crafts	0.0	0.2	0.7	1.2	1.7	0.0	0.2	0.6	1.0	1.4
Nursing and caregiving	0.0	0.1	0.2	0.3	0.4	0.0	0.1	0.2	0.2	0.3
Other fields	0.0	0.3	1.2	2.1	3.1	0.0	0.2	0.6	1.0	1.4
Tertiary education, lower degree	0.1	0.7	2.7	5.0	7.5	0.0	0.1	0.3	0.6	0.8
Preliminary examination	0.0	0.0	0.1	0.2	0.3	0.0	0.2	0.6	1.0	1.4
Humanities and arts	0.0	0.1	0.2	0.5	0.7	0.0	0.1	0.4	0.8	1.1
Education	0.0	0.1	0.3	0.5	0.7	0.0	0.0	0.1	0.3	0.4
Social sciences	0.0	0.0	0.2	0.4	0.6	0.0	0.1	0.5	0.9	1.2
Law	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.5	0.9	1.2
Economics and administration	0.0	0.2	0.8	1.5	2.3	0.0	0.1	0.5	0.8	1.1
Other fields of science	0.0	0.1	0.3	0.5	0.8	0.0	0.2	0.6	1.0	1.4
Nursing and caregiving	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Other fields of health and social services	0.0	0.0	0.1	0.2	0.4	0.0	0.0	0.2	0.3	0.4
Engineering	0.0	0.1	0.4	0.7	1.0	0.0	0.2	0.6	1.0	1.3
Other tertiary education	0.0	0.0	0.1	0.3	0.4	0.0	0.1	0.4	0.7	0.9
Tertiary education, higher degree	0.0	0.2	0.8	1.4	2.2	0.0	0.1	0.3	0.6	0.8
Humanities and arts	0.0	0.0	0.1	0.1	0.2	0.0	0.1	0.2	0.4	0.6
Education	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.5
Social sciences	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.2	0.4	0.5
Law	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.2	0.4	0.5
Economics and administration	0.0	0.0	0.1	0.2	0.3	0.0	0.1	0.5	0.8	1.1
Other fields of science	0.0	0.1	0.2	0.4	0.5	0.0	0.1	0.4	0.7	1.0
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.0	0.1	0.2	0.4	0.6	0.0	0.2	0.6	0.9	1.3
Other tertiary education	0.0	0.0	0.1	0.1	0.2	0.0	0.1	0.3	0.6	0.8
Total	0.2	2.1	9.3	16.9	24.5	0.0	0.1	0.3	0.6	0.9

¹ Programme for Specialization in General Programmes and folk high schools

² Corrected 11 January 2012.

Table 5.1.5. Effects of increased labor immigration on the labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	2.5	8.0	18.8	28.8	38.8
Primary and lower secondary education	-0.1	-0.9	-1.7	-3.1	-4.4
Upper secondary education, general and business studies	-0.1	-0.5	-1.0	-1.7	-2.3
Upper secondary education, vocational training	2.7	9.7	21.8	34.0	46.2
Tertiary education, lower degree	0.0	-0.2	-0.3	-0.5	-0.7
Tertiary education, higher degree	0.0	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	2.3	6.0	9.7	12.4	15.0
Primary and lower secondary education	-0.1	-0.9	-2.6	-4.6	-6.4
Upper secondary education, general and business studies	0.0	-0.4	-1.4	-2.4	-3.2
Upper secondary education, vocational training	2.5	8.4	17.4	26.2	34.7
Tertiary education, lower degree	-0.1	-0.8	-2.9	-5.4	-8.0
Tertiary education, higher degree	0.0	-0.2	-0.8	-1.4	-2.1
Unemployment rate, percentage points	0.1	0.2	0.3	0.4	0.5
Primary and lower secondary education	0.0	-0.2	-0.6	-1.1	-1.6
Upper secondary education, general and business studies	0.0	-0.1	-0.4	-0.7	-1.0
Upper secondary education, vocational training	0.4	1.1	2.2	3.0	3.9
Tertiary education, lower degree	0.0	-0.1	-0.4	-0.6	-0.9
Tertiary education, higher degree	0.0	-0.1	-0.3	-0.5	-0.7

Figure 5.1.1. Effects of increased labor immigration on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons

In this calculation, we have analyzed the effects of a shock in the labor supply. For illustrative purposes we have increased the inflow of male workers with vocational education entering the labor market each year from 2012. This is clearly seen in Table 5.1.5 and Figure 5.1.1 – the supply of persons holding an upper secondary vocational education is sharply increasing during the calculation period. Despite that the level of employment increases in this calculation, and especially for the group with vocational training, this is not enough to employ all the additional persons supplying a job. As a consequence, the unemployment rate is almost 4 percentage points higher in 2030 for persons with this educational level. The other educational groups achieve lower unemployment – the wage reduction in particular causes the employment level to increase. The wage reduction also results in lower participation rates for the least educated workers, bringing the unemployment rate further down for these groups.

5.2. Effects of increased labor participation

The labor supply could also be raised without increasing the labor immigration past the level in the baseline – if the existing population participates in the labor market more actively. This is not an unlikely scenario, as the pension reform's objective is to stimulate participation, especially among the older age groups. However, in this calculation we have assumed that all the different demographic groups increase their participation rates by 1 percentage point compared to the baseline scenario from 2012 and onwards. As we have raised the participation rates exogenously to a higher level, the labor supply does not respond to changes in the economic environment.

As can be seen in Table 5.2.1, the long term effect on the labor force is about the same as in the case where the labor immigration rises in the previous section. The labor supply increases by 40,000 persons in 2030. In this calculation, however, the labor supply by construction adjusts instantly. Accordingly, the impulses to the rest of the economy are much larger in the first part of the simulation period. Although the labor supply increases at once, the demand is not raised in the first place. The impulses from increased labor supply are thus basically captured through the effect on the wage formation also in this case. The unemployment level increases and the wages are reduced, making labor relatively cheaper compared to other factors of input. The firms, in turn, respond by increasing the demand for labor. The inflation rate is reduced, but not as much as the wage rate, and the real wage rate is lower throughout the calculation period. However, as the effects of the monetary policy gradually are transmitted, the household sector achieves higher disposable real income in total, and consumption is appreciably higher from 2020 and onwards.

Table 5.2.1. Effects of increased participation rates by 1 percentage point. Deviation from the projections in Bjørnstad (2010) in percent if not stated otherwise⁴

	2012	2015	2020	2025	2030
Consumption in households etc.	0.0	0.3	1.9	1.6	1.3
Gross fixed investment	0.1	1.5	3.8	3.6	3.7
Mainland private sector	0.1	2.5	5.9	5.4	5.3
Manufacturing	0.1	2.1	3.0	2.9	3.3
Residential housing	0.1	4.0	9.9	8.1	6.9
Exports	0.2	1.1	0.8	0.7	0.9
Traditional goods	0.4	2.2	1.7	1.2	1.4
Imports	0.0	0.2	1.4	0.9	0.6
Mainland GDP	0.1	1.1	1.9	1.9	1.9
Private sector	0.2	1.3	2.4	2.3	2.4
Manufacturing	0.3	2.7	3.0	2.7	3.1
Employment (in 1,000)	1.8	15.6	25.1	24.2	26.8
Labor supply (in 1,000) ¹	36.6	37.4	38.6	39.4	40.4
Unemployment rate (level) ¹	1.2	0.7	0.4	0.5	0.4
Wage per hour	-0.4	-1.3	-1.1	-2.1	-3.3
Consumer price index	0.2	0.4	-0.8	-1.6	-2.6
Export prices, traditional goods	1.0	3.6	0.8	-0.2	-1.2
Household's disposable real income	-0.2	-0.3	1.1	0.8	0.7
Money market rate (level) ²	-0.4	-1.5	-1.2	-1.1	-1.2
Import-weighted krone exchange rate (I44)	1.6	5.7	1.6	0.6	-0.3
Labour market participation ³	1.0	1.0	1.0	1.0	1.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

³ In percentage points

⁴ Corrected 11 January 2012.

The weakening of the currency gives further impulses to the exposed sector, and the interest rate cut stimulates investments. As a result, the levels of production and employment are higher in the manufacturing industry, the construction industry and in the private services. Total employment is 0.9 percent higher in 2030 compared to the baseline scenario, corresponding to nearly 27,000 persons. This is however not enough to employ all the additional people now offering labor, and the unemployment rate is 0.4 percentage points higher in this calculation. The activity level, measured by the mainland GDP, is nearly 2 percent higher from 2020 and onwards.

Table 5.2.2. Effects of increased participation rates on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	1.8	15.6	25.1	24.2	26.8
Manufacturing	0.7	5.4	5.9	6.0	7.1
Primary sector	0.0	-0.1	-0.4	-0.5	-0.4
Construction industry	0.5	1.1	2.0	2.9	4.0
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	0.6	8.3	16.5	15.2	15.4
Remaining sectors	0.1	0.8	1.0	0.7	0.7

Table 5.2.3. Effects of increased participation rates on employment by sector. Deviation from the baseline scenario in percent

	2012	2015	2020	2025	2030
Total employment	0.1	0.6	0.9	0.9	0.9
Manufacturing	0.3	2.1	2.4	2.4	2.8
Primary sector	0.0	-0.2	-0.6	-0.8	-0.7
Construction industry	0.3	0.6	1.1	1.5	2.0
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	0.0	0.7	1.3	1.2	1.2
Remaining sectors	0.1	0.9	1.1	0.8	0.9

The increase in production results in an increasing demand for labor in most industries. Manufacturing employment increases by nearly 3 percent relative to the baseline scenario, and employment in both the construction industry and in private services pick up markedly. The primary sectors reduce the demand for labor, but the sectors are small and mean little for the total outcome.

Table 5.2.4. Effects of increased participation rates on employment by level of education. Deviation from the baseline scenario²

	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	-0.3	3.5	5.2	4.0	3.7	-0.1	0.7	1.2	1.0	1.0
Upper secondary education, general and business studies	-0.4	2.0	3.4	2.5	2.2	-0.1	0.4	0.8	0.6	0.6
General programs ¹	-0.2	1.1	2.0	1.4	1.2	-0.1	0.4	0.7	0.6	0.5
Economics and administration	-0.1	0.9	1.5	1.1	1.0	-0.1	0.5	0.9	0.7	0.7
Upper secondary education, vocational programs	1.3	5.8	8.7	9.2	10.8	0.2	0.8	1.2	1.1	1.2
Electronics, mechanics work and machinery	0.5	2.4	3.5	3.7	4.3	0.3	1.1	1.5	1.5	1.7
Building and construction	0.2	0.8	1.4	1.8	2.3	0.2	0.8	1.2	1.4	1.7
Other fields of science, technique and crafts	0.2	1.0	1.4	1.4	1.5	0.2	0.9	1.2	1.2	1.3
Nursing and caregiving	0.1	0.2	0.3	0.3	0.3	0.1	0.2	0.3	0.2	0.2
Other fields	0.3	1.3	2.1	2.1	2.4	0.2	0.7	1.1	1.0	1.1
Tertiary education, lower degree	0.9	3.4	5.9	6.5	7.7	0.1	0.5	0.7	0.8	0.8
Preliminary examination	0.0	0.1	0.2	0.3	0.3	0.2	0.8	1.3	1.3	1.5
Humanities and arts	0.1	0.3	0.5	0.6	0.7	0.2	0.5	0.9	1.0	1.1
Education	0.1	0.3	0.6	0.6	0.7	0.1	0.2	0.3	0.3	0.4
Social sciences	0.1	0.2	0.4	0.5	0.6	0.2	0.7	1.2	1.2	1.3
Law	0.0	0.0	0.1	0.1	0.1	0.2	0.6	1.1	1.1	1.2
Economics and administration	0.3	1.1	1.9	2.1	2.5	0.2	0.7	1.1	1.1	1.2
Other fields of science	0.1	0.3	0.6	0.7	0.8	0.2	0.8	1.3	1.3	1.4
Nursing and caregiving	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
Other fields of health and social services	0.0	0.1	0.2	0.3	0.3	0.1	0.2	0.3	0.3	0.4
Engineering	0.2	0.6	0.9	1.0	1.1	0.2	0.9	1.3	1.3	1.5
Other tertiary education	0.0	0.2	0.3	0.3	0.4	0.1	0.6	0.8	0.8	0.9
Tertiary education, higher degree	0.3	1.0	1.8	2.0	2.5	0.1	0.5	0.8	0.8	0.9
Humanities and arts	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.6	0.6	0.7
Education	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.5	0.6
Social sciences	0.0	0.1	0.1	0.1	0.2	0.1	0.3	0.5	0.5	0.6
Law	0.0	0.1	0.1	0.2	0.2	0.1	0.3	0.6	0.6	0.7
Economics and administration	0.0	0.1	0.2	0.3	0.3	0.2	0.7	1.1	1.1	1.3
Other fields of science	0.1	0.3	0.5	0.5	0.6	0.2	0.6	1.0	1.1	1.2
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.1	0.3	0.5	0.6	0.7	0.2	0.9	1.3	1.3	1.5
Other tertiary education	0.0	0.1	0.2	0.2	0.2	0.1	0.4	0.7	0.6	0.7
Total	1.8	15.6	25.0	24.2	26.8	0.1	0.6	0.9	0.9	0.9

¹ Programme for Specialization in General Programmes and folk high schools

² Corrected 11 January 2012.

In total, the employment effects by education resemble the previous calculations. Nearly all the fields of education are affected by the increased demand for labor, but the employment increase is less profound for traditional occupational groups in public sector.

The service industry demand labor with specialization in economics and administration at all levels. Moreover, the demand for vocationally trained in electronics, mechanics work and machinery and in other fields is high in the service sector. At tertiary level, the service industry mostly demand labor educated within humanities and arts, social sciences, engineering and other fields of science at both levels. Persons with a higher degree in education and law are also demanded by the service industry.

Besides increasing the demand further for vocationally trained in technical fields and economics, the activity growth in manufacturing leads to stronger demand for persons with scientific education at tertiary level. Moreover, the demand for engineers, graduate engineers and persons with specialization in other fields of science is brought further up by the increased labor demand from manufacturing. In 2006, 75 percent of the workers with higher tertiary education in manufacturing had a scientific degree. Besides, the employment of persons with economic and administrative education at upper secondary level is substantial in manufacturing.

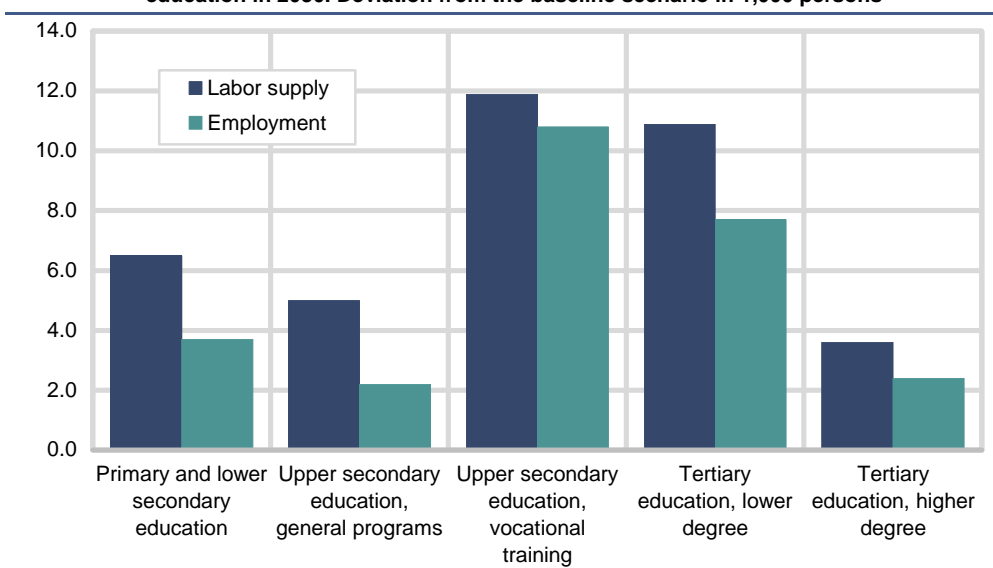
In addition, upswing in the service industry and in manufacturing increase the demand for unskilled persons – in 2006, roughly 30 percent of the employees had education below upper secondary level, both in manufacturing and in the service sector. Nearly 15 percent had a qualification in general programs at upper

secondary level in the service sector, while this applied to nearly 10 percent in manufacturing. Nevertheless, the educational upgrade of the population causes demand for these persons to moderate in such a way that the employment increases are less profound at these educational levels.

Table 5.2.5. Effects of increased participation rates on labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	36.6	37.4	38.6	39.4	40.4
Primary and lower secondary education	8.8	8.2	7.4	6.8	6.5
Upper secondary education, general and business studies	6.7	6.4	5.9	5.5	5.0
Upper secondary education, vocational training	9.0	9.6	10.4	11.2	11.9
Tertiary education, lower degree	8.4	8.9	9.7	10.4	10.9
Tertiary education, higher degree	2.6	2.8	3.1	3.3	3.6
Unemployment, total, 1,000 persons	34.8	21.9	13.6	15.2	13.6
Primary and lower secondary education	9.1	4.7	2.1	2.8	2.8
Upper secondary education, general and business studies	7.1	4.4	2.5	2.9	2.9
Upper secondary education, vocational training	7.7	3.8	1.7	2.0	1.1
Tertiary education, lower degree	7.5	5.6	3.9	3.9	3.2
Tertiary education, higher degree	2.4	1.8	1.3	1.3	1.1
Unemployment rate, percentage points	1.2	0.7	0.4	0.5	0.4
Primary and lower secondary education	1.6	0.9	0.4	0.6	0.6
Upper secondary education, general and business studies	1.5	1.0	0.6	0.8	0.8
Upper secondary education, vocational training	1.1	0.5	0.2	0.2	0.1
Tertiary education, lower degree	1.0	0.7	0.5	0.4	0.3
Tertiary education, higher degree	1.0	0.7	0.5	0.4	0.3

Figure 5.2.1. Effects of increased participation rates on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons



In this calculation, the labor participation rate is increased among all demographic groups. This raises the labor supply among all educational groups. Through the wage formation, among others, this leads to increased activity in the business sector, and therefore to a stronger demand for labor. The employment does however not increase sufficiently to employ all the extra persons who are now offering labor. This leads to increased unemployment among all educational groups.

Table 5.2.5 and Figure 5.2.1 indicate that the employment growth is strongest among skilled persons. The employment of persons with vocational education increases relatively most, as the additional demand of almost 12,000 persons corresponds to 1.2 percent of the employment in Bjørnstad et al. (2010) in 2015. The demand for persons with tertiary education increases by 0.9 percent at both levels. The strong employment growth among vocationally trained make the unemployment level increase least among these persons. Beyond that, the unemployment

levels increase mostly among the unskilled. In 2030, the effect on the unemployment rate is almost three times higher among persons with general and business studies than among persons with a tertiary education.

5.3. Effects of higher income tax

The public sector employment share increases from 30 percent in 2009 to nearly 39 percent in 2030 in Bjørnstad et al. (2010). This growth is possible to finance through the Government Pension Fund – Global, despite of small changes in the average tax rate. However, one might argue that the growth in the quality of public services is unrealistically low, and that the growing elderly population will demand a higher quality growth. The baseline is based on lower income tax rates for wage earners and self-employed towards 2025. After this, the income tax is gradually increased, but in 2030, the income tax rate is still somewhat lower than in 2009. In an alternative calculation, we have raised the marginal and average tax rates by 1 percentage point compared to the assumed tax rates in the baseline scenario. The motivation behind this calculation is that the extra public income can be spent on a higher quality within public services, for example by raising the public employment as we do in section 5.6 and scaling it in such a way that the non-oil government deficit is roughly unchanged, see Table 5.0.1. However, these calculations are partial, since we have not increased public spending accordingly. Hence non-oil government deficit is reduced compared to the baseline scenario, cf. Table 5.0.1. The calculations show the consequences of the tax increase in isolation.

Table 5.3.1. Effects of higher income tax. Deviation from the baseline scenario in percent if not stated otherwise⁴

	2012	2015	2020	2025	2030
Consumption in households etc.	-0.7	-1.5	-1.6	-1.5	-1.6
Gross fixed investment	-0.1	-0.4	-0.4	-0.3	-0.3
Mainland private sector	-0.1	-0.7	-0.6	-0.4	-0.4
Manufacturing	0.0	-0.1	0.3	0.4	0.4
Residential housing	0.0	-1.1	-1.1	-0.8	-0.9
Exports	0.0	0.1	0.3	0.2	0.2
Traditional goods	0.0	0.3	0.6	0.4	0.4
Imports	-0.4	-1.1	-1.1	-1.0	-1.1
Mainland GDP	-0.2	-0.5	-0.4	-0.4	-0.5
Private sector	-0.3	-0.6	-0.5	-0.5	-0.6
Manufacturing	-0.1	0.0	0.4	0.3	0.3
Employment (in 1,000)	-2.4	-5.7	-5.4	-6.6	-8.0
Labor supply (in 1,000) ¹	-0.6	-0.9	-2.1	-4.4	-5.4
Unemployment rate (level) ¹	0.1	0.2	0.1	0.1	0.1
Wage per hour	0.0	-0.2	-0.5	-0.6	-1.0
Consumer price index	0.0	0.1	0.0	-0.4	-0.7
Export prices, traditional goods	0.0	0.5	0.6	0.0	-0.3
Household's disposable real income	-1.6	-2.0	-1.9	-1.8	-1.9
Money market rate (level) ²	0.0	-0.2	-0.4	-0.3	-0.3
Import-weighted krone exchange rate (I44)	0.0	0.8	1.0	0.2	-0.1
Average tax rate ³	1.0	1.0	1.0	1.0	1.0
Marginal tax rate ³	1.0	1.0	1.0	1.0	1.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

³ In percentage points

⁴ Corrected 11 January 2012.

Raising the tax rate leads to a fall in the household's real disposable income. Thus, consumption falls, hitting the production in private services particularly strong. Accordingly, employment is reduced and wages fall, leading to a further drop in household's real wages and real disposable income. Both housing investments and business investment are negatively affected by the tax increase. All together, economic activity is reduced even more.

In order to increase the economic activity, Norges Bank cuts the interest rate. This reduces the value of the krone and raises the activity in the exposed sector. This, together with a lower cost level due to reduced wages, boosts exports, which is higher than in the baseline scenario throughout the period we are looking at. The weaker

krone exchange rate, the lower business activity and the reduced spending power of the household sector all suppress the import level. Consequently, the trade balance is improved and this dampens the negative outcome of the raised tax rate on GDP.

The wage reduction reduces the price level. However, the weakened krone exchange rate works in the opposite direction, and the overall effect on the price level is fairly moderate in the beginning of the calculation period. From 2015 to 2020, however, the interest rate is somewhat raised, and the krone depreciation is reversed. Inflation is thus lower than in the baseline from 2020 and onwards.

The reduced wage and the higher unemployment level cause the labor supply to fall relative to the baseline. The effect on the unemployment level is moderated by this, and effect on the unemployment rate is relatively small and stable in the entire period. Altogether, the total activity level measured by mainland GDP is dominated by the negative effects caused by the tax rate increase. Broadly speaking, mainland GDP is around one half percent lower in the entire calculation period.

Table 5.3.2. Effects of higher income tax on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	-2.4	-5.7	-5.4	-6.6	-8.0
Manufacturing	-0.1	0.1	0.8	0.6	0.6
Primary sector	0.0	0.0	0.0	0.0	0.0
Construction industry	0.0	-0.2	-0.2	-0.2	-0.3
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	-2.3	-5.7	-6.3	-7.1	-8.5
Remaining sectors	0.0	0.1	0.3	0.3	0.2

Table 5.3.3. Effects of higher income tax on employment by sector. Deviation from the baseline scenario in percent

	2012	2015	2020	2025	2030
Total employment	-0.1	-0.2	-0.2	-0.2	-0.3
Manufacturing	0.0	0.0	0.3	0.2	0.2
Primary sector	0.0	0.0	0.1	0.0	-0.1
Construction industry	0.0	-0.1	-0.1	-0.1	-0.2
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	-0.2	-0.5	-0.5	-0.6	-0.7
Remaining sectors	0.0	0.1	0.3	0.3	0.3

The overall employment reduction of 8,000 persons is dispersed across the different industries. As Table 5.3.2 and Table 5.3.3 show, the reductions are most severe in the private service industries. Employment is cut by 2,500 persons the first year, but as the negative effects are transmitted in the economy, this has increased to 8,500 persons by 2030. This corresponds to a 0.7 percent employment reduction. Due to the lower investment levels, the construction industries also reduce their staff relative to the baseline scenario. The manufacturing industries, on the other hand, increase the staff.

Table 5.3.4 reveals that the effects of the higher income tax on the various educational levels are less dispersed than in several of the other calculations. The outcome of the different shocks depends on the sizes of the shocks and through which channels they are transmitted to the rest of the economy. In the case of a decline in the petroleum investment, for example, the slowdown in the economy manifested itself on a broad front. As a result, most industries were hit and employment reductions were severe in the manufacturing industry, the construction industry and the service industry. With this, the employment reductions were strong particularly among the workers with primary and lower secondary education and the workers with upper secondary education. In this case, however, the manufacturing employment is raised. This moderates the employment effects among several of the fields of vocational education. As can be seen, there are numerous educational fields on the tertiary level that are hit as strong as the least educated groups. Still, the overall effects are less profound among the persons with a tertiary level of education. This is because several of the persons with a higher level of education are employed by the public sector.

Table 5.3.4. Effects of higher income tax on employment by education. Deviation from the baseline scenario²

	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	-0.8	-1.8	-1.5	-1.6	-1.7	-0.2	-0.4	-0.3	-0.4	-0.4
Upper secondary education, general and business studies	-0.6	-1.5	-1.4	-1.3	-1.4	-0.1	-0.3	-0.3	-0.3	-0.4
General programs ¹	-0.4	-0.8	-0.8	-0.8	-0.8	-0.1	-0.3	-0.3	-0.3	-0.3
Economics and administration	-0.3	-0.6	-0.6	-0.6	-0.6	-0.1	-0.4	-0.4	-0.4	-0.4
Upper secondary education, vocational programs	-0.5	-1.2	-1.0	-1.5	-2.1	-0.1	-0.2	-0.1	-0.2	-0.2
Electronics, mechanics work and machinery	-0.2	-0.4	-0.3	-0.4	-0.6	-0.1	-0.2	-0.1	-0.2	-0.3
Building and construction	-0.1	-0.2	-0.2	-0.2	-0.3	-0.1	-0.2	-0.1	-0.2	-0.2
Other fields of science, technique and crafts	-0.1	-0.2	-0.2	-0.2	-0.3	-0.1	-0.2	-0.1	-0.2	-0.3
Nursing and caregiving	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1
Other fields	-0.2	-0.4	-0.4	-0.5	-0.7	-0.1	-0.2	-0.2	-0.3	-0.3
Tertiary education, lower degree	-0.4	-1.0	-1.2	-1.6	-2.1	-0.1	-0.1	-0.1	-0.2	-0.2
Preliminary examination	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.3	-0.3	-0.3	-0.4
Humanities and arts	0.0	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.3	-0.3
Education	0.0	-0.1	-0.1	-0.2	-0.2	0.0	-0.1	-0.1	-0.1	-0.1
Social sciences	0.0	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.3	-0.3	-0.4
Law	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.4
Economics and administration	-0.1	-0.3	-0.4	-0.6	-0.8	-0.1	-0.2	-0.2	-0.3	-0.4
Other fields of science	0.0	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.3	-0.4
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields of health and social services	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1
Engineering	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.1	-0.2	-0.2
Other tertiary education	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
Tertiary education, higher degree	-0.1	-0.3	-0.3	-0.5	-0.6	-0.1	-0.1	-0.1	-0.2	-0.2
Humanities and arts	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.2	-0.2
Education	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
Social sciences	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.2	-0.2
Law	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3
Economics and administration	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4
Other fields of science	0.0	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.2	-0.2	-0.3
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.3
Other tertiary education	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Total	-2.4	-5.7	-5.4	-6.5	-8.0	-0.1	-0.2	-0.2	-0.2	-0.3

¹ Programme for Specialization in General Programmes and folk high schools

² Corrected 11 January 2012.

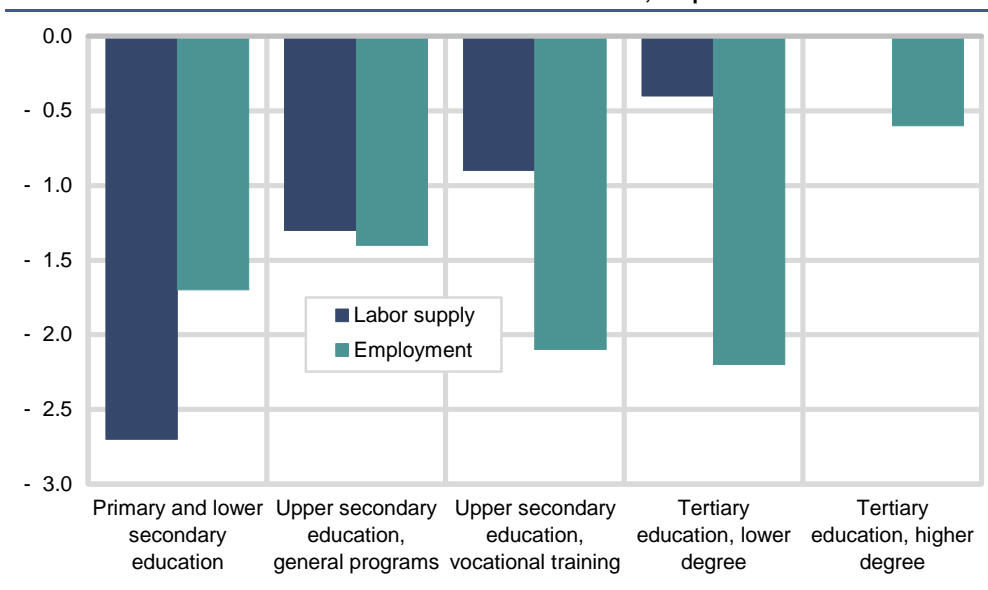
Table 5.3.5. Effects of higher income tax on the labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	-0.6	-0.9	-2.1	-4.4	-5.4
Primary and lower secondary education	-0.4	-0.5	-0.9	-2.2	-2.7
Upper secondary education, general and business studies	-0.1	-0.1	-0.6	-1.2	-1.3
Upper secondary education, vocational training	0.0	-0.2	-0.4	-0.7	-0.9
Tertiary education, lower degree	0.0	0.0	-0.2	-0.3	-0.4
Tertiary education, higher degree	0.0	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	1.9	4.9	3.3	2.1	2.6
Primary and lower secondary education	0.4	1.3	0.6	-0.6	-1.0
Upper secondary education, general and business studies	0.5	1.3	0.8	0.2	0.1
Upper secondary education, vocational training	0.5	0.9	0.6	0.8	1.2
Tertiary education, lower degree	0.4	1.0	1.0	1.3	1.8
Tertiary education, higher degree	0.1	0.3	0.3	0.5	0.6
Unemployment rate, percentage points	0.1	0.2	0.1	0.1	0.1
Primary and lower secondary education	0.1	0.3	0.2	-0.1	-0.2
Upper secondary education, general and business studies	0.1	0.3	0.2	0.1	0.0
Upper secondary education, vocational training	0.1	0.1	0.1	0.1	0.1
Tertiary education, lower degree	0.1	0.1	0.1	0.2	0.2
Tertiary education, higher degree	0.1	0.1	0.1	0.2	0.2

From Table 5.3.5 and Figure 5.3.1, we see that the effects of the income tax increase affect the educational groups quite differently. The three groups of skilled labor all face the same employment decrease relative to the size of the groups in

the original projections in 2030. As the reduction in the labor supply is stronger among vocationally trained, the resulting outcome on the unemployment levels are stronger among persons with higher education. Among the unskilled educational groups, the situation is quite different. The labor force response is stronger than the reduction in employment among persons with education below secondary level. Besides a stronger discouraged workers effect among these persons, this may also be a consequence of the fact that these groups are reaching their reservation wage as they are taxed harder. As a result, the unemployment rate is actually reduced among the least educated persons. For persons with general and business studies, the reduction in the labor force is not as strong, and there is no effect on the unemployment rate.

Figure 5.3.1. Effects of higher income tax on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons



5.4. Effects of a higher value added tax

Instead of financing the higher government expenditures through increased income tax, as assumed in previous section, it is possible to raise the public income through higher value added tax (VAT). Table 5.4.1 indicates the macroeconomic effects of raising the VAT by 10 percent (equivalent to 2.5 percentage points for the main VAT-rate) from 2012 and onwards. Again, this is a partial analysis since we do not consider an increase in public spending at the same time. However, by scaling this shift and holding it together with the shift in section 5.6, an impression can be formed on the total effects of the shift when the public expenses increase in line with the fiscal policy rule. Note that the effect on the government budget is similar to that of higher income taxes, cf. Table 5.0.1.

We see that the effect of the VAT rise on the activity level is complex. The VAT rise increases the cost of living for the household sector. They are partly compensated for this by increased wages, but household’s disposable real income is reduced in the whole calculation period. Consumption thus falls relative to the baseline scenario. The wages raises the unit cost of production, so the exposed sector experiences a loss in competitiveness. However, the increased price level leads to a depreciation of the krone exchange rate, an effect that is strong particularly after 2020. This works in the opposite direction and as a result, exports pick up gradually. The developments in the krone exchange rate also reduce the import shares.

Initially, the investment level increases when the VAT rises. This is primarily due to lower real interest rates, which increases the prices on dwellings and hence the housing investments. However, investments are lower than in the baseline scenario

from 2020 and onwards. This is primarily driven by a weak development in household real disposable income.

Table 5.4.1. Effects of higher value added tax. Deviation from the baseline scenario in percent if not stated otherwise³

	2012	2015	2020	2025	2030
Consumption in households etc.	0.0	-0.9	-2.5	-2.4	-2.1
Gross fixed investment	0.1	1.3	-0.9	-1.0	-0.9
Mainland private sector	0.3	2.1	-1.5	-1.5	-1.3
Manufacturing	0.2	-0.1	-0.4	-0.1	-0.1
Residential housing	0.4	5.8	-2.2	-2.5	-2.0
Exports	0.1	-0.1	0.3	0.6	0.5
Traditional goods	0.3	-0.1	0.8	1.1	0.9
Imports	0.0	-0.3	-1.8	-1.5	-1.2
Mainland GDP	0.2	0.0	-0.8	-0.7	-0.6
Private sector	0.2	-0.1	-0.9	-0.8	-0.8
Manufacturing	0.3	-0.1	0.1	0.4	0.2
Employment (in 1,000)	0.2	0.6	-5.6	-5.1	-6.1
Labor supply (in 1,000) ¹	0.0	1.8	-1.4	-2.9	-5.2
Unemployment rate (level) ¹	0.0	0.0	0.2	0.1	0.0
Wage per hour	0.8	1.1	1.3	2.0	2.6
Consumer price index	2.1	2.8	3.8	4.3	4.6
Export prices, traditional goods	1.1	0.8	3.0	3.7	3.9
Household's disposable real income	-1.3	-1.5	-2.6	-2.4	-2.1
Money market rate (level) ²	0.1	0.5	0.2	0.0	0.1
Import-weighted krone exchange rate (I44)	1.6	0.7	3.7	4.4	4.3
VAT	10.0	10.0	10.0	10.0	10.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

³ Corrected 11 January 2012.

The total effects of the rise in VAT on the real economy are modest. Employment is reduced by 6,100 persons in 2030, but the unemployment rate is relatively unchanged. The money market rate is also relatively unaltered, as the rise in the VAT does not affect the targeted core inflation, measured by the CPI-ATE.

Table 5.4.2. Effects of higher value added tax on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	0.2	0.6	-5.6	-5.1	-6.1
Manufacturing	0.6	0.3	0.8	0.9	0.0
Primary sector	-0.1	0.1	0.3	0.3	0.2
Construction industry	-0.1	0.2	0.2	-0.3	-0.4
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	-0.1	0.0	-7.2	-6.6	-6.4
Remaining sectors	0.0	-0.1	0.3	0.6	0.5

Table 5.4.3. Effects of higher value added tax on employment by sector. Deviation from the baseline scenario in percent

	2012	2015	2020	2025	2030
Total employment	0.0	0.0	-0.2	-0.2	-0.2
Manufacturing	0.2	0.1	0.3	0.4	0.0
Primary sector	-0.1	0.2	0.5	0.6	0.4
Construction industry	-0.1	0.1	0.1	-0.1	-0.2
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	0.0	0.0	-0.6	-0.5	-0.5
Remaining sectors	0.0	-0.1	0.3	0.7	0.7

Table 5.4.2 and Table 5.4.3 indicate the employment by sectors relative to the baseline in 1,000 persons and in percent, respectively. As consumption declines, the private service sector scales down production and employment. In 2030, employment in this sector is reduced by 6,400 persons, corresponding to 0.5 percent of the baseline employment. Investment in residential housing decreases from 2020 and onwards, and as a consequence, the construction industry downscale, but only moderately. The manufacturing industry benefits from a weaker krone currency rate and increase both production and employment towards 2030.

Table 5.4.4. Effects of higher value added tax on employment by education. Deviation from the baseline scenario in 1,000 persons²

	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	0.1	0.3	-1.5	-1.0	-1.1	0.0	0.1	-0.3	-0.2	-0.3
Upper secondary education, general and business studies	0.4	0.3	-1.4	-1.2	-1.0	0.1	0.1	-0.3	-0.3	-0.3
General programs ¹	0.2	0.2	-0.8	-0.7	-0.6	0.1	0.1	-0.3	-0.3	-0.2
Economics and administration	0.2	0.1	-0.6	-0.5	-0.5	0.1	0.1	-0.4	-0.3	-0.3
Upper secondary education, vocational programs	-0.1	-0.3	-1.1	-1.7	-2.0	0.0	0.0	-0.1	-0.2	-0.2
Electronics, mechanics work and machinery	0.1	-0.1	-0.3	-0.4	-0.5	0.0	0.0	-0.1	-0.2	-0.2
Building and construction	-0.1	0.0	-0.1	-0.3	-0.4	-0.1	0.0	-0.1	-0.3	-0.3
Other fields of science, technique and crafts	0.0	-0.1	-0.2	-0.3	-0.3	0.0	-0.1	-0.2	-0.3	-0.3
Nursing and caregiving	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1
Other fields	-0.1	-0.1	-0.4	-0.5	-0.7	-0.1	-0.1	-0.2	-0.3	-0.3
Tertiary education, lower degree	-0.3	0.3	-1.4	-1.2	-1.6	0.0	0.0	-0.2	-0.1	-0.2
Preliminary examination	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.4	-0.3	-0.4
Humanities and arts	0.0	0.0	-0.2	-0.2	-0.2	-0.1	0.0	-0.3	-0.3	-0.3
Education	0.0	0.0	-0.2	-0.2	-0.2	0.0	0.0	-0.1	-0.1	-0.1
Social sciences	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.3	-0.3	-0.3
Law	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.4	-0.3	-0.3
Economics and administration	-0.1	0.1	-0.4	-0.4	-0.6	-0.1	0.1	-0.3	-0.2	-0.3
Other fields of science	0.0	0.0	-0.1	-0.1	-0.2	-0.1	0.0	-0.3	-0.2	-0.3
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields of health and social services	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1
Engineering	-0.1	0.1	-0.1	-0.1	-0.1	-0.1	0.2	-0.2	-0.1	-0.1
Other tertiary education	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1
Tertiary education, higher degree	-0.1	0.2	-0.3	-0.3	-0.3	0.0	0.1	-0.1	-0.1	-0.1
Humanities and arts	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.2	-0.2	-0.2
Education	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Social sciences	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.2	-0.1	-0.1
Law	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1	0.0
Economics and administration	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	-0.1	-0.1	-0.2
Other fields of science	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.1	-0.2	-0.2	-0.2
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0
Other tertiary education	0.0	0.0	0.0	0.0	-0.1	0.1	0.2	-0.1	-0.1	-0.2
Total	0.1	0.8	-5.7	-5.3	-6.0	0.0	0.0	-0.2	-0.2	-0.2

¹ Programme for Specialization in General Programmes and folk high schools

² Corrected 11 January 2012.

Table 5.4.4 indicates the employment deviations by educational fields in the case of the VAT rise relatively to the baseline in 1,000 persons and percent. At the upper secondary level, the educational groups that are most negatively affected by the VAT increase in 2030 are persons with general education along with persons specializing in economics and administration, building and construction, other fields of science, technique and crafts and other fields in general. The effects in 2030 are on the other hand relatively small for persons with vocational education in electronics, mechanics work and machinery. At tertiary level, this applies for engineers and graduate engineers along with persons with specialization in health and education at all levels. This arises from the public sector and the manufacturing industries being relatively unaffected by the VAT increase.

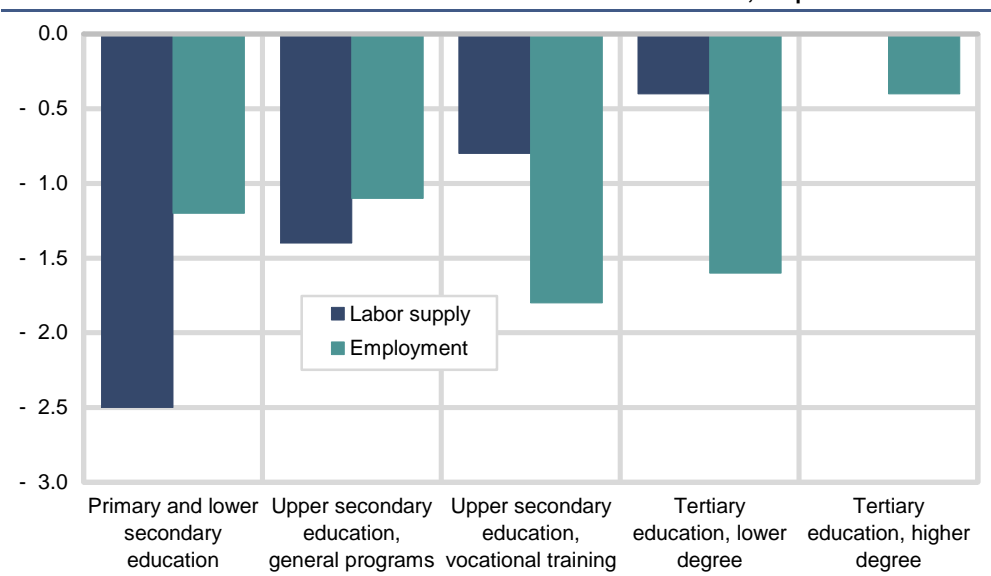
Table 5.4.5 summarizes the dynamic development in the labor supply, the unemployment level and the unemployment rate from 2012 to 2030, while Figure 5.4.1 indicates the employment and labor supply development in 2030. Relative to the sizes of the educational groups, the employment level is reduced in about the same proportion. Among persons with general or business studies, however, the decline is somewhat stronger. With the stronger labor supply response to increasing unemployment among the lower educational groups, this leads to declines in the unemployment level among persons with primary and lower secondary education and among persons with general and business studies. The remaining educational groups all face the same rise in the unemployment rates, which increase by 0.1 percentage point. This amounts to around 1,000 additional persons with vocational

training and with lower tertiary education seeking a job in 2030 relative to Bjørnstad et al. (2030).

Table 5.4.5. Effects of higher value added tax on the labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	0.0	1.8	-1.4	-2.9	-5.2
Primary and lower secondary education	0.0	0.9	-0.6	-1.3	-2.5
Upper secondary education, general and business studies	0.0	0.4	-0.4	-0.9	-1.4
Upper secondary education, vocational training	0.0	0.3	-0.3	-0.5	-0.8
Tertiary education, lower degree	0.0	0.1	-0.1	-0.3	-0.4
Tertiary education, higher degree	0.0	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	-0.2	1.2	4.3	2.1	1.0
Primary and lower secondary education	-0.1	0.8	1.0	-0.1	-1.3
Upper secondary education, general and business studies	-0.1	0.4	1.1	0.3	-0.3
Upper secondary education, vocational training	-0.1	0.2	0.9	0.8	1.0
Tertiary education, lower degree	0.0	-0.1	1.0	0.9	1.1
Tertiary education, higher degree	0.0	-0.1	0.2	0.2	0.4
Unemployment rate, percentage points	0.0	0.0	0.2	0.1	0.0
Primary and lower secondary education	0.0	0.2	0.3	0.0	-0.3
Upper secondary education, general and business studies	0.0	0.1	0.3	0.1	-0.1
Upper secondary education, vocational training	0.0	0.0	0.1	0.1	0.1
Tertiary education, lower degree	0.0	0.0	0.1	0.1	0.1
Tertiary education, higher degree	0.0	0.0	0.1	0.1	0.1

Figure 5.4.1. Effects of higher value added tax on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons



5.5. Effects of deterioration in the terms of trade

One of the main reasons for the extraordinary growth Norway has experienced during the last decade is a large gain from the terms of trade – the price level of our exports has increased much relative to the price level of our imports. The prices of our traditional exports, such as metals, fish and other raw materials, have largely been driven by a strong demand growth both among our traditional trading partners and from emerging economies. Looking ahead, there is great uncertainty associated with the international demand and consequently the price development, not least for the raw materials that Norway export.

The prices on metals and wood processing are important for the value of Norwegian export. In this calculation, we have reduced these price levels by 10 percent compared to the baseline scenario from 2012 and onwards. The krone exchange rate against euro is held fixed, so that we disregard the exchange rate effects in this calculation.

The price reduction brings the Norwegian export prices on traditional goods down. Norwegian manufacturers lower the prices on their products, but not as much as the world market price reduction. Hence output is reduced in the exposed sector and employment levels are cut back, which brings the unemployment level up. As the manufacturing is a leader in the wage settlements, the wage level is brought down, and household consumption is lower than the baseline scenario. To increase activity, Norges Bank cuts the interest rate quite early in the calculation period, and in 2015, the money market rate is 0.7 percentage points lower than in Bjørnstad et al. (2010), see Table 5.5.1. This increases housing investments, but is not enough to boost consumption, which is suppressed by the weak wage growth.

Table 5.5.1. Effects of a deterioration in the terms of trade. Deviation from the baseline scenario in percent if not stated otherwise³

	2012	2015	2020	2025	2030
Consumption in households etc.	0.0	-0.4	-1.0	-1.6	-2.1
Gross fixed investment	0.0	0.0	0.1	-0.9	-1.4
Mainland private sector	-0.1	0.0	0.2	-1.3	-2.0
Manufacturing	0.0	0.0	0.1	0.0	-0.4
Residential housing	0.0	0.2	0.9	-2.3	-3.4
Exports	-0.4	-0.4	0.0	0.2	0.4
Traditional goods	-1.1	-0.9	-0.2	0.2	0.4
Imports	-0.3	-0.7	-1.1	-1.7	-2.0
Mainland GDP	-0.1	-0.2	-0.1	-0.3	-0.5
Private sector	-0.2	-0.2	-0.1	-0.4	-0.7
Manufacturing	-0.6	-0.2	0.8	1.1	1.1
Employment (in 1,000)	-1.9	-0.4	6.4	6.9	7.0
Labor supply (in 1,000) ¹	-0.4	-1.3	2.8	2.2	1.7
Unemployment rate (level) ¹	0.1	0.0	-0.1	-0.2	-0.2
Wage per hour	0.0	-1.4	-2.6	-3.3	-3.5
Consumer price index	0.0	-0.7	-1.1	-1.6	-1.6
Export prices, traditional goods	-1.3	-2.3	-2.5	-2.6	-2.5
Household's disposable real income	-0.1	-0.5	-1.4	-1.7	-1.9
Money market rate (level) ²	0.0	-0.7	0.2	0.1	0.1
World market price, wood processing	-10.0	-10.0	-10.0	-10.0	-10.0
World market price, metals	-10.0	-10.0	-10.0	-10.0	-10.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

³ Corrected 11 January 2012.

The fall in export prices starts in 2012, and from 2017, the effects are relatively stable at 2.5 percent below the level in the baseline scenario. The importance of the price development of the export goods is greater in Norway than abroad, and accordingly, the wages are brought further down than among our trading partners. The wage level is continually reduced, and in 2020, the reduction in wages is greater than the export price reduction relative to the baseline scenario. By then, the exposed sector has achieved a competitive recovery in the international markets. The manufacturing production is thus higher than originally from 2020, and with higher production there is need for more inputs, both labor and real capital. As hiring labor is relatively cheap, the production increase is transmitted into higher employment numbers in manufacturing. The employment increase in manufacturing is greater than the employment reduction from the rest of the private sector, and consequently, the unemployment rate is lower than in the baseline scenario in the last half of the calculation period.

Responding to lower unemployment, Norges Bank reverses the interest rate cut, and in 2020, the money market rate is higher than in the baseline. Further, consumption prices are appreciably lower in this calculation, mainly as a result of the wage developments. The real interest rate thus increases markedly from 2015 to 2020, limiting investments, especially in housing. Moreover, reduced house prices bring households' housing wealth down compared to the baseline, which contributes to lower consumption. Despite that the unemployment rate is somewhat reduced in this scenario, the wage level is still appreciably lower in 2030 compared to the baseline, also in real terms. As a consequence, both consumption and investments are reduced. Reduced import shares and higher exports contributes to

dampening the negative effects on demand. The activity level, measured by mainland GDP, is one half percentage point lower than in the baseline in 2030.

Table 5.5.2. Effects of a deterioration in the terms of trade on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	-1.9	-0.4	6.4	6.9	7.0
Manufacturing	-0.3	1.1	4.4	5.7	6.4
Primary sector	0.0	0.1	0.6	0.9	1.1
Construction industry	0.0	0.0	0.3	0.2	-0.1
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	-1.6	-1.8	0.5	-0.8	-1.4
Remaining sectors	0.0	0.1	0.5	0.8	1.0

Table 5.5.3. Effects of a deterioration in the terms of trade on employment by sector. Deviation from the baseline scenario in percent

	2012	2015	2020	2025	2030
Total employment	-0.1	0.0	0.2	0.2	0.2
Manufacturing	-0.1	0.4	1.8	2.3	2.5
Primary sector	0.0	0.1	1.0	1.5	1.9
Construction industry	0.0	0.0	0.2	0.1	-0.1
Public sector	0.0	0.0	0.0	0.0	0.0
Private services	-0.1	-0.1	0.0	-0.1	-0.1
Remaining sectors	0.0	0.1	0.6	1.0	1.3

Despite that the production level in manufacturing is lower than in the baseline in 2015, employment is at a higher level. This is primarily due to the lower wage level, which makes labor relatively cheaper than other inputs of production. As production increases, employment continue to grow, and in 2030 manufacturing employment increases by more than 6,000 persons. This amounts to an employment growth of 2.5 percent relative to the original manufacturing employment in 2030.

Employment increases relatively markedly also in the *agriculture and forestry* industry. This is the largest industry in the primary sector and is particularly labor intensive; wage costs accounts for nearly 50 percent of the total production costs. When the wages fall as much as they do in this scenario, this allows for considerable employment growth in the primary sector.

The *wholesale and retail trade* industry is the only industry with a higher share of wage costs than the *agriculture and forestry* industry, and the wage reduction is beneficial for the private services industry, too. However, the domestic demand deficiencies constrain growth and employment is somewhat lower in this scenario.

Examining how the employment by education is affected by the economic developments in this scenario, Table 5.5.4 indicates that demand rises particularly for persons with the lowest level of education. In 2030, employment of persons with education below upper secondary level is 0.6 percent higher than the baseline scenario. This accounts for 2,400 additional employees with this educational level. In addition to increased demand from the manufacturing industry, the upturn in demand for persons with education below upper secondary level comes from the primary sector. In 2006, nearly 40 percent of the employment in this sector had education below upper secondary level. This is a higher share than both manufacturing and the private services industries, with sharer of about 30 percent of the staff with the lowest level of education. In addition, the primary sector demands persons with vocational education, particularly within other fields. Moreover, the increase in employment of persons with other tertiary education at both levels of tertiary education is primarily attributable to the employment growth in the primary sector. Besides that, the employment by education is high for persons with the competence that is required in manufacturing. This amplifies the demand for persons with vocational education.

Table 5.5.4. Effects of a deterioration in the terms of trade on employment by education. Deviation from the baseline scenario²

	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	-0.6	0.0	2.1	2.2	2.4	-0.1	0.0	0.5	0.5	0.6
Upper secondary education, general and business studies	-0.4	-0.2	1.0	0.8	0.8	-0.1	0.0	0.2	0.2	0.2
General programs ¹	-0.3	-0.1	0.5	0.5	0.5	-0.1	0.0	0.2	0.2	0.2
Economics and administration	-0.2	-0.1	0.4	0.4	0.3	-0.1	0.0	0.3	0.2	0.2
Upper secondary education, vocational programs	-0.4	0.0	2.1	2.4	2.3	-0.1	0.0	0.3	0.3	0.3
Electronics, mechanics work and machinery	-0.2	0.1	1.0	1.2	1.2	-0.1	0.0	0.4	0.5	0.5
Building and construction	0.0	0.0	0.3	0.3	0.2	0.0	0.0	0.3	0.3	0.2
Other fields of science, technique and crafts	-0.1	0.0	0.4	0.4	0.4	-0.1	0.0	0.3	0.3	0.3
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields	-0.1	0.0	0.4	0.5	0.5	-0.1	0.0	0.2	0.2	0.2
Tertiary education, lower degree	-0.3	-0.2	0.9	1.0	1.2	0.0	0.0	0.1	0.1	0.1
Preliminary examination	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1	0.2	0.3	0.3
Humanities and arts	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	0.1	0.1	0.1
Education	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Social sciences	0.0	0.0	0.1	0.1	0.1	-0.1	-0.1	0.2	0.2	0.1
Law	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.0	0.0
Economics and administration	-0.1	-0.1	0.3	0.3	0.4	-0.1	-0.1	0.2	0.2	0.2
Other fields of science	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.2	0.2	0.2
Nursing and caregiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other fields of health and social services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Engineering	-0.1	0.0	0.2	0.3	0.4	-0.1	0.0	0.3	0.4	0.5
Other tertiary education	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.2	0.3
Tertiary education, higher degree	-0.1	0.0	0.3	0.3	0.4	0.0	0.0	0.1	0.1	0.1
Humanities and arts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Education	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Social sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Law	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Economics and administration	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2
Other fields of science	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.2	0.2	0.2
Medicine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dental studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Graduate engineering	0.0	0.0	0.1	0.1	0.1	-0.1	0.0	0.3	0.4	0.3
Other tertiary education	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.2	0.3
Total	-1.9	-0.4	6.4	6.9	7.0	-0.1	0.0	0.2	0.2	0.2

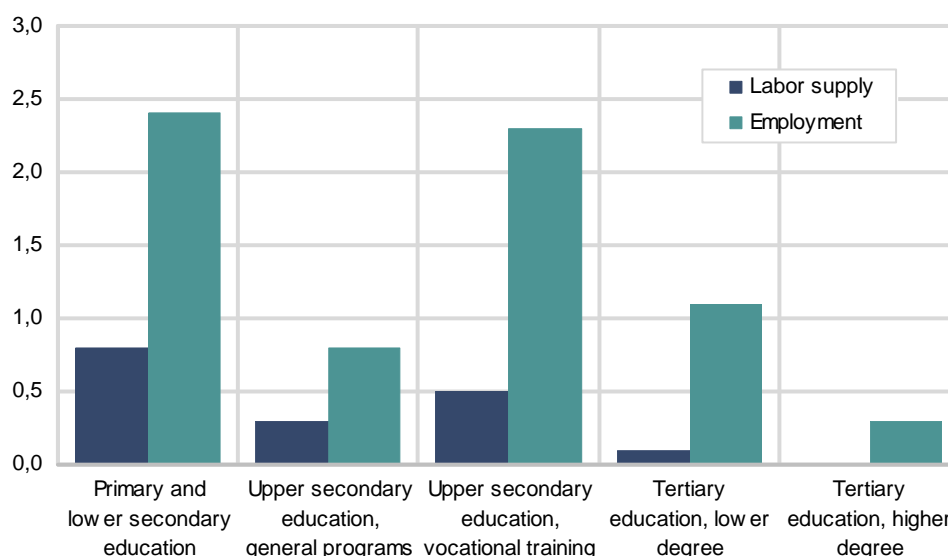
¹ Programme for Specialization in General Programmes and folk high schools

² Corrected 11 January 2012

Table 5.5.5. Effects of a deterioration in the terms of trade on the labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	-0.4	-1.3	2.8	2.2	1.7
Primary and lower secondary education	-0.3	-0.8	1.2	1.1	0.8
Upper secondary education, general and business studies	-0.1	-0.2	0.8	0.5	0.3
Upper secondary education, vocational training	0.0	-0.3	0.5	0.5	0.5
Tertiary education, lower degree	0.0	0.0	0.3	0.2	0.1
Tertiary education, higher degree	0.0	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	1.5	-0.8	-3.6	-4.6	-5.3
Primary and lower secondary education	0.3	-0.8	-0.9	-1.2	-1.6
Upper secondary education, general and business studies	0.4	-0.1	-0.2	-0.3	-0.5
Upper secondary education, vocational training	0.4	-0.3	-1.6	-1.9	-1.9
Tertiary education, lower degree	0.3	0.3	-0.7	-0.9	-1.0
Tertiary education, higher degree	0.1	0.1	-0.3	-0.3	-0.3
Unemployment rate, percentage points	0.1	0.0	-0.1	-0.2	-0.2
Primary and lower secondary education	0.1	-0.2	-0.2	-0.3	-0.4
Upper secondary education, general and business studies	0.1	0.0	-0.1	-0.1	-0.2
Upper secondary education, vocational training	0.1	0.0	-0.2	-0.2	-0.2
Tertiary education, lower degree	0.0	0.0	-0.1	-0.1	-0.1
Tertiary education, higher degree	0.0	0.0	-0.1	-0.1	-0.1

Figure 5.5.1. Effects of a deterioration in the terms of trade on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons



The group of persons with education below upper secondary level experiences the highest employment boost compared to the baseline. In 2030, employment is almost 0.5 percent higher than the employment level in the baseline scenario, which is almost twice as much as the employment growth for the group with vocational education. The labor supply responses are, as Figure 5.5.1 reveals, relatively moderate and less dispersed across educational level. The increased employment brings the supply of labor in each educational group up, but the strong wage decrease has the opposite effect on the labor supply. This effect is quite strong among all educational groups. Nevertheless, the responses reduce the effect on the unemployment rate by educational groups. The unemployment among vocationally trained is reduced by 1,900 persons in 2030, which corresponds to a decline of 7.4 percent relative to Bjørnstad et al. (2010). The fall in unemployment among persons with tertiary education is also high; 300 fewer unemployed with this competence corresponds to a 6.6 percent fall among the highest educated persons. The strongest effect on the unemployment rate, where the unemployment level is regarded relative to the total supply of labor in each educational group, is among persons with education below upper secondary level.

5.6. Effects of increased public employment

In the baseline, public employment is assumed to grow by around 300,000 persons from 2009 to 2030. This implies that public sector's share of total employment rises from about 30 percent in 2009 to about 37 percent in 2030. The population of elderly persons grows substantially over the same period, and most of the increase in public employment is needed in order to sustain today's standard of public services. Table 5.6.1 indicates how the employment is divided into different sectors of the economy and further into the three public subsectors; the health and social sector, the education sector and other sectors.⁸

From 2009 to 2030, the employment increase in the health and social sector is assumed to grow by 117,000 persons, while the education sector grows by only 26,000. The public employment in other sectors is at the same time predicted to grow by almost 160,000 persons. The employment figures imply that service standards, measured by the number of working hours per user of each service,

⁸ To distribute employment into the subsectors, information from Statistics Norway's projection model MAKKO was employed in the baseline. For further information, see Bjørnstad et al. (2010). For a closer review of MAKKO, see Nielsen (2008).

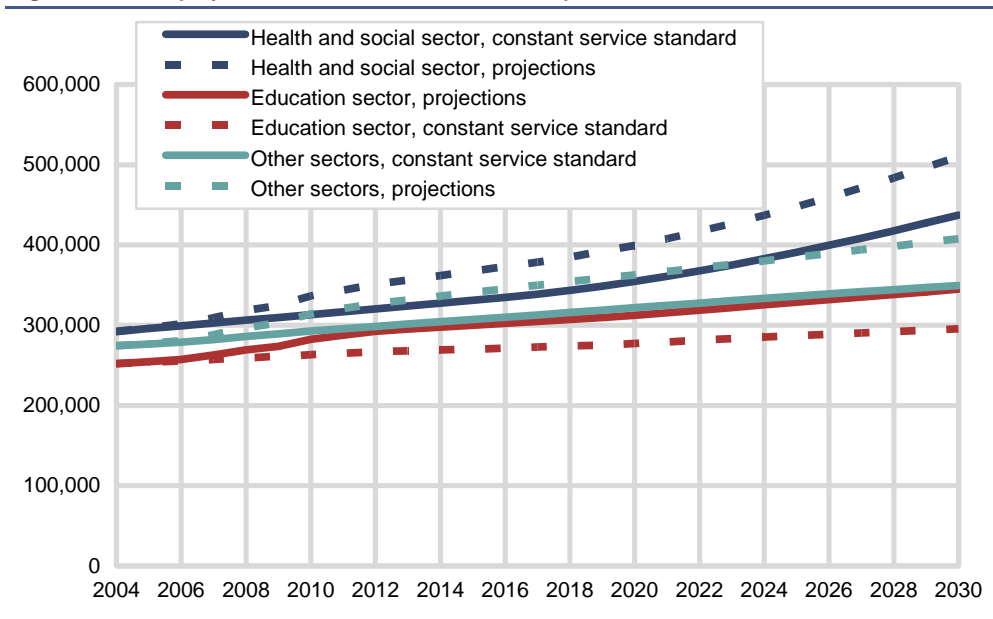
grow modestly in each of the three public subsectors. Figure 5.6.1 indicates how the employment in the public subsectors, measured in man-hours, evolve relative to MAKKO-projections with constant service standards in the subsectors from 2004.

Table 5.6.1. Employment in Bjørnstad et al. (2010) in 1,000 persons

	2006	2009	2012	2025	2030
Employment, total	2,437	2,596	2,658	2,837	2,945
Manufacturing	281	281	262	249	253
Private services	1,095	1,185	1,221	1,265	1,285
Construction	169	179	178	189	198
Public sector ¹	695	748	805	965	1,050
Health and social sector	194	212	225	291	329
Education sector	113	123	127	143	149
Other sectors	388	413	452	531	572

¹ Excluding defence

Figure 5.6.1. Employment in 1,000 man-hours in three public sectors



The balance between the level of taxation and the service level provided by public sector is not obvious. In isolation, structural changes from the baseline will also make other levels of public employment and public service possible. To shed light on the effects of changing assumptions concerning the level of public employment, we have raised the public sector employment by 1 percent from 2012 in the following calculation. This additional manpower is maintained throughout the period relative to the baseline.

Table 5.6.2 shows the macroeconomic effect of increasing the public employment level by 1 percent from 2012. Higher employment increases value added in the public sector directly, and this is part of mainland GDP, which is raised by 0.2 percent in the first year. The labor market is also directly affected – the employment level is raised by 8,000 persons the first year. This puts pressure on the wage level, which increases by 0.1 percent immediately and hence boosts household income and demand.

The effects on wages grow over time. This increases household demand in the first part of the calculation period. Unemployment is reduced far less than employment is increased resulting from more ample supply of labor. The labor supply increases as a result of both a tighter labor market and increased real wages. The consumer prices rises gradually, while unemployment falls. To neutralise the expansionary effects, the interest rate is raised by about 0.3 percentage points. This has several effects on the economy. The krone exchange rate is strengthened, thereby leading to weaker exports and higher import shares. This contributes to reducing the GDP

effect after some time. Moreover, manufacturing production is lower than in the baseline, both through increasing wage costs and through the strengthened krone exchange rate. The increased interest rate in isolation contributes to a higher household saving ratio. Besides, a higher real interest rate throughout the calculation period causes housing prices to fall relative to the baseline, which reduces the household's wealth and dampens the consumption further. Despite of increased income, the overall effect on household consumption is therefore quite modest over time. The investment decisions are negatively affected by increased interest rate, and are substantially lower particularly in manufacturing and residential housing than in the baseline. All in all, the negative effects on mainland GDP dominate in the long run when the public employment level is raised.

Table 5.6.2. Effects of increased public employment. Deviation from the baseline scenario in percent if not stated otherwise

	2012	2015	2020	2025	2030
Consumption in households etc.	0.1	0.2	-0.1	0.0	0.1
Gross fixed investment	0.0	-0.2	-0.6	-0.6	-0.6
Mainland private sector	0.0	-0.4	-0.9	-0.9	-0.9
Manufacturing	0.0	-0.4	-0.6	-0.6	-0.7
Residential housing	0.0	-0.6	-1.5	-1.3	-1.1
Exports	0.0	-0.2	-0.2	-0.2	-0.3
Traditional goods	-0.1	-0.5	-0.4	-0.3	-0.4
Imports	0.1	0.1	-0.1	0.0	0.1
Mainland GDP	0.2	0.0	-0.1	-0.1	-0.1
Private sector	0.0	-0.2	-0.4	-0.3	-0.4
Manufacturing	-0.1	-0.5	-0.6	-0.6	-0.8
Employment (in 1,000)	8.0	6.3	5.1	6.1	6.3
Labor supply (in 1,000) ¹	1.5	2.1	2.1	3.0	2.9
Unemployment rate (level) ¹	-0.2	-0.2	-0.1	-0.1	-0.1
Wage per hour	0.1	0.3	0.3	0.6	0.9
Consumer price index	0.0	0.0	0.2	0.4	0.7
Export prices, traditional goods	-0.2	-0.7	-0.2	0.1	0.3
Household's disposable real income	0.2	0.3	0.1	0.2	0.2
Money market rate (level) ²	0.1	0.3	0.3	0.3	0.3
Import-weighted krone exchange rate (I44)	-0.4	-1.1	-0.4	-0.1	0.0
Public sector employment	1.0	1.0	1.0	1.0	1.0

¹ According to the Statistic Norway's labor force survey (LFS)

² 3 month NIBOR

The reason why employment is raised in the long run despite of a fall in activity is due to several factors. The value of public production is measured by production costs, i.e. the sum of wage costs in addition to other factor input costs and the cost of capital depreciation. Because there is no profit from production in public sector, transferring employment from private to public sector will normally bring GDP down. Moreover, lower average working time for public employed persons result in higher employment numbers for a given level of production in public sector relative to private sector.

Table 5.6.3. Effects of increased public employment on employment by sector. Deviation from the baseline scenario in 1,000 persons

	2012	2015	2020	2025	2030
Total employment	8.0	6.3	5.1	6.1	6.3
Manufacturing	-0.2	-1.0	-1.3	-1.4	-1.8
Primary sector	0.0	0.0	0.1	0.1	0.0
Construction industry	-0.1	-0.2	-0.3	-0.5	-0.6
Public sector	8.1	8.4	8.9	9.5	10.3
Private services	0.1	-0.7	-2.0	-1.5	-1.5
Remaining sectors	0.0	-0.2	-0.2	-0.2	-0.2

Table 5.6.3 and Table 5.6.4 indicate the overall effects on the different sectors resulting from higher public employment. The employment increase in public sector constitutes 10,300 persons in 2030. Some of these persons are provided from other sectors. Both the manufacturing employment and the employment in the construction industry are cut back. Moreover, the export of services suffers from a strong currency, while the part of the private services sector that delivers to the

manufacturing and the construction industry experience lower demand. Consequently, the production level in the private services industry is also reduced and employment is brought down in this sector too.

Table 5.6.4. Effects of increased public employment on employment by sector. Deviation from the baseline scenario in percent

	2012	2015	2020	2025	2030
Total employment	0.3	0.2	0.2	0.2	0.2
Manufacturing	-0.1	-0.4	-0.5	-0.5	-0.7
Primary sector	0.0	0.0	0.1	0.1	0.1
Construction industry	0.0	-0.1	-0.2	-0.2	-0.3
Public sector	1.0	1.0	1.0	1.0	1.0
Private services	0.0	-0.1	-0.2	-0.1	-0.1
Remaining sectors	0.0	-0.2	-0.2	-0.2	-0.2

If we examine the employment effects by educational level and field according to Table 5.6.4, we see that the employment increases in most fields, even those highly represented in business activities. The reason is that the additional demand for personnel from public sector is so large that it dominates the employment reductions implied by the downscale from the enterprises. The typical skill trained workforce employed in manufacturing and building and construction provides the exception. These persons are mostly employed outside public sector, while the cutbacks implied by the downscale in manufacturing and building and construction dominate the development.

Table 5.6.5. Effects of increased public employment on employment by education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030	2012	2015	2020	2025	2030
	In 1,000					Percent				
Primary and lower secondary education	1.6	1.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.3
Upper secondary education, general and business studies	1.4	1.2	0.9	1.2	1.3	0.3	0.3	0.2	0.3	0.3
General programs ¹	0.9	0.7	0.6	0.7	0.8	0.3	0.3	0.2	0.3	0.3
Economics and administration	0.6	0.5	0.4	0.5	0.6	0.3	0.3	0.2	0.3	0.4
Upper secondary education, vocational programs	1.2	0.6	0.3	0.5	0.3	0.2	0.1	0.0	0.1	0.0
Electronics, mechanics work and machinery	0.0	-0.3	-0.5	-0.5	-0.6	0.0	-0.2	-0.2	-0.2	-0.3
Building and construction	0.0	-0.1	-0.2	-0.2	-0.3	0.0	-0.1	-0.1	-0.2	-0.2
Other fields of science, technique and crafts	0.1	0.0	-0.1	-0.1	-0.1	0.1	0.0	-0.1	-0.1	-0.1
Nursing and caregiving	0.9	0.9	1.0	1.1	1.3	0.9	0.8	0.8	0.9	0.9
Other fields	0.3	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
Tertiary education, lower degree	3.0	2.8	2.6	2.9	3.0	0.4	0.4	0.3	0.3	0.3
Preliminary examination	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
Humanities and arts	0.2	0.1	0.1	0.1	0.1	0.3	0.2	0.2	0.2	0.1
Education	1.2	1.2	1.2	1.3	1.3	0.7	0.7	0.7	0.7	0.7
Social sciences	0.1	0.1	0.0	0.0	0.0	0.3	0.2	0.1	0.1	0.1
Law	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0
Economics and administration	0.1	0.0	-0.1	0.0	-0.1	0.1	0.0	0.0	0.0	0.0
Other fields of science	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	-0.1
Nursing and caregiving	0.8	0.8	0.9	1.0	1.2	0.9	0.9	0.9	0.9	0.9
Other fields of health and social services	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Engineering	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.2
Other tertiary education	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Tertiary education, higher degree	0.7	0.6	0.6	0.6	0.7	0.3	0.3	0.2	0.2	0.2
Humanities and arts	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.4	0.4	0.4
Education	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5
Social sciences	0.1	0.1	0.1	0.1	0.1	0.6	0.5	0.5	0.5	0.5
Law	0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.3	0.3	0.3
Economics and administration	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Other fields of science	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1
Medicine	0.1	0.1	0.2	0.2	0.2	0.9	0.9	0.9	0.9	0.9
Dental studies	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.4
Graduate engineering	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.2
Other tertiary education	0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.3	0.3	0.3
Total	7.9	6.4	5.1	6.3	6.6	0.3	0.2	0.2	0.2	0.2

¹ Programme for Specialization in General Programmes and folk high schools

The skilled personell that public sector demands in large scale experience the largest increase in employment. This concerns persons with specialization in health and education programs at every level of education. Educational groups with a high degree of presence in the private services sector maintain the employment level relative to Bjørnstad et al. (2010). This concerns those specialized in economics and administration and in other fields of science at tertiary level, among others.

The development implies total employment growth for all levels of education except the group with upper secondary education in vocational programs. On the other hand, the employment increase is quite strong for persons with education below secondary level and for persons with general or business studies at upper secondary level. These groups are often vulnerable when employment fluctuates. On balance, total employment is 0.2 percent higher in the longer run when the public employment level increases by 1 percent in 2012 and onwards.

Table 5.6.6. Effects of increased public employment on the labor market by level of education. Deviation from the baseline scenario

	2012	2015	2020	2025	2030
Labor supply, total, 1,000 persons	1.5	2.1	2.1	3.0	2.9
Primary and lower secondary education	1.0	1.0	1.1	1.6	1.5
Upper secondary education, general and business studies	0.3	0.5	0.6	0.8	0.7
Upper secondary education, vocational training	0.1	0.4	0.3	0.4	0.4
Tertiary education, lower degree	0.1	0.1	0.2	0.2	0.2
Tertiary education, higher degree	0.0	0.0	0.0	0.0	0.0
Unemployment, total, 1,000 persons	-6.5	-4.2	-3.0	-3.1	-3.4
Primary and lower secondary education	-0.6	-0.1	0.3	0.5	0.4
Upper secondary education, general and business studies	-1.2	-0.6	-0.3	-0.4	-0.6
Upper secondary education, vocational training	-1.1	-0.3	0.0	0.0	0.1
Tertiary education, lower degree	-2.9	-2.6	-2.4	-2.6	-2.7
Tertiary education, higher degree	-0.7	-0.6	-0.6	-0.6	-0.6
Unemployment rate, percentage points	-0.2	-0.2	-0.1	-0.1	-0.1
Primary and lower secondary education	-0.1	0.0	0.1	0.1	0.1
Upper secondary education, general and business studies	-0.3	-0.2	-0.1	-0.1	-0.2
Upper secondary education, vocational training	-0.2	0.0	0.0	0.0	0.0
Tertiary education, lower degree	-0.4	-0.4	-0.3	-0.3	-0.3
Tertiary education, higher degree	-0.3	-0.3	-0.2	-0.2	-0.2

Figure 5.6.2. Effects of increased public employment on labor supply and employment by level of education in 2030. Deviation from the baseline scenario in 1,000 persons

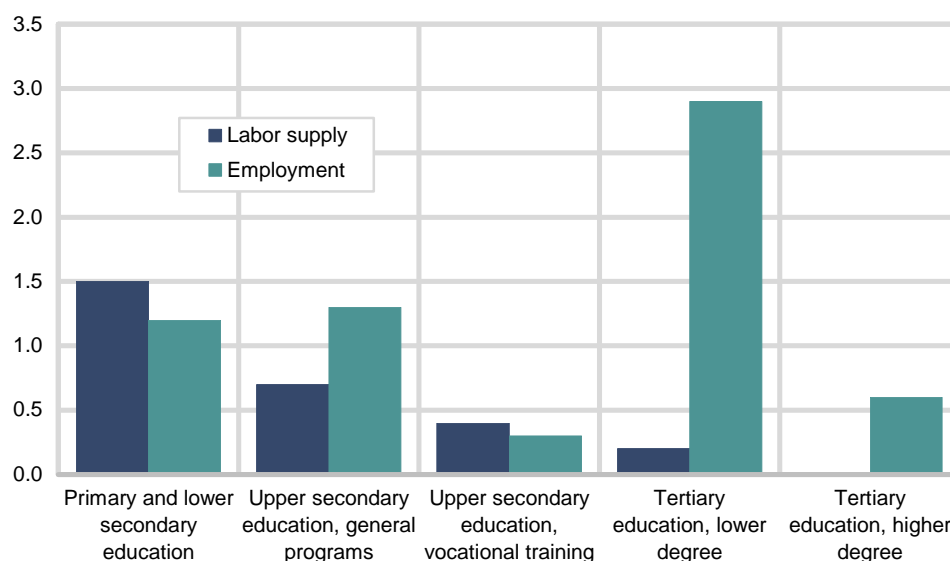


Table 5.6.5 indicates how the labor market is developing for the different groups of education throughout the calculation period, while Figure 5.6.2 provides an illustration of the labor market situation in 2030. Improved job market conditions together with a significant wage increase among persons with education below upper secondary level causes a strong supply response, resulting in a rise in the unemployment rate for this group. For persons with general and business studies at upper secondary level, the employment rise is somewhat higher while the additional labor supply is half as strong. As a consequence, the unemployment rate is reduced by 0.2 percent compared to the employment level in the baseline scenario. For persons with vocational training at upper secondary level, the modest employment rise causes some additional labor supply, which roughly cancels out the effect on the unemployment rate. Compared with the changes for the group with the lowest level of education, the situation is quite the opposite at tertiary level. Here, the labor supply response is nearly non-existent, while the employment level rises sharply, particularly among persons with a lower degree of education. Accordingly, the unemployment rate falls markedly for these educational groups.

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