

ENGLISH SUMMARY

Chapter I: The Danish Economy

During this year, unemployment has fallen and GDP growth has been fairly high in Denmark. GDP growth is projected to be 2½ per cent in 2004 and also above 2 per cent next year. Consequently, unemployment will decrease further during next year and will amount to about 160,000 persons at the end of 2005. GDP growth in 2006-07 is projected to be around 1¾ per cent for both years. Thus, the unemployment rate will probably level out at approximately 5¼ per cent of the labour force.

GDP growth this year has primarily been driven by an unexpectedly high rate of growth in exports. An increase in domestic demand has also contributed to strong GDP growth. The increase in Danish exports is a result of a high rate of growth in the international economy, particular outside Europe, during the first half of 2004. This positive development has also been supported by a low interest rate.

The international economy has been relatively unaffected by the high oil prices. Even so, high oil prices have contributed to the uncertainty concerning the international recovery. The international recovery is also threatened by the deficit imbalance in the US economy for both the public budget and the current account. In the coming years it is projected that the international economy will grow at slower pace than in 2004, though without a true recession developing.

The increase in domestic demand has mainly been driven by private consumption, which has been positively affected by the reduction in income tax and the suspension of the mandatory private savings scheme (*Særlige pensionsordning, SP*). Consequently, private consumption is expected to grow by 3½ per cent this year and 3 per cent in 2005. Greater disposal income and a lower interest rate also contributed to a significant increase in real estate prices during 2004. As a

Table 1 Short-term outlook for the Danish economy

	Current	Per cent	Percentage change, volume				
	prices	of GDP					
	DKK bn.						
	2003	2003	2003	2004	2005	2006	2007
Private consumption	659,3	47,1	0,8	3,4	2,8	2,1	2,1
Public consumption	371,8	26,6	1,0	0,7	0,7	0,7	0,7
Gross fixed capital formation	279,9	20,0	0,0	3,8	3,8	2,4	1,8
consisting of:							
Residential investments	65,3	4,7	5,2	8,3	3,0	2,0	0,0
Business fixed investments	191,3	13,7	-1,2	2,6	4,1	2,5	2,2
Public investments	23,3	1,7	-1,4	3,3	3,3	2,0	2,0
Stockbuilding (a)	-4,0	-0,3	-0,4	0,2	0,2	0,0	0,0
Total domestic demand	1.307,0	93,5	0,3	3,0	2,8	1,8	1,7
Exports of goods and services	605,0	43,3	0,0	5,4	3,6	3,6	3,6
Imports of goods and services	513,6	36,7	-0,6	6,9	4,7	3,9	3,7
GDP	1.398,3	100,0	0,5	2,5	2,3	1,7	1,7
Key indicators							
Consumer prices, percentage change (b)			1,8	1,1	2,1	1,7	1,7
Unemployment, per cent (c)			5,9	6,0	5,6	5,3	5,3
Current account, DKK bn.			40,0	44,5	48,0	53,9	59,0
Current account, per cent of GDP			2,9	3,0	3,1	3,4	3,6
General government financial balance, DKK bn.			16,9	17,1	20,9	21,1	24,8
General government fin. balance, per cent of GDP			1,2	1,2	1,4	1,3	1,5
Hourly wage costs, percentage change			4,2	3,6	3,6	3,6	3,5
Terms of trade, percentage change			2,2	0,5	0,2	0,1	0,1

a) The percentage changes are calculated as real changes in stock-building relative to real GDP in the previous year.

b) Implicit private consumption deflator.

c) Percentage of the total labour force. National definition.

d) The DKK/USD exchange rate is taken as 6.58 in 2003, 6.01 in 2004 and 5.80 in 2005-07.

Sources: Statistics Denmark, *National Accounts* and own estimates.

result, investment in real estate grew considerably, thereby driving domestic demand up further. The high growth in domestic demand has led to a remarkable increase in Danish imports, and even though Danish exports are expected to grow steadily during the coming years, the net balance of trade is expected to reduce total GDP growth up until 2006.

Unemployment has fallen by around 10,000 persons since the beginning of 2004. Unemployment is expected to decrease further during next year and to level out at approximately 155,000 persons in 2006-07.

Despite rising oil prices, inflation has been very low in 2004 in Denmark. This has been driven by a combination of a strengthening Danish Krone, moderate wage increases, relatively high growth in productivity, and the effect of lower indirect taxes due to the tax freeze and the “Grænsehandels-pakke” (border shopping package). Inflation is expected to be around 2 per cent next year in Denmark, mainly due to an anticipated high oil price. Wages in Denmark are expected to increase by approximately 3½ per cent per year up until 2007. Domestic wages are thus still expected to grow faster than foreign wages, even though the increase in wages will be slower than in recent years.

Both the public budget and the current account surpluses are expected to grow in the coming years. The public surplus will be approximately 1½ per cent of GDP in 2007, and the current account surplus will grow from DKK 40 billion to DKK 60 billion over the period 2004-07.

Policy Recommendations

As the outlook for the Danish economy is relatively good, no further fiscal easing is needed to stimulate economic growth.

If the outlook for the Danish economy should unexpectedly worsen dramatically, then a dilemma would arise in the choice between long- and short-term fiscal policy, since the current fiscal policy is unsustainable in the long-term (see

Danish Economy, Spring 2004). Ensuring sustainability without fiscal tightening would require labour market reforms that increased employment by 140,000 persons by 2011. In the absence of labour market reforms, a fiscal tightening will be needed either by increasing the basic income tax by 4¼ percentage points or by reducing public expenditure by DKK 30 billion.

There is a consensus among Danish economists that in the absence of reforms the current fiscal policy is unsustainable in the long-term due to demographical developments. Assessments by the Danish Ministry of Finance, the Welfare Commission, the Economic Council of the Labour Movement, and the Danish Economic Council all show that it will be necessary to cut public spending by between DKK 15 and 60 billion each year to ensure fiscal sustainability in the absence of reforms. These assessments differ mainly due to variations in projected average life expectancy and thus future changes in public expenditure, although other assumptions also contribute to the different assessments. Despite the disagreement, all assessments point out that the Danish welfare state will be greatly challenged by the demographic changes coming in the future.

In 2000 the centre-left government in office presented the 2010 plan, which was widely supported across the political spectrum. The purpose of the 2010 plan is to address the demographic challenges through labour market reforms and tight control of public spending. The major contribution of the 2010 plan is credibility and discipline with respect to Danish fiscal policy. Even so, recent developments mean that it will be very hard to meet the objectives of the 2010 plan, and in particular the lack of new initiatives in labour market policy is worrying.

It is necessary to work out new reforms to ensure the viability of the welfare state of the future. These reforms should be part of a new long-term plan for the Danish economy – a plan which in a credible way creates new objectives for mid and long-term economic policy. The objectives of the new plan should preferably reach beyond 2010. This new plan should also include the means to achieve these objectives.

Fiscal sustainability can be ensured in many different ways. One way is pre-funding. This strategy means that sustainability is secured through public budget surpluses. Building up great public wealth can help finance the welfare state of tomorrow. The 2010 plan is an example of a pre-funding strategy, as its central objective is to halve the public debt over the period 2002 to 2010. However, it is difficult to explain to the public the necessity of running a tight fiscal policy with large budget surpluses in order to build up public wealth. In addition, pre-funding may mean that today's generation will carry a relatively large burden in order to ensure long-term sustainability. A different strategy for ensuring fiscal sustainability is adaptation. This strategy means that sustainability is gradually ensured through, for example, labour market reforms. A problem with the adaptation strategy is the lack of credibility, as today's politicians cannot commit politicians of tomorrow to securing the welfare state.

A large sustainability problem cannot be solved purely by increasing public savings. Such a strategy would mean either a dramatic fiscal tightening or an unrealistically short time horizon for carrying out structural reforms. On the other hand, an adaptation strategy may end up seeming like a systematic postponement of the reforms necessary to solve the welfare problems. The best policy is to combine the two approaches. This requires that the objective of budget surpluses is combined with labour market reforms. Such reforms are unlikely to leave the possible age of retirement unaffected. Consequently, these reforms should be announced in good time so as to give the public time to adapt to the new rules.

The government has taken an initiative to fight "black" work by applying a set of legal control instruments. Such an initiative should be supported by economic incentives that reduce the urge to employ "black" work. One option is to introduce tax deductions for maintenance expenditures on owner-occupied dwellings. The deductions should be financed by an increase in real estate taxation, which would ensure that house-owners are not subsidised more than they are today. However, if the administrative consequences

turned out to be over-complex, consideration could be given to introducing a subsidy on maintenance expenditures on owner-occupied dwellings, again funded by an increase in real estate taxation.

Besides discouraging “black” work, introducing deductions for maintenance expenditures on owner-occupied dwellings would lead to several other favourable effects. Instead of carrying out maintenance on their own, house-owners would be motivated to employ professionals to perform the task. As a consequence, the division of labour would be improved and the overall productivity in the economy would increase. Moreover, it is likely that the ordinary labour supply would rise if house owners carried out their own maintenance to a lesser extent. This would lead to further welfare gains.

The tax freeze, which is an important issue in the current fiscal policy debate, has pros and cons. The tax freeze is aimed at preventing taxes from rising, and there seems no doubt that it has contributed to reduced growth in public spending in recent years. However, the tax freeze is only an indirect means of controlling public spending. In *Danish Economy, Spring 2002* it was argued that direct control of public spending combined with expenditure quotas given to each municipality would be a more appropriate way of attaining the long-term goals for public spending. It is also important to note that the sanctions to be imposed on the municipalities in a situation where they breached the tax freeze are vague. This may erode the disciplinary effect of the tax freeze. A considerable drawback of the tax freeze is that it hinders desirable changes in the tax system. Furthermore, the tax freeze means that any unexpected increase in public spending would necessarily cause an increase in public debt.

A clear problem regarding the tax freeze is the so-called “nominal principle”, which will result in a reduction in public funds of about DKK 10 billions over the period 2002-10. The reduction is a result of freezing excise duties and real estate taxation in nominal 2002 terms.

The “nominal principle” decreases the real value from taxation on goods and houses, since inflation gradually erodes the revenue from these taxes. Certain considerations disfavour this type of tax reduction. Firstly, real estate taxation distorts the supply of labour to a lesser extent than income taxation, and a reduction in income taxation will accordingly have a larger positive effect on economic progress. Secondly, the current tax rate on real estate is small enough to mean that private houses are subsidised (see *Danish Economy, Spring 2001*), and a continuing erosion of real estate taxation therefore gradually increases this subsidy. Thirdly, whether a particular tax has been defined as an excise duty which is affected by the “nominal principle” or as a rate which is unaffected by the “nominal principle” has historically been a matter of chance. Hence, whether or not there is a tax reduction on particular goods as a result of the “nominal principle” is also a matter of chance. Furthermore, some excise duties, e.g. those on gasoline, have been fixed on environmental grounds, whereas other duties, e.g. those on alcohol and cigarettes, have been fixed on the basis of health care arguments. Easing taxation in such areas is therefore inappropriate.

On the assumption of unchanged fiscal sustainability, abolition of the “nominal principle” would give room for cutting income taxes. Abolition of the “nominal principle” would mean that excise duties would rise in accordance with inflation and that real estate taxation would increase in accordance with house prices.

Easing income taxation by repealing the “nominal principle” would reduce the distortion in the labour supply, causing employment and welfare to increase in the long run. The greatest gains would be attained through marginal tax cuts or when the tax reduction directly increases the benefit obtained from being in employment. The analysis in section I.8 indicates that, compared to a cut in income taxes, the “nominal principle” causes a reduction in employment of around 8,000 full-time-persons in only four years. The analysis thus clearly leads to the conclusion that tax relief through the “nominal principle” is inappropriate and that cutting income taxes produces a much larger welfare gain.

Chapter II: International Outsourcing

Over the past decades, a skill-biased labour demand shift has occurred in Denmark as well as in many other advanced economies. The purpose of the chapter is to examine to what extent outsourcing can explain this shift. The analyses in the chapter do not support the hypothesis that job losses have been accelerating in recent years as a result of outsourcing. However, outsourcing does affect the functioning of labour markets; for individuals a higher level of outsourcing in a sector implies lower wages, and a higher level of outsourcing in a sector also implies more job destruction. Calculations in the chapter show that this amounts to 4,000 jobs yearly in the industrial sector (conditional on the level of outsourcing at the beginning of this decade). To this number, a presumably small number of lost jobs in other sectors should be added. The number of job losses due to outsourcing should be compared to a total, economy-wide destruction of 260,000 jobs each year. Therefore, outsourcing explains only a small part of the ongoing labour market dynamics. New technology is probably much more significant in that respect.

Nevertheless, outsourcing and other aspects of globalisation have received much attention. This is probably related to the fact that the decision to move jobs offshore is more visible than other reasons for job destruction. Furthermore, job losses are more worrying now compared to the end of the 1990s, when job growth was stronger.

Outsourcing has taken place for many years and is a natural consequence of the possibility of moving still more specialised job functions abroad. Possibly, there are circumstances that could add to this tendency over a period of time. Many firms expect that they will increasingly base their production on outsourcing, and it is likely that the integration of China and India into the global economy will lead to or has already led to some acceleration in the moving of jobs offshore. However, such changes cannot be seen in the statistics yet, although these are often inadequate for definite conclusions on the matter.

In any case, it is important to determine the quantitative effects of outsourcing, also because the possibility of outsourcing can in itself affect wage formation. Furthermore, outsourcing shares many characteristics with other conditions that affect labour market developments, including technological progress. By way of example, outsourcing corresponds in many respects to automation of production. The appropriate solutions to the consequences of outsourcing will be the same in many cases. That is to say, general labour market measures that improve employment prospects for vulnerable groups in the labour market will also be relevant with respect to outsourcing.

Outsourcing corresponds to a kind of international division of labour resources. In this way, outsourcing contributes to a more efficient use of resources and is as such a potential gain for society. However, a prerequisite for reaping this gain is that resources can be used in new functions relatively quickly after being idle. To ensure rapid adjustment to the new conditions, the labour market must be sufficiently flexible. Often it will be more profitable for firms to move unskilled rather than skilled labour functions offshore. Therefore, the unskilled will face the biggest pressure for adjustment. Analyses in the chapter show that a skill-biased labour demand shift has occurred. However, this shift has taken place without a marked increase in wage inequality or a marked increase in unskilled unemployment.

Upgrading of qualifications of the labour force is therefore imperative. It is important that young people entering the labour force have a sufficient level of education and it is important that employed persons participate frequently in further education and training. With respect to the former group, there is a significant risk of their ending up in unemployment if the level of their education is insufficient. The unskilled have not so far experienced any major negative consequences of the skill-biased shift in labour demand, most likely because the supply of unskilled labour has fallen markedly, with older groups of unskilled labourers leaving the labour force. If the tendency for skill-bias continues, unskilled persons will have a much weaker position in the labour market in the coming years. The intention of the

government to look more closely at and analyze different aspects labour force training and education is therefore a welcome initiative. A number of considerations relevant in this respect are presented below.

As a starting point, it is imperative that as many people as possible receive vocational training or higher education. For young people wishing to take vocational training it is important that there is a sufficient number of practical training places. This is also in the interests of firms, because it will increase the supply of qualified labour later on. However, individual firms or firms in specific sectors may not have sufficient incentives to establish training places. The Danish Economic Council has previously recommended a thorough investigation of how firms could be encouraged to establish a sufficient number of training places, for example by means of subsidies. Part of the solution to an insufficient number of training places could be more flexible wages for students taking vocational training. Another problem concerns the high dropout rate. In order to reduce the number of students not finishing their education, it is necessary to increase the academic level in primary school without putting the independence and creativity of the students at risk.

In general, the unskilled receive little supplementary training. More knowledge is needed about why this is the case. Possible reasons might include lack of information about already existing possibilities and rights, restrictions imposed by employers, and lack of relevant courses. In addition, individual barriers with respect to, *inter alia*, motivation may play a role. In any case, the situation is problematic, because this group needs more education to meet labour market demands. One possible measure which presumably would improve the incentives to undertake education later in life could be to establish individual accounts for educational purposes on which wage earners would have a clear right to draw. Such accounts would make funds for educational purposes more visible, and would, in addition, ensure a better supply of relevant courses. A thorough investigation of the benefits and drawbacks of such accounts should also

look into the question of financing, including whether it is necessary to increase public funding or whether existing funding should be used differently.

A sound principle in this context is the public financing of a large proportion of general education and general upgrading of qualifications, while the acquisition of firm-specific skills should be paid for mostly by firms and wage earners. Access to accounts for education should be directed primarily towards the unskilled, while persons with higher education should be covered by labour market agreements to a larger extent.

Initiatives directed at young people should be given first priority if the means for education are restricted, giving them a better foundation for receiving further education and living up to labour market demands. In addition, means should be directed towards those who have a clear need for general upgrading.

The relatively inflexible Danish wages may lead to a higher level of unemployment or a relatively large number of people leaving the workforce. Hence, it should be considered how to counter this development. In the following paragraphs three proposals are outlined, each of which would lead to a greater demand for low-skilled labour. The three proposals concern a lower wage-indexation of unemployment benefits, tax reduction in the lower brackets, and an employment subsidy.

A change in the way unemployment benefits are indexed could be a way to create more flexible wage formation, as the wage formation is dependent on the regulation of unemployment benefits, among other things. Unemployment benefits are indexed to the general growth in wages in the economy; a large increase in high-skilled workers' wages will mean a subsequent large increase in the unemployment benefits and a larger increase in the wages of low-skilled workers. If instead unemployment benefits were indexed to the wages of unskilled workers, a more flexible wage formation would result, thereby creating a greater demand for unskilled workers. Furthermore, this system would prevent

the compensation rate for unskilled workers from rising if wage growth was lower for unskilled than for skilled labour.

A reduction in taxes on wages targeted at the lower end of the income spectrum would lead to a greater increase in employment and greater flexibility in wage formation. Unlike the previous proposal, this would not lead to greater inequality in after-tax incomes. The increase in the size of the labour force would produce a smaller effect on public finances than the initial tax cut would suggest. The above proposal concerning a lower indexation of unemployment benefits would lead to lower expenditures; these savings could be used to finance a tax reduction for the working poor. It should be noted that this proposal would lead to a more progressive tax-system and therefore a smaller incentive to undergo education unless it was followed by greater wage dispersion.

A third way to increase the demand for unskilled labour is the use of wage subsidies. The existing wage subsidy for the unemployed could be expanded and targeted towards the unemployed with skills in declining demand by employers. Subsidized employment is granted to the unemployed when other opportunities are depleted. Compared to the alternative activation measures, this kind of wage subsidy has a positive effect on the chance of employment afterwards. The existent subsidies have primarily been used by the unemployed with the better qualifications among the target group. It will therefore be relevant to target the employment subsidy at the unemployed with the lowest qualifications among the target group. The employment subsidy must be combined with a certain amount of education that would give the people employed new qualifications and a greater chance of non-subsidised employment.

If the demand for low-skilled workers continues to decline, a more widespread use of employment subsidies may be necessary. However, employment subsidies should not be considered a general way to increase demand for unskilled labour, but only a means to help the weakest unskilled workers. Employment subsidies can be problematic for a number of reasons, as they affect incentives and create dis-

turbances in the economy. Subsidies lead to competition between employees working on regular contracts and employees working with a subsidy. These kinds of subsidies should therefore be limited and should be used only as a last resort when other initiatives have failed. If the employment subsidies are targeted at the unemployed with the lowest qualifications and if they are combined with some form of education, the risk of employees working on regular contracts being replaced will probably be smaller.

The ideal situation would leave everybody with qualifications matching employers' needs. Outsourcing and other aspects of globalisation, including technological change, lead to a greater level of reallocation of jobs and therefore a demand for more flexibility of the work force. This development could lead to a greater inequality in the form of higher unemployment or lower relative wages if the necessary training of the workforce does not take place.

For employers, the discussion concerns the possibilities of adjusting production or starting new production. The regulations regarding hiring and firing are not very restrictive in Denmark and, in general, regulation concerning companies seems favourable (see *Danish Economy, Spring 2003*). The latest assessment in *Global Competitiveness Report* published by the World Economic Forum places Denmark as the fifth most competitive economy in the world.

There seem to be no good reasons to support industries experiencing greater international competition. This kind of subsidy would only postpone the necessary adjustment process and, thereby, leave employees and capital tied up in non-competitive industries. The same goes for subsidizing certain industries that seem to have a large potential for future growth. For such a strategy to be successful, there should first of all be reason to believe that public intervention is necessary for the industry to prosper and that the gains are great enough for the public sector to intervene. The next question concerns which industries to subsidize. Even though the winners are obvious in retrospect, it is not at all clear that the public sector can pick the winners *a priori*. This makes it difficult to advocate subsidies to certain

sectors of the economy, including subsidies to certain kinds of research (*Danish Economy, Spring 2003*).

There are several public subsidies that Danish firms can receive in connection with investing abroad. The most important are The Industrialisation Fund for Developing Countries (IFU) and The Investment Fund for Central and Eastern Europe (IØ), which in 2003 invested in activities creating 7,000 and 1,000 jobs in developing countries and in Central and Eastern European countries respectively. Eksport Kredit Fonden (EKF) gives guidance in projects where Danish businesses establish branches abroad. The fund will, in accordance with a new strategy, increase its engagement in projects of this type.

It is of interest to note that according to a report dated June 2004, the subsidies from IFU typically go to countries where development is well advanced; furthermore, the subsidies go primarily to Danish partners who already possess the necessary financial resources and international experience. The same will probably be true for the subsidies from IØ, even though it no longer invests in Central and Eastern European countries which are now members of the European Union. These kinds of subsidy are primarily subsidies for industries, and they are not targeted towards the poorest developing countries. As argued earlier, there are no good reasons for a general support of certain industries. These kinds of subsidy should not be granted unless there is a foreign aid element; if that is the case, then the establishment of branches abroad and outsourcing could lead to increased development.

Chapter III: Water and Environment

Water is essential for life on Earth. In Denmark, most of the drinking water is extracted from ground water. In general, Danes are very concerned about the protection of the ground water. In the chapter, an analysis is presented of whether water resources are managed in an appropriate way and whether there is efficiency in the water supply sector.

Humans affect water resources in both the short and the long term. The use of water may put pressure on the sustainability of the resources. Pollution can damage water resources and affect biodiversity. Therefore, it is necessary to regulate the use of water.

Pesticides are among the most debated pollutants of the ground water. Pesticides are used in the public and the private sectors. The agriculture sector accounts for four-fifths of the total use of pesticides. Use of pesticides and fertilisers in agriculture has contributed to increased production and has resulted in cheaper food products for consumers. However, there are also negative environmental consequences of the use of pesticides and fertilisers. Besides pollution of ground water, the use of pesticides is expected to lead to a decrease in biodiversity and is also suspected of having negative health effects.

In the chapter, an analysis is presented of the economic and environmental consequences of alternative regulations for reducing the use of pesticides in agriculture. The focus is on pesticides in drinking water and the consequent effects of pesticides on biodiversity. A valuation study is presented which was carried out in order to estimate the cost of some of the environmental effects. Finally, the management and ownership structure of the ground water resource is analysed, including an examination of whether the current organisation of the water supply sector is efficient.

The use of pesticides in agriculture has decreased slightly in the last couple of years. In Denmark, water from drillings is tested for pesticides and other pollutants on a regular basis. These tests of the drinking water quality do not give a clear indication of trends in the levels of pesticide residuals in the drinking water. During the last 10 years, the overall proportion of tests containing pesticide residuals has been increasing, but the proportion of tests where the pesticides residuals have exceeded safety levels has been slightly on the decrease over the last 5 years. However, it can take several years from when the pesticides are used on the fields before they are found in the drinking water extracted from the ground water. The use in agriculture of the types of pesti-

cides most frequently found in the ground water today is now prohibited.

The current safety standards for pesticide residuals in the drinking water date back to the late 1970s, when Danish politicians decided that pesticides in the drinking water were not acceptable. Therefore, today's safety levels are set at the lowest concentration it was possible to measure at that time. However, safety standards should actually reflect the harm done to humans and to the environment. Therefore, it is important to obtain knowledge of the possible harm caused by different substances.

In Denmark there have been several action plans to protect the environment, for example three action plans to protect the aquatic environment (*Vandmiljøplan I, II, and III*), where the main purpose was to reduce nitrogen loss. In addition, three action plans have been aimed at reducing the use of pesticides. In the first action plan, the reduction targets were set with limited knowledge of the actual environmental effects and without any calculation of the costs. In the later action plans, analyses of the social costs for achieving a given reduction were carried out. This should be regarded as a sound development, but there has not yet been an economic evaluation of whether the total environmental benefits exceed the economic costs for achieving the goals. That is, a real social cost-benefit analysis including estimates of the monetary value of the environmental benefits has not yet been carried out.

As a result of these pesticide action plans, there has been a reduction in the use of pesticides. However, the targets for reduction have not yet been reached. Even though the use of pesticides has been decreased, it is still of interest to analyse whether the benefits from a further reduction are higher than the social costs of the reduction. In the chapter, the consequences of different ways of reducing the use of pesticides in agriculture are analysed.

In the analysis, some of the main environmental benefits are compared with the social costs. The instruments analysed are taxes on pesticides, pesticide-free buffer zones around

field edges and water boreholes, and an increase in the proportion of organic farming. First, the social costs and the environmental effects are calculated. Second, an economic value is attached to the environmental effects; this makes it possible to compare the social costs with the value of the benefits of the reduction.

The calculation of the economic and environmental effects is carried out by combining economic, biological, and geological models and analyses. The economic models are used for calculating the social costs (indicated by the decrease in total consumption) and the effects on the agricultural sector (e.g. choice of crops). Geological analyses assess the effects of implementing each of the instruments on the probability of the level of pesticides in the drinking water and in the entire ground water resource being above the safety level. Finally, a biological model is used to describe the effects on biodiversity in the arable land, indicated by the population of skylarks.

In the calculation of the effects of the different instruments intended to reduce the use of pesticides, the effects are compared with a baseline scenario for the year 2015. The analysis shows whether it is appropriate for there to be a further reduction in the use of pesticides than that already decided in current action plans. In the analysis, the following instruments are considered:

- a *tax on pesticides*, which it is estimated would decrease the use of pesticides by 25 per cent
- *pesticide-free buffer zones* of 5 meters around field margins and 100 meters around water boreholes (50 meters around small water boreholes), i.e. zones where agriculture activities are allowed but without the use of pesticides
- an increased proportion of *organic farming* by means of subsidies to organic farming.

In the calculations the economic instruments have been scaled to levels so that the social cost of the regulation is similar, slightly below DKK 1 billion per year (which corresponds to about 1,200,000 Euro). This facilitates the comparison of the effects of the different policy instruments

applied, i.e. the analysis shows which of the instruments yields the best environmental outcome for a given level of social cost. It should be noted that these levels of the instruments do not necessarily reflect their optimal levels. It would require further analyses to find the optimal levels for each instrument.

In order to compare the social costs of the different policy instruments with the economic values of the environmental benefits, it is necessary to obtain monetary estimates of the value of the environmental improvements. Several economic valuation methods have been developed over recent decades. These methods have been widely adopted in several countries, but so far only a modest number of valuation studies have been carried out in Denmark.

Several international studies indicate that the (hypothetical) valuation methods yield upwardly-biased estimates of the willingness to pay for environmental improvements. Because of this apparent upward bias, the merits of the hypothetical valuation methods have been questioned. However, it should be taken into account that all decisions on environmental policy indirectly reflect implicit values of the environmental benefits compared to the social costs. In a valuation study the values are explicitly measured, which may increase the transparency of the decision process and ensure consistency in the decisions across sectors and over time.

On the one hand, it is clear that there are still unsolved methodological problems with some of the valuation methods currently being applied. On the other hand, information on the monetary values of environmental benefits is important, because this information is essential for making systematic comparisons of costs and benefits associated with different environmental policies. Despite the methodological problems it seems that there is a need for more studies of Danish data on the monetary values of environmental goods. Therefore, valuation studies should be one of the priorities in environmental policy.

In order to take into account some of the environmental gains from pesticide regulation, a valuation study has been carried out in order to estimate the value of increased biodiversity in rural areas, as indicated by a change in the population of birds in rural areas. The contingent ranking method was applied in the study.

A number of international studies have provided valuation estimates related to drinking water or groundwater contamination, e.g. values for ensuring that the level of drinking water and groundwater contamination does not exceed safety limits. Results of these international studies have been applied in the analysis in order to provide a rough measure of the value of reductions in pesticides in the drinking water. However, some people have pointed to weaknesses in these studies which make their validity questionable. In addition, it can be argued that the Danish population considers groundwater preservation to be more important than other countries do. Groundwater is the main source of drinking water in Denmark, and comparative studies suggest that Danes are therefore more concerned about groundwater contamination than other Europeans.

When we focus first on the environmental effects of the alternative pesticide regulation methods, without including the monetary values of these effects, it appears from the analyses that pesticide-free buffer zones would have the greatest positive impact on biodiversity as well as on pesticide residuals in drinking water. The positive effect on biodiversity derives from the pesticide-free buffer zones around the fields, while the reductions in pesticide residuals in the drinking water derive from the buffer zones around water boreholes.

When the environmental effects measured in physical units are combined with the estimated valuation of the biodiversity and the reduced contamination of the drinking water, it appears that the value of the environmental gains exceeds the social costs, i.e. that there is a net benefit associated with pesticide-free buffer zones. The methodological problems associated with the hypothetical valuation methods suggest that the overall monetary benefits of the different

types of pesticide regulation should be interpreted cautiously. However, the pesticide-free buffer zones yield a net gain even if the monetary value of the environmental benefits is considerably lower than that found in the valuation studies. In addition, it seems likely that there are additional environmental benefits and health benefits not taken into account in the study.

It appears that the environmental gains associated with increased organic farming are smaller than those from the pesticide-free buffer zones (for similar levels of social cost). Furthermore, it seems that the social cost of increased organic farming may be larger than the environmental benefits (in monetary terms). It should be noted, however, that the analysis of increased organic farming should be interpreted more cautiously than the results from the other analyses of pesticide regulation policies. Furthermore, there may also be some additional benefits associated with increased organic farming which are not included in the analyses (e.g. animal welfare).

A tax on herbicides (i.e. weed killers) is the most effective instrument with respect to the protection of the total groundwater resource, including groundwater reserves not currently utilised for drinking water. However, the tax on herbicides does not have as great a positive effect on biodiversity as was found with pesticide-free buffer zones.

It should be noted that there are problems concerning implementation and control associated with pesticide-free buffer zones that do not arise when using a pesticide tax, as it is costly to oversee whether farmers act in conformity with the pesticide-free buffer zone regulations. In comparison, it is relatively cheap to increase the level of pesticide taxes, though increased tax levels may lead to an increase in cross-border trade.

Command-and-control regulations have been widely applied in the Danish farming sector in order to reduce nitrogen loss, which has had a large negative environmental impact on surface water in Denmark. It appears from other Danish studies that national targets for reduction in nitrogen

loss can be achieved at a lower social cost if the command-and-control regulation is replaced by economic regulation.

In Denmark, ground water is the main source for the public water supply and for watering crops. It appears from geological analyses that the extraction of ground water in parts of Zealand exceeds the sustainable level. Excess extraction may have environmental consequences; water levels in lakes and rivers are lowered, and the quality of the ground water may decline. On the other hand, the current level of extraction may be reduced and sustainability thereby ensured by using economic regulation. One possibility is to impose extraction taxes that are differentiated in such a way that the highest taxes are levied upon consumers (households, industries and agriculture) in areas where the scarcity is the greatest. Alternatively, tradable extraction permits could be used.

At present, household water consumption is taxed uniformly throughout Denmark, while agriculture and industries are exempted from tax. Household taxation is high compared with other countries, and water consumption is rather insensitive to price changes. The uniform tax can therefore be regarded as appropriate with respect to raising public revenues. No analysis is made in the chapter concerning the question of whether the tax should be even higher, however. Environmental concerns imply that there should be a differentiated tax on extraction of ground water, depending on the scarcity. It should be stressed that these taxes should be levied on extraction, not on consumption. This would make transportation of water an attractive alternative for water suppliers when this is appropriate viewed from the perspective of society.

The pollution of water is not solely a local problem, as pesticides enter the ground water and may thereby be spread over a larger area. Nitrogen on the fields may also be spread to larger areas by leaching. Nitrogen can be carried via rivers and streams to lakes and costal areas, where anoxic events can result. This implies that the regulation and control of the water environment should be undertaken by the central government instead of local authorities. A structural

reform of local government in Denmark which has already been decided will mean that municipalities are larger and that the municipalities will administer matters that until now have been administered by the counties. This includes the regulation and control of larger parts of the water environment.

In Denmark, water utilities are operated by a mix of public and private suppliers. The private suppliers are usually small companies owned by consumers. Water is supplied by 200 municipalities and more than 2,500 typically very small private companies. Analyses indicate that the larger private suppliers are more efficient than the public ones. If public suppliers were as effective as private suppliers, their costs could be lowered by 15-20 per cent.

Experience with privatisation of the water companies in the United Kingdom indicates that a privatised market, regulated by yardstick competition, can increase efficiency. Yardstick competition means that the suppliers are regulated by price caps based on the costs of comparable producers. Within the price cap limit, the suppliers can increase earnings by being more efficient.

The suppliers are currently regulated by a cost-recovery (non-profit) principle (earnings must balance costs). This principle gives the public suppliers only limited incentives to minimise costs. Due to technological constraints, the supply of water is characterised by natural monopolies. If there were no regulation the suppliers would exploit their monopoly status to increase prices. Regulation is therefore necessary. Yardstick competition protects consumers and creates incentives for greater efficiency. It is recommended that the non-profit principle is replaced by yardstick competition.

Experience from the United Kingdom and our own analyses indicate that private suppliers are more efficient than public suppliers. Municipalities that manage the water supply are therefore encouraged to assess whether private ownership would be an advantage. It is recommended that the budgets of the publicly-owned suppliers are separated from the gen-

eral budgets of the municipalities. To ease a transition to private ownership it is further recommended that suppliers should follow the procedures of annual accounts and develop other indicators that would make comparisons possible.

The administrative costs in the United Kingdom for regulation by yardstick competition are substantial. Other ways to create competition should be considered if it is estimated that administrative costs of yardstick competition in Denmark would be too great. Increased outsourcing (licensing out) would mean more private production and might therefore improve efficiency incentives. Today there is already a large degree of outsourcing in water supply with respect to construction, but outsourcing could be increased for operation.

Pesticide-free buffer zones around field margins and water boreholes are recommended, as benefits with respect to biodiversity and ground water exceed the social costs of the lower agricultural productivity.

Water extraction exceeds the sustainable level in parts of Zealand. The existing water tax should be regionally differentiated. In this way the extraction of water can be reduced in areas where the resource is under pressure.

It seems that the water supply industry is not efficient. More efficient production would probably be achieved by replacing the existing cost-recovery regulation by yardstick competition. A further increase in efficiency could probably be achieved if the municipalities outsourced a larger part of the operation of the water supply or chose to sell the supply operation to private companies.

The costs and benefits of new environmental initiatives should be analysed. A solid scientific basis is necessary for adequate social economics. Science provides the possibility of quantifying environmental consequences. There are several methodological problems with the valuation of environmental commodities. The results should therefore be interpreted with caution. On the other hand, valuation im-

proves the basis for determining the benefits of environmental policy and reduces the problems of comparing environmental factors across sectors and time.