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**Food consumption and welfare economics
– impacts of economic and political conditions**

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Summary, conclusions and perspectives

Life-style related diseases (including diseases related to diets and overweight) is an increasing problem - in Denmark as well as in many other countries around the world. It has been estimated by the Danish Institute of Public Health that inappropriate diets and overweight impose an annual cost on the Danish society between 3.5 and 7.5 billion DKK (corresponding to between 0.25 and 0.6 per cent of GDP) in terms of increased health care costs and loss of labour productivity. This estimate is in line with corresponding estimates in similar countries. The number of overweight and obese people is strongly increasing, so a future increase in these costs may be foreseen. As such costs have implications not only for the persons directly suffering from such problems, but also for the surrounding society (e.g. employers and taxpayers), society has an economic interest in preventing the growth of these problems.

A number of factors are presumed to have influenced this development:

- During the last decades, foods have become relatively cheaper and more easily accessible
- The number of work places demanding considerable physical activity is decreasing
- Transportation of people is to an increasing extent taking place in cars and public transport systems, due to increasing distances between home and work places
- Leisure activities involving physical activity are decreasing and to an increasing extent being replaced by e.g. television, computers, etc.
- Marketing of foods has been intensified during the last decades
- Policies in various subject areas have not been coordinated with respect to prevention of lifestyle diseases (e.g. policies on agriculture, competition, trade etc.)

A set of dietary recommendations have been put forward by Danish food authorities. These recommendations imply high intake of fruits, vegetables, fish, potatoes, rice, pasta and whole grain bread, low intake of sugar and fats and physical activity. There is scientific evidence that compliance with these recommendations may significantly reduce mortality and morbidity from cardiovascular diseases, cancer as well as other diseases. Despite this evidence, and in spite of the fact that such dietary recommendations have existed (and remained fairly stable) in Denmark for about 10 years, a large proportion of the Danish population is still not complying with these recommendations. There may be several reasons

for this. One reason may be that awareness and knowledge about nutritional recommendations or about the health implications is not sufficiently spread in the population. Another reason may be that even though the dietary recommendations may be known and understood by the broad population, the message may be overshadowed by information from e.g. marketing activities. A further reason may be that the citizens do not have sufficient incentives to comply with the recommendations. Among the most important barriers for healthy eating (despite positive intent) are lack of time and old habits, but also taste and cost considerations have a role to play.

As mentioned, official dietary recommendations have existed for several years, and they have been published and discussed in newspapers, websites, reports and other media. Such information may not get through to all citizens, and the effectiveness of such information may depend on factors like education, social norms etc. Simultaneously with these recommendations, various other recommendations have also been put forward by different experts, and this may have led to confusion among citizens. However, it seems like official diet information campaigning activities during the last decade have contributed to the improvement of Danes' diets in terms of increased intake of fruits and vegetables and reduced intake of high-fat foods. But based on international findings, there may be reason to suspect that the campaigning and information activities have not been equally effective in all groups of the population, and that the diet of especially male singles, older citizens and people with shorter education have been less affected than the average population. Hence, there may be a challenge in reaching some of these groups in the future.

In the use of media children are faced with increasing promotion and advertising in their daily lives, and it is only possible to regulate some of these marketing channels, e.g. public service television, through national legislation. Television commercials for unhealthy food products are highly overrepresented compared to advertisements for products more in line with the nutrition recommendations. To some extent children are capable of understanding the underlying agenda of the commercials, but a full understanding depends on how easily the commercial can be recognized as such. Various studies show that the child has a basic knowledge about nutrition but preferences can be affected. Research results have revealed a clear link between television viewing and obesity, but no research results establishing a clear link between promotion of unhealthy products and obesity have so far been identified.

There is a considerable economic and social welfare potential in promoting healthy diets and life styles in general. For example, the present study estimates that if the share of population complying with official dietary recommendations increases by 10 percentage

points, there may be a gain in the magnitude of 2200-2800 saved disability-adjusted life years in terms of reduced cardiovascular and cancer disease occurrences per year, corresponding to an expected income gain at 400-600 million DKK per year. As a number of effects are not included in this estimate, it may represent a lower-end estimate of the total gain.

One major challenge for governments is to design future food policies that aim at reducing obesity and overweight in the population. For this reason, there is a need for more knowledge in the field of environmental factors affecting the development of obesity, including the development in socio-economic framework, the impacts of various policies and the effectiveness and appropriate design of policy interventions to meet the challenge of obesity and related diseases.

The findings in the present report are to a large extent based on findings from the national and international literature. The literature seems to provide fairly strong evidence for the finding that unhealthy lifestyle and obesity accounts for a significant health and economic burden for society and that there is considerable room for improvement in the diets in large groups of the Danish population. Although a number of environmental factors underlying this situation - including general socio-economic trends, interactions between different policies, marketing etc., have been identified in the literature, the exact impacts of such factors are not clearly established and well-documented. Along the same line, the effectiveness and costs of different policy interventions to meet the challenge of obesity, is also documented in the literature only to a limited extent, although some studies have been undertaken regarding various interventions, such as food tax differentiation. There is however still some way to go to improve the understanding of such interventions' effectiveness and impacts in different groups of the population. Hence, there is still considerable room for improvement of the knowledge base for specific design of policy interventions regarding nutrition, overweight and obesity.

More research regarding the environmental factors could be recommended in the following areas:

- Interplay between national policy aims at regulating obesity and other policy concerns, including competition regulation, agricultural policy. A recent example is the concern for border trade and illegal imports, which has led to reduced taxes on soft drinks.
- Effectiveness of different types of interventions in different groups of the population and the associated costs for society. For example, economic instruments may have

the advantage that without dictating a certain behaviour they can be used to make it easy for consumers to choose healthy diets (taxes and subsidies can be coordinated such that the cheapest food is also the most healthy) – but other factors than relative prices might be very important.

- Effectiveness of combinations of policy instruments in regulating dietary behaviour
- More light on the diversity in peoples' response to marketing and policy interventions
- More light on the interactions between weight gain on the one hand and food intake, physical activity, genomics, lifestyle in general etc.
- More precise estimates of the costs and benefits derived from various interventions in a future perspective.
- International commitments related to e.g. free trade pose a limit to the range of instruments that can be used in meeting the obesity epidemic. This calls for joint action internationally.

1. Introduction

Over the past few decades, food consumption patterns have changed dramatically. Technological changes have contributed to a more cost-efficient food production and developments of highly available and pre-prepared foods. As a result, welfare has been enhanced by falling relative prices of food, measured in both terms of money and time. However, negative health effects have followed from this development. Today's food consumption has proven to be an important determinant of a number of severe illnesses, such as diabetes, several types of cancer, heart diseases and also overweight and obesity, themselves major risk factors of the illnesses mentioned. Overweight and obesity are increasing problems in Denmark as well as in the rest of Europe (Matthews et al., 2004, Rasmussen et al., 2004). Not only is the obese part of the population increasing but the obese are also getting more obese (Richelsen et al., 2003). Weight gain can be a result of a too high energy intake combined with too low energy expenditure. Projections made by the WHO indicate that these are among the most important drivers behind the significantly growing trend in mortality due to non-communicable diseases.

In addition to the human suffering that diet-related illnesses and overweight/obesity causes, a number of studies have also demonstrated that the economic costs related to these factors can be considerable (Finkelstein et. al., 2003, WHO, 2000, WHO, 2002, European Commission, 2005, Danish Institute of Public Health, 2006) - a burden that will rise even further, should current trends prevail.

Estimates of the health care costs attributable to unhealthy food habits and obesity suggest that these costs account for between 5 and 10 per cent of total health care costs (Richelsen et al., 2003, WHO, 2003, International Obesity Task Force, 2003, Bhattachary & Sood, 2004). In addition, increased mortality and morbidity due to unhealthy food habits account for considerable losses of life-years – for example, a study by the Swedish Institute of Public Health (1997) suggests that almost 10 per cent of the disability-adjusted lifeyears¹ in the EU are lost due to poor nutrition, obesity and lack of physical activity (WHO, 2004a).

The development has raised concern at national as well as supra-national levels and a number of proposals and action plans have been launched during recent years. Examples at the supra-national level include the establishment of an International Obesity Task Force (IOTF) in 1995, a Green Paper from the Commission of the European Communities (2005), a Nordic Plan of Action on better health and quality of life through diet and physical activity from the Nordic Council of Ministers (2006a), and a recent WHO conference dealing with the WHO European Region (2006).

These ongoing trends raise a number of concerns and needs for more knowledge, including answers to questions like:

- Why does this development continue even though most people know it may cause health problems?
- What are the main driving forces behind the development, and what is the mutual “balance of power” between these driving forces?
- How can the development affect the economy (labour supply, productivity, health care costs)?
- What could be done to change the development?

The objective of the present paper is to illuminate some of the above questions based on existing literature, investigations and statistical material, with the main focus on four subject areas:

- Economy-wide consequences related to the citizens’ choice of foods (with focus on unhealthy dietary habits and overweight)

¹ Disability Adjusted Life Years: (DALY) is a measure of lost “healthy life years” due to death and disease, compared with an ideal health condition. Hence, DALY is an aggregate measure of morbidity and mortality, where account is also taken of the severeness of diseases.

- Impacts on key variables like food consumption, nutrition and overweight in Denmark from the economic-political setting, with focus on the European Common Agricultural Policy
- Effects of food marketing on the choice of foods (with focus on children/adolescents), and the derived socio-economic consequences.
- Potentials and choice of policy interventions

The paper is organised as follows. In section 2, the extent of nutrition and obesity problems in Denmark and Europe is investigated, and a number of economic-political determinants for the development are considered in section 3. Section 4 investigates the evidence concerning food marketing towards children. Finally, section 5 discusses the economic welfare implications of consumers' food choice and the economic rationale for policy intervention, as well as the choice of policy instrument.

2. The extent and development of poor nutrition and obesity in Denmark and the derived economic consequences

Food consumption and the intake of nutrients

According to figures from Statistics Denmark Consumption Survey², food expenditure amounts to approximately 16 percent of the disposable income for low income households and 7 percent of the high income households. Dietary surveys from the Danish Institute of Food and Veterinary Sciences (e.g. Groth & Fagt, 2003, Lyhne et al., 2005) also show large differences in food consumption among different household categories. For example, the consumption of fish is greatest among the elderly and the upper social classes. More sugar is eaten by the children and people in the middle and lower social classes. The middle-aged have the largest consumption of meat, fruit and vegetables, while the lowest consumption level of fruits and vegetables is found for the lowest social class.

Smed (2002) also finds that the cooking is more traditional and includes more fat in the rural areas compared to other parts of Denmark, and (Larsen 2003, Smed 2002, and Groth & Fagt, 2003) report that the elderly in Denmark more often eat traditional meals that are high in fats, since they are typically stronger bounded by traditions and react slowly to new trends.

² See www.statistikbanken.dk

Although the diet of the Danish population has improved during recent years, the aim of Danes having a diet consisting of at least 600g of vegetables and fruits per day and a maximal share of energy from fat of 30 percent is still far from being achieved, see table 1.

Table 1. Danish consumers' intake of nutrients per day, 2000/01

	Children 4-14 years	Adults 15-75 years	Recommendations
Energy (MJ)	8.5	9.2	
Fat (E%)	34	34	30
Fat (g/day)	75	79	
Carbohydrate (E%)	53	48	55
Sugar (E%)	14.0	9.3	max. 10
Sugar (g/day)	71	52	
Fibres (g/10MJ)	19	22	
Protein (E%)	13	13	15
Fruits (g/day)	216	239	
Vegetables (g/day)	117	151	
Potatoes (g/day)	78	110	

Source: Fagt et al. (2004), Nordic Council (2004b).

The actual food intake among Danish consumers could be compared with the recommended intake of food and nutrients. The official Danish recommendations for a healthy life style are shown in box 1.

Box 1

The official Danish recommendations regarding healthy life style

Eat fruit and vegetables – 6 pieces/portions a day

Eat fish and fish products – several times a week

Eat potatoes, rice or pasta and wholemeal bread – every day

Limit intake of sugar – particularly from soft drinks, confectionary and cakes

Eat less fat –particularly fats from meat and dairy products

Drink water when you are thirsty

Engage in physical activity – at least 30 minutes per day

Living according to these dietary advices will ensure that the body's needs for vitamins, minerals, and other important nutrients are covered. The risk of life style diseases such as ischaemic heart disease, type 2 diabetes and cancer will be reduced and it will prevent weight gains. The main part of the Danish population would benefit from following these advices.

Source: Available online: Ministeriet for familie- og forbrugeranliggender, Fødevarerstyrelsen, alt om kost.

Inadequate diet in terms of excessive intake of sugar and fats and too low consumption of fruits and vegetables may lead to health problems, such as overweight, diabetes-2, heart disease or cancer. The official Danish recommendation of a daily intake of 600 grams of fruits and vegetables was announced in 1998. In Trolle et al. (2002), it is estimated that the risk of cancer and ischaemic heart disease can be reduced by 15-30 pct. if this recommendation is followed (see some more estimates of health effects in section 5 below).

The Danish Institute of Public Health (2006) has estimated the costs to society due to a too high intake of saturated fats (i.e. direct impacts of diet on cardiovascular disease) in terms of lost productivity to lie between 15 and 391 million DKK per year, depending on the extent of difficulty in replacing labour affected by disease or death³. Similarly, the societal costs of inadequate consumption of fruits and vegetables have been estimated at between 15 and 395 million DKK. To the extent that idiets also have effects on overweight, diabetes 2 and cancer, these calculations represent lower-end estimates of the societal costs of inadequate diets. Some details from the study from the Danish Institute of Public Health are given in table 2.

Table 2. Health consequences related to diet, physical activity, alcohol and tobacco, Yearly average

	Deaths	Loss of expected life-time	Hospitalizations
<i>Men</i>			
Too little fruit and vegetables	1.100	5 months	
Too much saturated fat	1.100	5 months	29.000
Overweight and obesity	400	3 months	
Too little physical activity	2.300	10 months	42.000
Tobacco	7.500	42 months	100.000
Alcohol	2.200	16 months	19.400
<i>Women</i>			
Too little fruit and vegetables	1.100	4 months	
Too much saturated fat	1.000	4 months	26.000
Overweight and obesity	900	8 months	
Too little physical activity	2.200	9 months	55.000
Tobacco	6.400	36 months	50.000
Alcohol	850	6-7 months	9.000

Source: Danish Institute of Public Health (2006)

As the table shows, too little consumption of fruits and vegetables causes 2.200 premature deaths per annum (1.100 for men and 1.100 for women), and shortens the expected life-time

³ Two different approaches have been pursued in the quantification of productivity loss: The human capital approach (assuming full employment in the economy), where labour removed due to illness or death cannot be replaced, as there is no free labour available, and the friction approach (assuming less than full employment), where labour is assumed to be replaced after three months. Hence, the human capital approach will always lead to higher estimated productivity losses than the friction approach, the magnitude of the difference however depending on the age structure of those affected by disease or death.

by 4-5 months. The effects of too high intake of saturated fats have a similar magnitude. Lack of physical activity causes 4.500 premature deaths per annum and shortens expected life-time by 9-10 months. Overweight and obesity causes 1.300 premature deaths, and the effects of obesity appear to have larger implications for women than for men. The aggregate effects related to inappropriate diets and lack of physical activity are however smaller than those related to tobacco. It should be noted that overlaps between the individual effects may exist, and hence the figures are not additive.

Overweight and obesity

Overweight⁴ is the most important known determinant for diabetes 2, and overweight also increases the risk of ischaemic heart diseases, stroke and various types of cancer.

According to OECD Health Statistics (2004) more than 40 percent of the Danish population can be characterised as obese or overweight. The prevalence of obesity has increased considerably during the last 20 years, from 5.5 % in 1987 to 11.4% of the adult Danish population in 2005⁵. The prevalence of obesity is lowest in the younger age groups. These age groups however also exhibit the largest increase in prevalence, although increases are observed for all age groups and for both genders (figure 1).

⁴ The Body Mass Index (BMI) is used as a measure of overweight and obesity in the following. BMI is defined as the body weight in kg, divided by the squared height in m. Overweight persons have a BMI>25, whereas obese persons have a BMI>30.

⁵ The results stem from the most recent (2005) Health and morbidity survey (SUSY), which monitors the development in Danes' health, morbidity, health habits, contact to health care system, life conditions etc. SUSY-2005 is based on interviews with 14.566 persons and is representative at the national level.

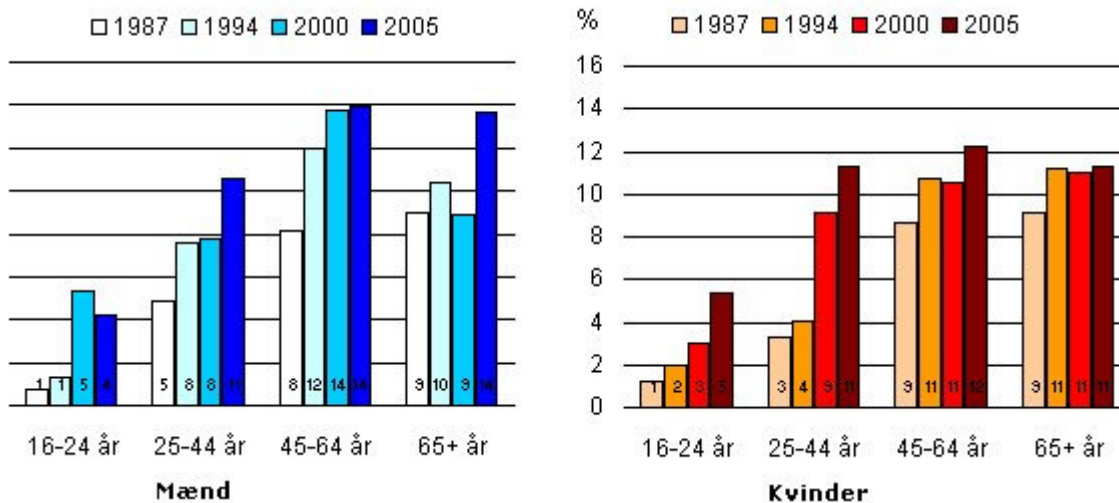


Figure 1: Development in the share (%) of obese adult Danes in the period 1987-2005, divided by age and gender

Source: Danish Institute of Public Health (2006)

The average obesity rate shows significant differences among socio-demographic groups. The fraction of obese people is higher among unskilled workers (with no training or only short-term training) and among low income groups. The growth rate of obesity is also larger among the unskilled groups (Richelsen et al., 2003). This is similar to findings in other countries (Nichéle, 2003 and Anderson et al., 2003). There are also differences across regions: The prevalence of obesity is larger on Sealand, whereas the Capital Region as well as the central part of Jutland exhibit prevalences that are lower than the national average. To a large extent, these differences can be explained by differences in diets (Groth and Fagt 2003). Nichéle (2003) finds that households where the main income provider has a lower-level or no education have diets that is higher in fats and cholesterol and lower in vegetables and fruits than the average household. There is also a growth in obesity among children and teenagers. This development may be caused by the consumption of unhealthy food and a high consumption of sugar (see table 1) in combination with too little physical exercise (Larsen 2003).

Economic costs related to overweight and obesity comprise

- private and public health care costs related to diseases and health problems caused by obesity (cardiovascular diseases, diabetes 2, etc.) (direct costs)
- costs of production lost due to reduced productivity as consequence of absenteeism and premature death (indirect costs)
- missed opportunities, lower quality of life and psychological problems (intangible costs)

Recently, the Danish Institute of Public Health (SIF) has estimated the overweight-related net health care costs at almost 1.5 billion DKK per annum (approximately 0.1 per cent of GDP), and costs of productivity loss at between 2.1 and 6.3 billion DKK per annum (0.14-0.4 per cent of GDP), depending on assumptions about the difficulty of replacing persons who leave the working force due to illness or death – the more difficult, the higher production loss. SIF estimates the health care costs to be a lower-end estimate, as some treatments (e.g. emergency rooms) could not be included. The total costs of health care and production loss could thus be estimated to lie somewhere between 0.25 and 0.5 per cent of the GDP. The magnitude of intangible costs was not estimated.

Corresponding estimates have been provided for a range of countries. Some of these estimates are summarised in table 3.

Table 3. International estimates of economics costs of obesity (BMI>30)

	Direct cost		Indirect cost		Total cost		
	US\$ PPP per capita	per cent of health expen- diture	per cent of GDP	US\$ PPP per capita	per cent of GDP	US\$ PPP per capita	per cent of GDP
Belgium (1999)	69	3	0,2				
France (1992)	115	6	0,5				
France (1992)*	212	10	0,9				
Germany (2001)	17-35	1		17-38			0,1-0,3
Netherlands (1999)	32	2	0,1				
Sweden (2003)	45	2		157			0,7
Switzerland (2001)**						186	0,6
United Kingdom (2002)	25-31	4		58-65			0,3-0,4
European Union (2002)							0,3
United States (2000)	199	9		183			1,2
Canada (2001)	41	2		70			0,4
New Zealand (1991)	26						0,2
Japan (1995-98)	55	0,2					0,01
Denmark			0,1		0,14-0,4		0,25-0,5

Source: WHO (2006): The challenge of obesity in the WHO European Region and the strategies for response, table 1

* BMI > 27

** BMI > 25

The figures in the table suggest that the estimates for Denmark (in terms of percent of GDP) lie within the range spanned by corresponding estimates for other countries like Germany, United Kingdom, Canada, Sweden and United States. The cost estimates for France are somewhat higher than for most of the other countries considered. As the costs for France

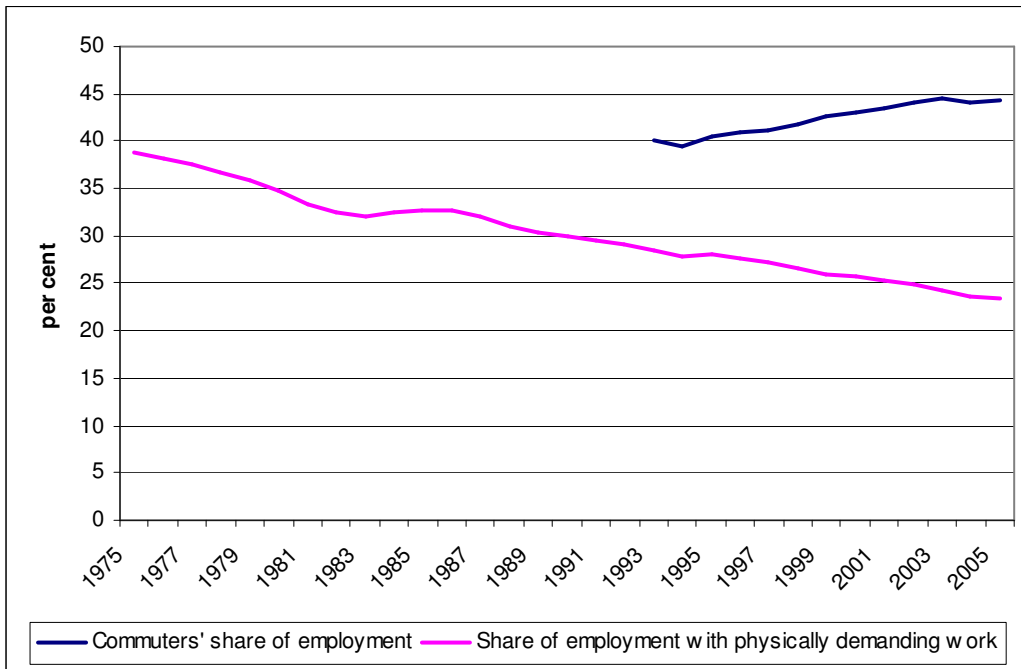
have been calculated with 2 different BMI-limits, it is possible to estimate the significance of this limit, and hence the contributions from obese and moderately overweight people, respectively. Thus, the results for France suggest that the moderately overweight people contribute almost as much to health care costs as obese people.

3. Impacts of the economic-political setting for food consumption, nutrition and overweight

3.1 General technological, economic and social trends in society

According to Miljkovic (2006), several economists have investigated why obesity rates are rising among Americans. The observed increase in obesity rates in the United States stem from technological change occurring in the last century and have resulted in calories becoming relatively cheaper, while exercise has become relatively more expensive. Individuals have maximized their utility subject to this new budget constraint, and that resulted in higher body mass indexes.

Physical activity is not a natural part of everybody's everyday life to the same extent as earlier. The extent of physical activity is related to working activities, including the type of work as well as the transportation from home to the workplace. The employment structure in the Danish economy has changed towards a lower share of the employed people working in sectors with physically demanding work (in the present study defined as agriculture, fisheries, manufacturing and construction), and a higher share employed in trade and service sectors, as illustrated in figure 2. It should however be noted that conclusions should be drawn carefully from this curve, as the prevalence of overweight and obesity is relatively lower among the higher educated (which are also those working outside the physically demanding sectors). The slope in the figure probably underestimates the rate of decrease in work-related physical activity, as work in these 'physically demanding' sectors has undergone considerable technological developments, so the work in these sectors is now less physically demanding than was the case in the mid-1970's.



Source: www.statistikbanken.dk

Figure 2. Structural trends affecting work-related physical activity

In addition to the development in employment structure, a development towards longer distances between home and workplace has also taken place, and has materialised in an increased extent of commuting (defined as working in a municipality different from the home municipality), as illustrated in figure 2. Hence, the share of employed people working within walking or cycling distance is decreasing.

3.2 Prices and tax conditions and their impacts on food consumption and nutrition

The importance of market conditions and hence the demand and supply relations for food consumption is illustrated in figure 3 in two scenarios (A) and (B). Assume that an initial equilibrium situation occurs in which supply equals demand at the quantity Q^* and the market price P^* . Then assume that an upward shift in supply conditions is imposed (scenario A), for example introduction of a new tax on the product, an increase in production costs or reduced competition among suppliers, which will imply that suppliers will require a higher market price to supply a given quantity than before. Such an upward/leftward shift in the supply curve leads to higher equilibrium market price and lower equilibrium demand, because consumers substitute the now more expensive products with other (now relatively cheaper) products, or reduce their total consumption due to reduced real consumption budget.

Alternatively, assume a shift in demand (scenario B), for example due to an increase in consumers' incomes, shift in preferences or withdrawal of a close substitute to the product from the market. Such a shift may increase consumers' willingness to pay for the commodities (for given quantity), hence affecting the equilibrium price and demanded quantity of the product.

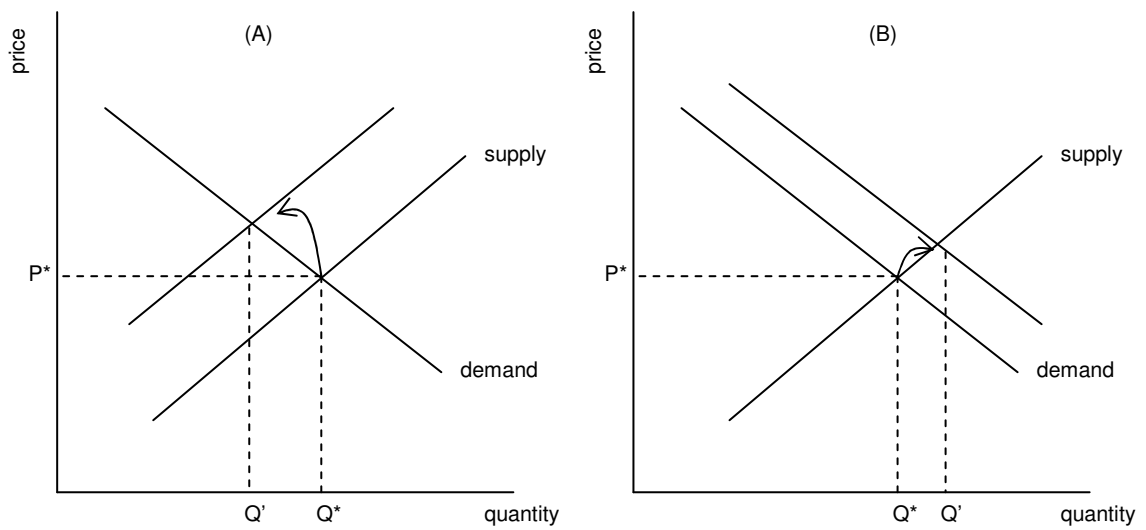
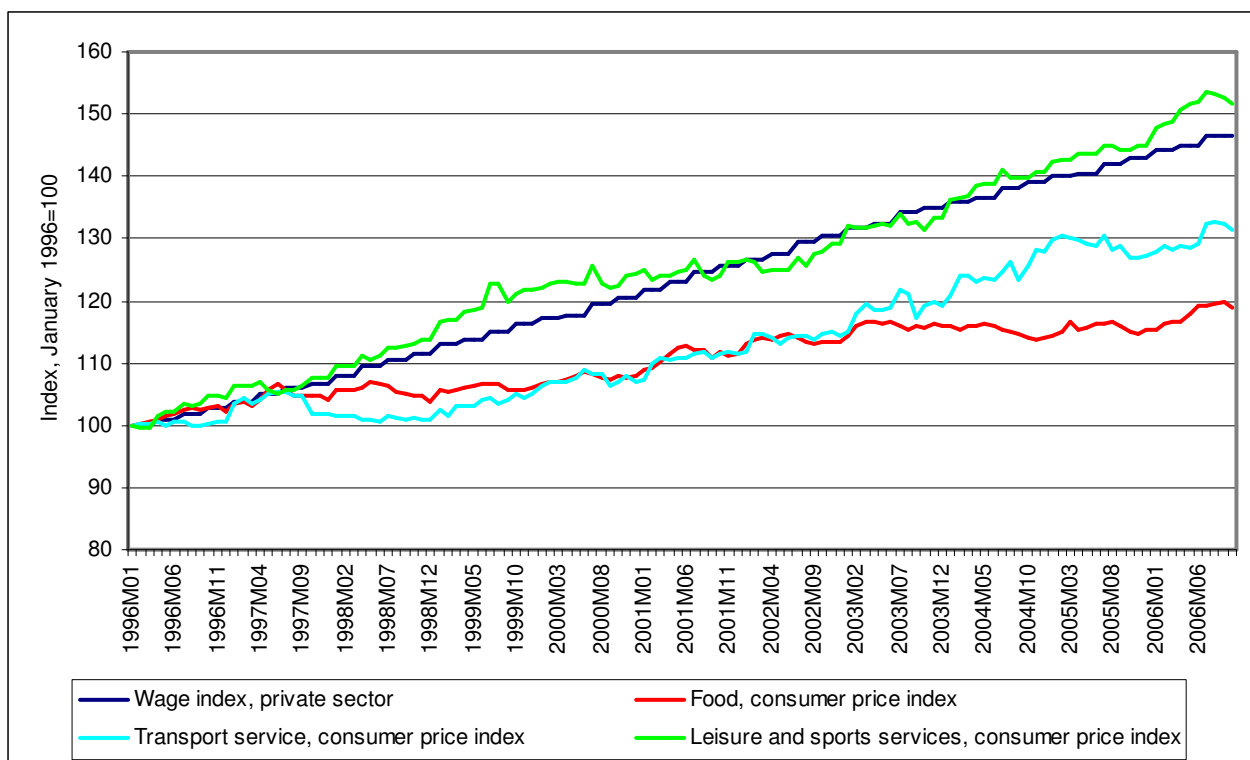


Figure 3. Impacts of price support on supply and demand

Such shifts in market conditions may affect the economic incentives of consumers (and suppliers) of foods and hence the demanded quantities of various foods. However, the extent of such impacts depends on the price responsiveness of supply and demand – the more price responsive, the larger the quantity response. An often applied measure for the price sensitiveness is the price elasticity measure. On the demand side, the price elasticity represents the percentage shift in demanded quantity if the price increases by one per cent. As is demonstrated in section 5, the price responsiveness has important implications for the choice of policy interventions, if such interventions aim at modifying the diet of the population.

It is well known that food production has undergone significant productivity changes through the last decades. This trend may be assumed to have led to a downward/rightward movement of the supply curves for food commodities, thus lowering the equilibrium food prices (relative to other goods, cf. figure 4) and stimulating the demand for food relative to other goods. On the other hand, other trends in society (e.g. increased concentration in processing and distribution of foods, as well as e.g. the agricultural and food policy) may have drawn the supply curve in the opposite direction.



Source: www.statistikbanken.dk

Figure 4. Relative price development of foods, transport services, and leisure/sports services, 1996-2006.

As appears from figure 4, the prices of foods and transport services have increased at a slower rate than e.g. prices of leisure and sports services⁶, where the latter has to a large extent followed the wage rate growth in the private sector. Hence, relative to working time, foods and transports have become cheaper, relative to working time, whereas sports and leisure activities have become more expensive relative to foods and transports services. Although the extent of sports and leisure activities may have increased, it is likely that they would have increased more, if their prices had developed similarly to the food prices. As a consequence, the price developments have enhanced the economic incentives to increase the use of foods and transport services, whereas the economic incentives to increase sports and leisure activities have not been strengthened to the same extent.

3.3 The Common Agricultural Policy

Since the establishment of the European Economic Community/European Union, the Common Agricultural Policy (CAP) has involved support to the production of a number of food commodities and hence had implications for the price formation on these food commodities. From the 1950's and until the early 1990's, the CAP was based on price support ensuring higher prices on the internal market than on the world market for many agricultural products. The instruments to achieve this goal have included tariffs on imports, subsidies for exports and market interventions. The effects of price support on the internal (EU market) are illustrated in figure 5.

⁶ It should be noted that the price index of leisure and sport services may reflect changes in the composition of these activities over time.

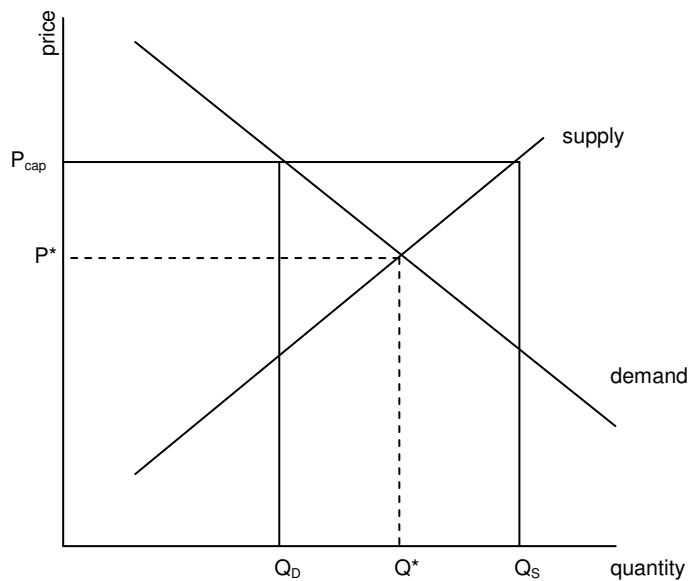


Figure 5. Impacts of price support on supply and demand

Equilibrium between supply and demand in the absence of price support is represented by the equilibrium price P^* and the equilibrium quantity Q^* . However, if some price support intervention is assumed, the market price may be raised to P_{cap} . At this price level, consumers have the incentive to consume the quantity Q_D , whereas the suppliers have the incentive to supply the quantity Q_S . The difference $Q_S - Q_D$ can be considered as excess production that will have to be removed from the market, either by destruction or by export enabled by means of export subsidies.

It should be mentioned that since the early 1990's, the CAP has been reformed a number of times in the direction of reducing the extent of price support and replacing this support by direct payments, and thus to a lesser extent affecting price formation on the internal market. However, some of the problems from the price support system are still inherited in the current agricultural policy.

For food products for which consumption should be promoted for health reasons (e.g. fruits, vegetables), the price support policy can be considered as inappropriate, whereas for other food products, for which consumption should be reduced for health reasons, the price support to some extent supports this goal.

In table 4, the impact of the European Union agricultural policy on consumers' food expenses are estimated in terms of the Consumers' Subsidy Equivalent (CSE⁷) indicators for individual commodities (OECD, 2006). The indicator measures the degree of support to the consumers, measured as a percentage of the commodity price at farm gate. Thus, a negative CSE implies that consumers are imposed an economic burden from the policy, normally in terms of higher commodity prices. For example, the CSE value at -3 for common wheat in 2005 implies that consumers' payment for one kg wheat is higher than would be the case if wheat could be purchased at the prevailing world market price. The extra payment amounts to 3 per cent of the farm gate price of wheat. This is not necessarily the same as 3 per cent of the consumer price, as the consumer prices also include costs of processing and distribution, as well as price mark-ups in various stages of the supply chain.

Table 4. Consumer Subsidy Equivalent (CSE) estimates in the European Union, measured as per cent of farm-gate "consumer price"

Commodity	1991	2005	Commodity	1991	2005
Common wheat	-34	-3	Tomatoes	0	-5
Durum wheat	-52	0	Wine	-8	-1
Maize	-9	-4	Milk	-52	-24
Barley	-13	0	Beef	-61	-41
Oats	-4	-5	Pork	-17	-16
Rice	-58	0	Poultry meat	-45	-45
Sugar	-66	-59	Sheep meat	-56	-22
Potatoes	-14	-8	Eggs	-11	-4

Source: OECD (2006)

The table indicates that the Common Agricultural Policy in 2005 tends to raise the prices of sugar, meat and milk substantially, whereas the EU-internal prices of commodities like grains, wine and eggs are only moderately affected by the policy in 2005. The price of pork and poultry meat is also increased due to the CAP, as an indirect consequence of the support to grains. As mentioned above, the CAP has been subject to a number of reforms in the period 1991-2005. This is reflected in the CSE-estimates for grains, beef, sheep meat and dairy products, where the extent of consumers' economic loss (in terms of policy-induced high food prices) has decreased significantly during this period. The price support for sugar was not reduced much in the considered period, but the sugar sector is currently under a

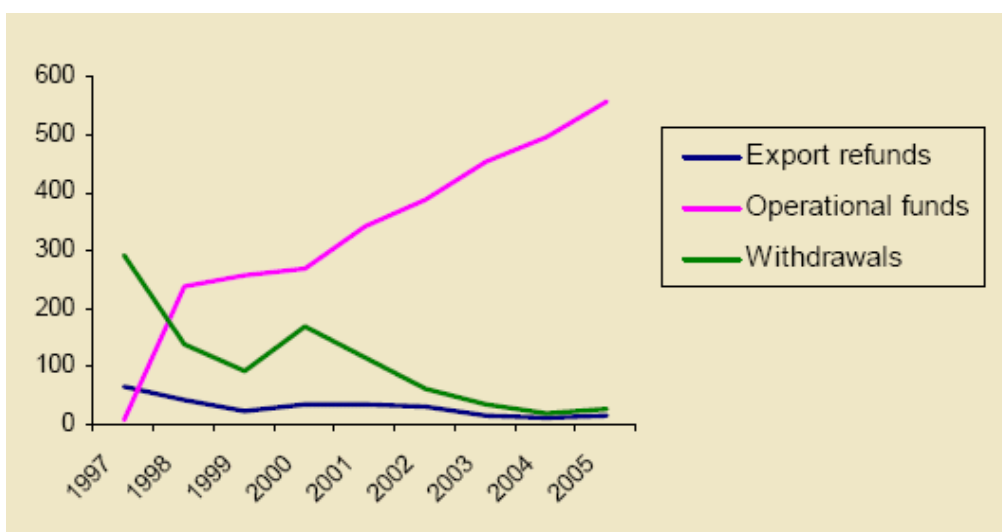
⁷ The CSE indicator is calculated as

$$CSE = 100 \cdot \frac{\left(\frac{\left(\begin{array}{c} \text{transfers from taxpayers} \\ \text{to consumers} \end{array} \right) - \left(\begin{array}{c} \text{transfers from consumers} \\ \text{to producers} \end{array} \right) - \left(\begin{array}{c} \text{other transfers from} \\ \text{consumers} \end{array} \right)}{\left(\begin{array}{c} \text{value of consumption} \\ \text{(farm gate)} \end{array} \right) - \left(\begin{array}{c} \text{transfers from taxpayers} \\ \text{to consumers} \end{array} \right)} \right)$$

reform, which is expected to lead to a considerable reduction in the level of price support for sugar. Also for dairy products, the level of price support is expected to decrease in the coming years due to the implementation of the 2003-reform of the CAP.

The market policy ensures a certain price level for producers of *fruits and vegetables* through withdrawal instruments. For 16 products (lemons, satsumats, clementines, mandarines, oranges, watermelons, melons, aubergines, pears, peaches, nectarines, apricots, grapes, apples, tomatoes and cauliflower), organised members of producer organisations may benefit from EU withdrawal compensation (i.e. they can withdraw products from the market in order to reduce supply and hence maintain high price levels) up to certain withdrawal ceilings (Elinder, 2003). Withdrawn products can only be used for certain purposes and must not disturb the market. Hence, these withdrawn products can not be used for human consumption, except some charitable purposes. Due to the withdrawal mechanism for fruits and vegetables, the supply of these foods to the market becomes restricted, leading to higher average prices and lower consumption.

During the last decade, these withdrawals have been reduced in two ways – reduction in the quantity that can receive withdrawal compensation, and reduction in the withdrawal compensation rates (Elinder, 2003). The funds for withdrawal schemes have been redirected to co-financing of operational programmes with the aim of improving producer organisations’ performance and skills in marketing, product quality and environmental considerations. The development in the CAP budget for market support to fruits and vegetables is illustrated in figure 6.

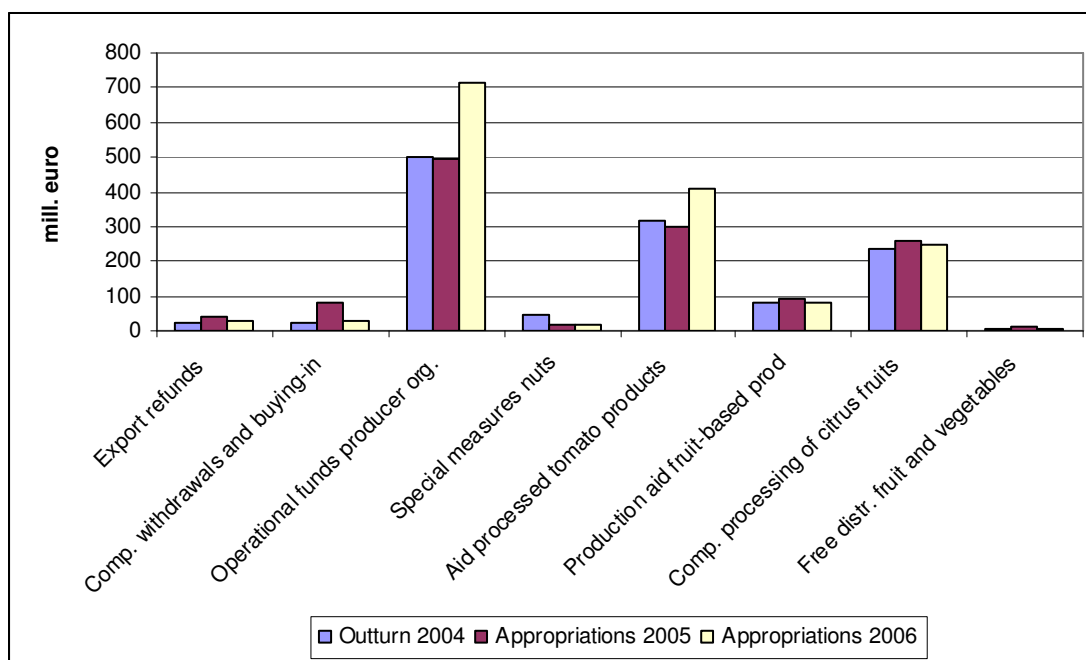


Source: European Commission

(http://ec.europa.eu/agriculture/capreform/fruitveg/presentations/cmo_mfb2_rev.pdf)

Figure 6. Development in the CMO for fresh fruits and vegetables, mill. €.

The observed downward trend in support for market withdrawal of fruits and vegetables may be expected to put a downward pressure on the market prices of fruits and vegetables, thus potentially leading to a stimulation of the consumption of these food products. Unfortunately, it has not been possible to verify this expectation on empirical data, as such consumption data are not available.



Source: European Commission (http://eur-lex.europa.eu/budget/data/D2006_VOL4/EN/nmc-titleN123A5/nmc-chapterN50452281327-264/index.html#N50452281327-264)

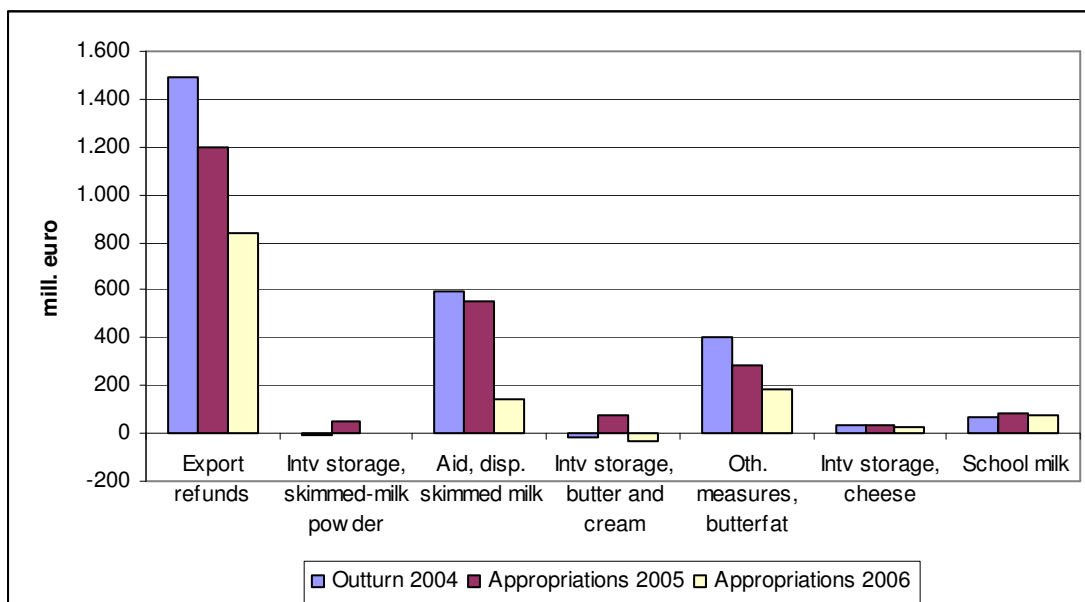
Figure 7. EU EAGGF budget allocation for market support, fruits and vegetables, 2004-2006

The allocation of the EU budget for market support to fruits and vegetables in 2004-2006 is shown in figure 7. As is also illustrated in the previous figure, operational funds in order to enhance the performance of producer organisations as well as financial support to the processing of selected fruits and vegetables are the major components in the market support, whereas withdrawal schemes and export refunds play minor roles. As the figure illustrates, the budget also allocates funds (5-10 million euro per year) for free distribution of fruits and vegetables.

Dairy products is one of the major sources of saturated fat in the European diet, and hence a risk factor in the development of obesity and related health problems. Like for fruits and vegetables, the common *dairy policy* in the European Union implies supporting the producer price of milk and dairy products. This is ensured by quotas on milk production, which limits the supply to the market and hence induces higher prices. However, despite the quota regulation, the supply still exceeds the demand at the EU level at the internal market

prices, in that the total EU-domestic use of butter and cheese constitute around 95 per cent of production, whereas total EU-domestic use of skimmed milk and whole milk powder constitute 25 and 50 per cent of EU-domestic production, respectively (Eurostat).

In order to dispose of the excess supply, a number of disposal schemes have been implemented, including subventioning export of dairy commodities outside the Common Market, import duties, as well as measures to increase the domestic consumption of dairy products, including support for school milk schemes, subsidies for industrial use of milk fats, support for the purchase of butter by non-commercial institutions and organisations and promotion aid for milk and milk products. Some of these schemes thus channel the milk fats back to the consumers through industrially processed foods (Elinder, 2003). The EU budget allocation for various market support measures is displayed in figure 8. Hence, export refunds constitute the major component (65 per cent in 2006) in the support schemes for dairy products, but aid for disposal of skimmed milk, measures other than storage to dispose of butter fats, and school milk support also play significant roles (in total around 30 per cent), whereas intervention storage plays a minor role in the budget. Export refunds aid the removal of milk fats from the European market. On the other hand, “measures other than storage for disposal of butter fats” (14 per cent of the market support budget) - and to some extent school milk support - aim at stimulating the domestic use of these milk fats for human consumption, thus imposing an increased risk of too high saturated fat intake.



Source: European Commission (http://eur-lex.europa.eu/budget/data/D2006_VOL4/EN/nmc-titleN123A5/nmc-chapterN50452281327-264/index.html#N50452281327-264)

Figure 8. EU EAGGF budget allocation for market support, dairy products, 2004-2006

Due to existing commitments, as well as expected future stronger requirements, in the World Trade Organisation (WTO), the pressure on the use of export refunds to dispose of EU dairy products is increasing and is expected to increase even more, which potentially calls for reductions in milk production or (perhaps less likely) increase of the measures to dispose of dairy products on the internal market.

As is apparent from figure 8, the Common Agricultural Policy has already adjusted to this pressure through the 2003 reform of the Common Agricultural Policy, which has implied reductions in the intervention prices for butter and skimmed milk powder, thus lowering the guaranteed producer price of milk and dairy products (and hence reducing the wedge between domestic and world market price triggering the subsidy rates per unit of dairy product), and possibly improving the balance between EU-domestic supply and demand of dairy products. It should however be noted that the reform is not expected to reduce the milk production significantly (rather to increase it as the milk quota have been expanded slightly in 2005-2007 as part of the reform), but the lower prices of dairy products resulting from removal of price support may be expected to increase domestic demand, compared with the former policy regime.

4. Marketing of food to children and youth

Energy surplus can be caused by many factors in our modern lifestyle, including easy access to cheap and unhealthy food and a low daily level of physical activity. Especially obesity among children is a source of concern as obese children tend to become obese adults. To limit children's intake of unhealthy food, stricter rules for TV advertising that target children is one of the recommendations outlined in 'The national action plan against obesity' (Richelsen et al., 2003).

The purpose of the present section is to give an overview of the extent and effect of television advertising for unhealthy food aiming at children and young people in Denmark. It has been the intention to focus on Danish surveys, however parallels have been made to foreign studies when necessary due to a limitations in Danish sources.

Types of marketing and existing legislation

Different types of television advertising exist. The most well known way is to place the commercials in blocks between two programmes. This type is called 'block-advertising' and each block is introduced and finished in a way easily recognized by the viewers. Another type of commercials is showed by interrupting the programme in certain time intervals. This

type is called 'break-advertising'. Due to new technologies, which allow the viewers to skip these two types, product placement appears with increasing frequency in the media. Product placement is the use of logos or objects in movies, television programmes, etc (Hawkes, 2004).

Various European governments have taken different approaches to regulate the promotion to children. In both Norway and Sweden marketing to children less than 12 years old is banned (Hawkes, 2004). A different approach has been taken in Denmark where companies instead are encouraged to self control. However some rules do apply. According to the existing Danish legislation the marketing to children should respect that children are more naïve and less critical towards new information than adults (Lov om markedsføring, 2006). Especially the promoting of unhealthy food must not give the child the impression of the products being healthy or undermine a healthy diet (Forbrugerombudsmanden, 2006). In 2001 the former agreement between TV 2, TV Danmark and the government of no advertising 1½ minute before and after children's programmes were cancelled (Mikkelsen, 2001). Despite the upcoming legalisation of product placement in the European Union by January 2007, a ban of product placement is still meant to be maintained in Denmark. However, it is only possible to regulate channels transmitting from Denmark while the increasing numbers of channels from foreign countries are not subject to the Danish legislation. Another aspect is that many children are frequent and qualified users of electronic equipment as internet, cell phones, etc, which are hard to regulate.

The extent of marketing

How exposed are Danish children to commercials transmitted on television? Television advertising in Denmark is actually a relative new phenomenon, which began in 1988 with the introduction of TV 2. According to a description made by Mediesekretariatet (2005), an increasing number of advertisements are transmitted to Danish TV viewers. In 2001 children saw four spots on average each day while this number in 2004 was a little higher than ten. Four of those were shown at TV 2 while 0.8 at TV Danmark. Approximately half of the commercials seen by children were thus transmitted on channels beyond Danish regulation.

How many of the spots watched by children are for unhealthy food? In order to answer that question one has to know that in total a little less than one out of ten of the commercials shown on TV 2 in 2004 were transmitted around programmes aiming specifically at children. With respect to the content of these commercials, advertising for both toy and chocolate/sweets was centred on the children's programmes. Commercials for these

products were overrepresented around children's programmes as 73% and 22% of the commercials for respectively toys and for chocolate/sweets were shown here. As another indication of problems with the advertising presented to children, Matthews et al. (2004) state that almost all of the commercials for food targeting children are for unhealthy products high in fat, sugar, or salt.

The influence of marketing

Children's ability to distinguish a commercial from the programme is developed when they are around seven years old. However the child has to be approximately 12 years old in order to understand the deeper purpose of the advertisement. The exact age depends on the child and on factors as the parents' attitude towards advertisement, whether the subject is discussed at school, etc. The more integrated the product is in the programme, the harder it is to recognize the intention. Block advertising is the most easily recognized, while product placements are more complicated as the products are presented as an integrated part of the programme (Tuftte, 1999). Furthermore Tuftte (1999) concludes that a certain learning affect is observed, so children become more critical towards commercials the more they see.

The large amounts spent on advertising are an indication of the companies' expectation about increasing demand for their products. Children's purchasing behaviour, or pestering, is actually affected by advertising (Tuftte, 1999). The extent of the effect depends on whether the child actually wants the product and on whether it remembers the commercial. Children are often better to remember narrative sequences, humour, and commercials where other children appear.

Studies from Denmark

A report made by Nordisk Ministerråd (Brusch et al., 2006) investigates the effect of marketing towards young Danes between 12 and 16 years old. The overall conclusion is that young people in Denmark are competent consumers able to see through the underlying agenda of marketing. However, some differences exist between different sources of marketing. 62% of the 320,000 questioned young people find it easy to recognize product placement as advertising while 11% find it hard to recognize it. According to the results the hidden advertising in "chat robots" is the most difficult to recognize while product placement in computer games is the easiest.

Based on interviews with 300 children between 3-18 years old, Pilgaard (2005) concludes that promoting to children and young people has influence on the consumption and furthermore notes that this influence decreases with the age of the child. Three out of five of

the children 3–18 years old regularly desire the products they see advertised. This share has decreased to 1 out of 2 for the 9-12 year-olds and to one out of three of the teenagers spanning the age range 13-18 years old.

In 1997 an analysis of Danish children's attitude to promotion of products for children in television were carried out (GfK, 1997). In total 40 children in the age 5-11 years old and their parents participated in the survey. The conclusions were that children are capable of distinguishing advertising from the programmes. For children in the younger age groups this was easier for block advertisements than for break advertisements. Some of the parents experienced more pestering after the children had watched television.

Studies from other countries

An extensive review of the existing literature on effect of marketing to children is carried out by Hastings et al. (2003) for the Food Standard Agency in the United Kingdom. The authors conclude that even though the majority of the food advertising is for unhealthy products⁸, it only has little influence of the children's general perception of what constitutes a healthy diet. Despite this basic knowledge about nutrition the advertising does have an effect on the food preferences and actual purchasing behaviour. Furthermore, a link between television viewing and an unhealthy diet and obesity was established. However it is uncertain whether this is simply being the result of a low level of physical activity and unhealthy lifestyle. A clear evidence of correlation between food advertising and obesity was not found.

In a recent report (McGinnis et al., 2006), a systematic review of the scientific literature on the impacts of food marketing to children and youth is conducted. In general, the review finds that the majority of studies provide significant evidence that television advertising stimulates the preferences and purchase request for high-caloric and low-nutritional foods, mainly among children at the age 2-11 years, whereas the evidence is weaker for teenagers. The review also finds a moderately significant influence of television advertising the usual dietary intake of the youngest children (2-5 years), a weaker influence for older children, and weak influence that it does not influence the usual dietary intake of teenagers 12-18 years.

5. Welfare economic consequences of consumers' choice of food and policy intervention

⁸ A finding that is also documented by e.g. Wilson et al., (1999) for New Zealand

The purpose of this section is to provide an overview over the welfare economic consequences of consumers' choice of food and some aspects of policy intervention. We provide a review of studies that have estimated the social economic effects of changes in food choice – in particular in relation to obesity but also in relation to other food related health aspects.

Table 5 provides an overview of the scientific evidence surveyed by the Danish Institute of Public Health (2006).

Table 5. Diet related risks of obesity, diabetes 2, cardiovascular diseases and cancer

	Obesity	Diabetes-2	Cardiovascular disease	Cancer
Sugar	-	-	-	Positive relationship between sugar intake and risk of colorectal cancer
Fat			Relative risk of heart disease increases by 1% for each percentage point fat E% in excess of 30%. 9% of total deaths of ischaemic heart disease is attributed to this.	
Saturated fat		Saturated fat is associated with higher risk of diabetes 2. Large intake of polyunsaturated fats may lead to lower risk of diabetes 2. The same seems to be the case for monounsaturated fat	The risk of heart disease increases 3% per E%-point exceeding the recommended maximum of 10%. About 22% of the deaths by ischaemic heart disease could be attributed to this.	
Trans fat			The risk of heart disease increases by 10% per unit increase in the E% stemming from trans fat.	
Fruits and vegetables			There is scientific evidence that an increased intake of fruits and vegetables by up to 800 g/day may reduce the risk of stroke by 30%. The risk of ischaemic heart diseases is reduced by 4% per 80 g increase in the intake of fruit and vegetables. An increase in the daily intake of fruits and vegetables from 250 to 500 g may improve the expected life expectancy by up to 1.1 year	Fruits and vegetables may reduce the risk of cancer in lungs, stomach, intestines, bladder, mouth and gullet.

Source: Danish Institute of Public Health (2006), pp. 195-202

A recent study by Koch & Laursen (2006) has also surveyed the scientific evidence for the impacts of food intake on ischaemic heart disease, stroke, gastric cancer, colorectal cancer, lung cancer and breast cancer. Table 6 provides an overview of their findings, measured in terms of relative risks, i.e. ratio of the risk of a disease for those exposed (e.g. those not complying with nutritional recommendations) relative to the risk of those not exposed (i.e. those complying with recommendations). For example, if the risk of ischaemic heart disease for people eating more than the average amount of fruits and vegetables is 4 per cent lower

than for those with a less than average intake of fruits and vegetables, the relative risk is 0.96.

Table 6. Literature results concerning relative risks (RR) of increased intake of selected foods and nutrients

	Ischaemic heart	Stroke	Gastric cancer	Colorectal cancer	Lung cancer	Breast cancer
Fruits and vegetables	0.88-0.96 (3)	0.73-0.94 (5)	0.18-0.94 (3)	0.73-0.81 (2)	0.70-0.96 (3)	0.77 (1)
Fibres	0.64-0.86 (3)			0.51 (1)		
Fat	1.01 (1)					1.17 (1)
Saturated fat	1.03 (1)					1.18 (1)

Source: Koch & Laursen (2006)

Notes: Parentheses: number of studies referred

In cases with more than one study, the presented relative risks may refer to different levels of exposure

It should be noted that for all the considered health effects, the relative risk associated with higher intake of fruits, vegetables and fibres is less than one, indicating that the risk of getting these diseases are lower for those with a high intake. On the other hand, the relative risks for fat and saturated fats are higher than one for ischaemic heart diseases and breast cancer, indicating that a higher fat intake leads to higher risk of these health problems.

The case for public intervention

Cutler, Glaeser, and Shapiro (2003) point out that, according to the standard economic model, the resulting obesity is not necessarily viewed as a bad outcome. People make choices and if they choose to eat more and exercise less in the face of the current environment and circumstances, it must be because that makes them happier than eating less and exercising more. The implication of this simple economic analysis is that there is no reason to intervene with policies to reduce obesity, since it is merely the outcome of individuals pursuing their own self-interest.

There are, however, several reasons why one should not endorse the standard economic model's laissez-faire implications when it comes to obesity. First, the standard economic model requires well-informed individuals who are free to make their own choices. We have already seen that a large number of children are either obese or overweight. Children, generally speaking, rarely purchase their own food or determine what is for lunch or dinner neither at home nor at school.

Second, if overweight and obese people consume more medical care, and if much of that medical care is paid for by society rather than the individual, or if overweight and obesity leads to reduced labour supply or productivity, then there is a negative externality associated with high rates of being overweight or obese.

Finally, Cutler, Glaeser, and Shapiro (2003) argue there might be internalities or costs borne by individuals themselves because of their higher weights. These internalities exist in the presence of self-control or addiction problems: people would like to eat less than they do, but have difficulty limiting their consumption. They are similar to externalities because they result from individuals when they are consuming food, not internalizing the impact on their future happiness.

According to Miljkovic (2006), economists may care about policy interventions to address obesity for at least one more reason. The government already intervenes in people's lives in many ways that may have intentional or unintentional consequences for their weight. Public spending on transportation or parks, for instance, may affect the amount of exercise people get. The USDA's Food Guide Pyramid (2005) provides the government's definition of a healthful diet. This, in turn, affects the food that schools serve to children. Education policies affect physical education requirements in schools. Also, economic and social policies may have direct or indirect effects on parents' labour supply, thus potentially affecting the amount of time they have to oversee their children's diet and exercise, Miljkovic (2006).

Measuring the welfare effects of changed food choice

It is an ongoing debate how to measure health risks and changes thereof. Basically, public decisions regarding health risks can be based on non-economic analyses of the health-improving effect or on economic valuations of health improvements. The economic valuations of health risk reduction can further be divided into cost effectiveness analyses (where costs per unit of health risk reduction are estimated) or cost benefit analyses (where health risks reductions are assigned monetary values), Kuschler & Golan (1999). In medical decision making, cost-effectiveness analyses are carried out more often than cost benefit analyses. Elixhauser et al. (1993) have estimated that about two-thirds of analyses of health-related technologies, services, and programs are cost-effectiveness analyses. An overview is provided in box 2.

Box 2**Non economic analyses**

- DALY (Disability Adjusted Life Years)
- QALY (Quality Adjusted Life Years)

Economic analyses

- Cost effectiveness
- Cost benefit
 - Cost of illness
 - Willingness to pay for health risk reductions

An example of a non-economic analysis is found in Koch & Laursen (2006). The burden of illness can be estimated using DALY's (Disability Adjusted Life Years) which is an epidemiological measure for loss of 'healthy life years' due to premature death and loss of 'healthy life years' due to an illness or health risk compared to a situation without this illness or health risk. Hence, DALY captures morbidity and mortality in an aggregate measure. Furthermore, age at time of death and the severity of the illness are captured in the estimations (p. 18, Koch & Laursen, 2006). WHO often use DALY's as a measure of health status of a population.

Using QALY (Quality adjusted life years) as a measure of health status is a refinement of the DALY measure where a life year is 'quality adjusted' Annual changes are expressed on a scale from 0 to 1, with 0 representing no improvement in health in the given year and 1 representing an ideal health situation in that year. Hence, a QALY measure counts annual program-induced health changes over an individual's lifetime. A description of QALY is found in Kuschler & Golan (1999) p. 40.

The economic costs of health risks can be measured by estimating the costs of illness or by estimating society's willingness to pay for risk reduction. According to the cost-of-illness method (henceforth, COI), the sum of the two types of costs (reduced public health costs and improved productivity) are used as estimates of the costs of health risks. The public health costs include health care expenses such as physician visits and hospitalizations (sometimes called the direct costs, Kuschler and Ballenger, 2002). Productivity loss from human illness can be incorporated in the COI analysis in a rather straightforward manner by using estimates of the number of sick days and lost earnings during the period of illness. Also, productivity loss from premature death can be included in a COI analysis. This can be carried out by estimating foregone earnings or by using willingness-to-pay estimates of the

value of a statistical life (the value of productivity loss is sometimes called the indirect costs, Kuschler & Ballenger, 2002). One of the main criticisms of using the COI method to evaluate food safety policies is that calculating the costs of illness is not the same as calculating the value of risk reduction (Buzby et al., 1996, p. 9). Including the productivity loss from premature deaths reduces, but does not solve, this problem. In theory, the best estimate of the value of a reduction in health risk is obtained by estimating how much the population is willing to pay for reducing risks. However, a main obstacle concerning use of this method relates to the methodological issue of how to obtain reliable estimates. This brings the main advantage of the COI analysis into focus - the availability of reliable data.

It is important to keep in mind that the characteristics of health risk analysis differ markedly, depending on who the decision maker is and what are the objectives. Activities that count as costs (monetary as well as non-monetary) will differ, and the way in which health benefits are tabulated will differ, depending on which goal analysts (at least implicitly) embrace (inspired by Kuschler & Golan, 1999, p. 38). Such different perspectives are illustrated in table 7, including a listing of the aspects that are relevant from different perspectives.

Table 7. Relevant costs from different perspectives

Costs	Perspective		
	Health costs	Public sector	Societal Costs
Health costs (operational costs, health insurance, medicine, psychiatric costs, capital costs)	X	X	X
Public sector (wage loss refunds, ordinary and early-retirement pensions, care of elderly, tax revenue losses)		X	X
Intervention costs (campaigning costs, advertising, information, education, subsidies, tax reductions etc)		X	X
Other costs (own payment, production loss, transport time, time, inconvenience, social relations, distortionary effects and externalities)			X

Source: Gundgaard et al. (2002), table 5.1 p. 63

A study by Kuschler & Ballenger (2002) investigates some of the policy aspects related to obesity. They find that existing estimates of direct and indirect costs of illness confirm that overweight and obesity have a major effect on consumers' expenditures. Cost-of-illness estimates, however, are not the most appropriate measures to use in analyzing the costs and benefits of public sector programs intended to reduce the incidence of obesity. Estimates of direct and indirect costs of illness account for the shift in consumer expenditures from general consumption goods, savings and investment to medical goods/services and for the drop in productivity resulting from illness or premature death, but they suffer from two

important problems: they do not measure changes in income for the economy as a whole, and estimates of change in economic activity are not ideal measures of changes in societal well-being — no matter how thorough or accurate. For example, direct costs for medical services indicate a redirection of economic activity but do not correspond to a drop in income for the economy as a whole. Further, direct cost estimates do not include defensive expenditures, such as expenditures on weight-loss programs. Cost-of-illness estimates include only marketed goods and services, that is, those with an observed market price, but not the considerable value of pain and suffering associated with disease and thus fail to account for social well-being. The usual cost-of-illness estimates include direct costs incurred across the entire population, but indirect cost estimates leave out the well-being of people outside the paid labour force, including housewives, the retired elderly, and the infirm. Since these groups have no earnings that might be compromised by their inability to work, changes in their health status have no impact on the indirect component of cost-of-illness estimates. As workforce status and earnings vary systematically with age, race and gender, estimates of indirect costs will also vary along these lines, potentially leading to the untenable conclusion that obesity is more costly for some subpopulations than others.

An estimate of the gains from improved diets

Taking departure in the epidemiological findings summarised in table 6, as well as data on the disease burden related to the considered diseases, it is possible to obtain a rough estimate of the disease burden consequences (e.g. measured in terms of DALY's) of changing food consumption patterns. Assume, for example, that the share of population complying with the dietary recommendations regarding intake of fruits and vegetables increases by 10 percentage points. Using the above relative risk estimates, this may lead to a reduction in the disease burden from cardiovascular diseases and various cancer types in Denmark between 2000 and 2500 DALY's per year, with a little more than half of the reduction taking place in the number of cancer occurrences. A slightly smaller reduction in disease burden may be obtained if the share of population complying with recommendations concerning intake of fibres is increased by 10 percentage points, but with a slight majority of reductions in cardiovascular diseases.

Increased compliance with dietary recommendations concerning the intake of fats and saturated fats leads to more moderate effects on cardiovascular and cancer diseases. Hence, a 10 percentage points increase in the share of population complying with recommendations of maximum 30E% and 10E%, respectively, may lead to reductions in the disease burden at 250 and 350 DALY's per year, respectively, with the main effects on cancer diseases.

It should be noted that these calculations are very rough and only indicative due to a number of limitations. One limitation to the calculation is that it focuses exclusively on cardiovascular and cancer diseases, but omits other diseases like e.g. diabetes 2, where epidemiological parameter estimates have been less easily accessible. Furthermore, a number of less critical (in the sense of mortality and morbidity), but still serious health aspects are not taken into account. This may suggest that the above health impacts of increased compliance with dietary recommendations are underestimated. Secondly, it should be noted that overlaps may exist between the effects of different dietary improvements, for example between increased intake of fruits and vegetables and increased intake of dietary fibres. Hence, straightforward addition of the above effects may lead to an over-estimation of the total health effect. Third, a number of other dietary recommendations have not been assessed due to limited access to relevant epidemiological information (including intake of sugar and seafood). Compliance with these recommendations might be expected to reduce the disease burden further.

Assessing economic value to reduced disease risk is a highly controversial issue, as has been discussed in a wide range of the health economic literature. This study does not intend to go into a deeper discussion on the issue, but in order to illustrate some orders of magnitude we assume that the value of 1 DALY corresponds to the average professional income of 1 adult person, which is estimated to be in the area of 185.000 DKK per year (Statistics Denmark, Forbrugsundersøgelsen). Assuming this value, the above calculated reductions in disease burden resulting from a 10 percentage point increase in the share of population complying with dietary recommendations concerning intake of fruits, vegetables, fibres and fats is estimated to represent an economic value of 400-600 million DKK, depending on the assumed overlap between the different elements of the necessary adjustments. If the value of 1 DALY differs from 185.000 DKK, this estimate will differ from the above interval accordingly. As discussed above, this valuation represents only the average earning capability, but ignores welfare losses due to e.g. reduced social well-being and inconveniences. Hence, this estimate may be interpreted as a lower-end estimate.

Other estimates

The Danish Cancer Society has initiated an analysis of the health economic consequences of increasing the daily intake of fruits and vegetables. The analysis is documented in Gundgaard et al. (2002). The analysis focuses on estimating the effect on yearly number of human illness and expected life years from doubling the intake of fruits and vegetables. The most likely estimates and conservative estimates of health risk reductions are calculated for an increase from the intake of 250 g of fruits and vegetables to 500 g a day. Only cancer and

cardiovascular diseases are included as the relationship between the intake of fruits and vegetables and reduction in risk is well documented for these illnesses. For other diseases, the authors were not able to find well-documented quantifications of the effects of increasing the intake of fruits and vegetables.

The economic consequences of these health effects are described as benefits in terms of reduction in resources in the health sector due to lower prevalence of cardiovascular and cancer diseases (a positive effect) and increased costs due to increased life years and the related increased use of resources in the health sector (a negative effect). Health expenditures include hospital costs, costs of the family's general practitioner, dentists, physiotherapist, etc. It should be noted that the study by Gundgaard et al. is not a cost benefit analysis of social welfare as the consumer welfare (e.g. in terms of lost labour income) is not included and cost of interventions, such as information campaigns, commercials, larger variety of fruits and vegetables in canteens, tax reductions on fruits and vegetables or favourable conditions for the agricultural production, are not included either. (Gundgaard et al. 2002 p. 63, WCRF/AICR 1997 p. 546-547, Statens ernæringsråd 1998 p. 28-35). Furthermore, the time dimension is not included in their study.

In the base situation with an intake of fruits and vegetables of around 250 g per day, the costs to cancer and cardiovascular illnesses amount to 28,000 million DDK yearly. As a conservative estimate doubling the intake of fruits of vegetables to 500 g/day increases mean life time with 1.5 years in relation to reducing risks of cancer and cardiovascular illnesses, leading to an increase in the costs of the family doctor etc., dentists, physiotherapists etc. of 130 million DDK per year, whereas reduced occurrence of cardiovascular and cancer diseases leads to a decrease of 132 million DDK per year in hospital costs (DRG rates⁹). So the net effect on public health costs of doubling the intake of fruits and vegetables is close to zero¹⁰.

The Norwegian Council of Diet (Statens Ernæringsråd, 1998) published a report in 1998 on health economic advantages of increased intake of fruits and vegetables in Norway where they also included considerations and costs of how to stimulate this increased intake, and the time dimension and delay in when the health benefits would appear.

⁹ Diagnose Relaterede Grupper

¹⁰ On average, a cancer patient costs 31,000 DDK/year. This figure covers costs of around 90,000 DDK for the 1st year which drop to around 30,000 the second year and onwards, Gundgaard et al. (2002) p. 46. For cardiovascular patients, the costs are on average 35,000 DDK/year covering 56,000 the first year and then dropping to around 20,000 DDK/year. Survival rates for cancer and cardiovascular diseases are surprisingly identical, around 60 pct. after 1 year of diagnosis and 50 pct. after 3 years.

Frykberg (2005) estimates the effect of a transition from current dietary habits to those of a more sustainable nature on consumer's food costs. The cost estimates in the study are based on the dietary recommendations made in the report "Ett första steg mot hållbara matvanor" (A first step towards sustainable dietary habits) published by the Public Health Department at Stockholm County Council in 1999, which contains a concrete first-step proposal for how dietary habits should change in order to become more sustainable in the long term regarding health and the environment - "Första steget-maten" (First Step - Food [FSF]). The cost of eating in accordance with the FSF-proposal has been compared with the cost of current food consumption, which has been calculated in three different ways. The three different types of statistical data on current consumption used in the calculation are "Direct Consumption Data", "Household Expenditure 2003" and "Food Sales 2002", all of which are compiled by Statistics Sweden. Since none of the data currently available is directly comparable with FSF, the calculations in this report should primarily be seen as rough estimates. The results indicate a reduction in yearly food expenditure of approx. 15 per cent or about SEK 3,000 per person (not including additional cost of organic food), from 20.000 to 17.000 SEK. A prerequisite for the consumer to gain from the proposal is a 50-percent reduction in the intake of food that is unnecessary from a nutrition point of view, such as sweets, soft drinks, ice-cream, potato chips, alcoholic beverages, etc. This represents a cut in costs from the current level of nearly SEK 8,500 to about SEK 4,000. The proposal implies an increase in the costs for cereals and potatoes from about SEK 1,600 to around SEK 2,300. Furthermore, the costs for fruit and vegetables would be about SEK 4,500 compared to around SEK 2,600 prior to transition. A change in consumption according to the FSF proposal would provide scope for a consumption of organic products that is twice as high as it is today, without total costs being any higher. Therefore, the results indicate that sustainable food consumption does not need to be associated with higher food expenditure and that the consumer can save a considerable amount of money by reducing his/her consumption of low-nutritional items of the type mentioned above.

Policy instruments

Several suggestions have been made in order to reduce the fraction of people with intakes deviating substantially from dietary recommendations and thus counter the increase in obesity and associated health risks. Suggested measures include information campaigns, tighter rules for advertising, promotion of healthier eating at schools, modified food taxes or subsidies, etc. (Finkelstein et al., 2004). The existence of externality costs (i.e. cost for public health care) can be considered as the main argument for public intervention from a strictly economic perspective.

A key result from the economic literature on regulation is that the cost effectiveness of a policy instrument depends on the instrument's precision in targeting the considered problem. The more precisely the regulation targets the problem the smaller will the undesired substitution effect be (e.g. substitution from one unhealthy product to another), an effect which may undermine the effectiveness of the regulation. On the other hand, the cost-effectiveness also depends on the affected agents' possibilities to adjust to the regulation, and thus save costs. This relation is also valid with regard to regulating the diet in order to improve the future health of the population and the public health care costs. The more precisely the policy instruments can be directed towards the problem the more cost effective the policy instrument will be.

Information, labelling and promotion of healthy foods

Information instruments have so far been the most preferred policy approach to improving the diet of the population. As mentioned above, a set of fairly simple official dietary recommendations have been launched and disseminated by the Danish authorities, and some of the recommendations have been supported by more intensive information campaigns, e.g. to promote the intake of fruits and vegetables ("6-a-day") or fish or to reduce the intake of fats. According to Haraldsdottir et al. (2001), such campaigns have been effective in the cases, where they have been designed carefully with regard to people's normal dietary habits and hence provided recommendations that appear feasible in the every-day life. However, it is difficult and beyond the scope of the present analysis to assess the direct quantitative impact of these campaigns on the diets, as food consumption patterns have also been subject to trend developments.

Most foods in Denmark are labelled with nutritional information like total energy content, content of proteins, carbohydrates and fats. During recent years, it has been considered to introduce a more easily interpretable label, and hence make the nutritional information accessible to more consumers. Research from many countries suggests that consumers appreciate *nutrition labels* and find these labels supportive in food choice decisions. Nutrition labels have also been shown to encourage more healthful diets among people who read the labels. For example, a study in Australia and New Zealand finds that 30 per cent of food shoppers' choices are influenced by nutrition labels (Paterson et al, 2001). A US survey from 1995 found that 22 per cent of consumers started to buy a product because of information on a nutrition label, while 34 per cent stopped buying a product they used to purchase regularly. The level of fat was the most frequent cause of these changes (Parkwood Research Associates, 1995, cited in WHO, 2004b). Another study (Neuhaus et

al., 1999, cited in WHO, 2004b) finds that 6 per cent of all variance in fat intake among Washington State residents can be explained by label use, whereas a study by Kin et al., (2000, cited in WHO, 2004b) finds that consumers who use nutrition labels obtain a lower percentage of their total calories from total fat, saturated fat, cholesterol and sodium, and have a higher daily dietary fibre intake.

However, a limitation to the usefulness of nutrition labels as a public health tool is their predominant use amongst certain groups: younger people, women, people with higher education and people who are already interested in diet and health. Hence, the effectiveness of nutritional labelling depends on the level of knowledge among consumers. Nevertheless, mandatory nutrition labelling can have beneficial effects for the entire population, if labelling regulations encourage food companies to develop more healthy foods (WHO, 2004b).

It should be noted that interpretation of such findings from other countries in a Danish context is difficult due to considerable differences in labelling schemes and general regulation on marketing activities, as well as cultural differences between consumers in different countries. Nevertheless, the experience from other countries indicates, that there may be beneficial effects from improved nutrition labelling of food products.

Changes in food taxation

One type of economic policy instrument is to modify taxes or subsidies on specific foods that are considered as unhealthy or healthy, cf. figure 3 above. The idea behind modified taxes or subsidies is to provide consumers with economic incentives to change their food consumption in a direction towards nutritional recommendations, thus reducing the probability of being exposed to risk of obesity, overweight and other health risks. For example a VAT reduction can be imposed on selected groups of food, like fruits and vegetables. A policy like this will provide consumers with an economic incentive to increase their intake of fruits and vegetables at the cost of other food groups (such as meat, fish, dairy products etc.) and thus lead to a less fat and energy dense diet. Another type of economic policy instrument is to impose taxes on specific detrimental ingredients in the food commodities. In this case it can be of interest to tax the content of e.g. saturated fats and sugar. Compared with a change in the VAT for specific food groups, one can expect that this kind of tax scheme will be more closely related to the final aim of improving the health status of the population. A disadvantage with the second approach is that it is more costly to administrate.

Small taxes on particular unhealthy foods, such as soft drinks, snacks or junk food, have been imposed in several countries (Australia, Canada, Finland, Norway and the U.S., for example). However, the taxes imposed are rarely aimed at affecting consumer behaviour, but merely as a source of revenue (Jacobson and Brownell, 2000)¹¹. A potential barrier for the effectiveness of taxes and substitutes can be a low response to price changes for targeted consumer groups. Furthermore, the economic ability and/or the nutritional need vary across different consumer groups, so the use of a tax instrument may lead to undesired distributional effects. Leicester and Windmeijer (2004) find that a fat tax in the UK would have a regressive distributional effect, implying that poorer consumers would be more heavily taxed than richer consumers.

There is a growing theoretical literature on the effects of economic policy instruments designed to improve health (see for example O'Donoghue and Rabin, 2003 and Aronsson and Thunström, 2006), but the empirical research done on effects of economic policies designed to improve the quality of food consumption is very limited. Chouinard et al. (2005) analyses the effects of a 10 percent tax on dairy consumption and conclude that consumers shift away from higher to lower fat dairy products, if a tax is imposed. In another study, Kuchler et al. (2005) use existing estimates of food elasticities and show that small taxes on snacks would only have marginal effects on consumer behaviour.

The most comprehensive studies have been done by Jensen and Smed (2007) and Smed and Denver (2005) who both consider the effects of taxes/subsidies on food in Denmark. The study by Jensen and Smed (2007) is based on annual aggregate market demand data from Statistics Denmark for the period 1972-1996, whereas the study by Smed and Denver (2005) is based on a weekly household panel data set, which spans the period January 1997 to January 2000.

In the study by Jensen and Smed (2007) 7 different scenarios are considered: two subsidy scenarios, three tax scenarios, and two tax revenue neutral combined scenarios. The subsidy scenarios are: (1) a lower VAT on fruits, vegetables and potatoes (from 25 percent to 12.5 percent), (2) a subsidy on fibres (approximately 75.20 DKK per kg fibre). The tax scenarios, which consider the ingredients in the food, are: (3) a tax on all fats (approximately 10.20 DKK per kg fat), (4) a tax on saturated fats (approximately 17.90 DKK per kg saturated fat), (5) a tax on sugar (approximately 7.10 DKK per kg sugar). The tax revenue neutrals scenarios are: (6) a subsidy on fibres and taxes on saturated fats and sugar, (7) halved VAT on fruits and vegetables and taxes on fats and sugar. In the analysis the authors normalize

¹¹ See the Appendix for an overview of VAT differentiation in different countries.

the scenarios so that the net welfare loss is equally large in all scenarios, 65 Million DKK.¹² The results are shown in Table 8.

Table 8. Effects on the intake of selected foods and nutritional components, per cent.

Scenario	Subsidy scenarios		Tax scenarios			Combined scenarios	
	1	2	3	4	5	6	7
	Fruits/ vegetables	Fibres	Total fats	Saturated	Sugar	Nutrients	Commodities
Milk	-1.6	-1.2	-1.6	-1.9	1.2	-1.2	-1.4
Butter and fats	-1.8	-2.5	-12.6	-14.5	2.1	-7.6	-5.1
Cheese	-2.2	-3.0	-7.0	-7.7	2.5	-4.5	-3.3
Eggs	-2.1	-2.9	1.0	3.3	2.5	0.4	-0.5
Meat	0.0	-0.4	-5.4	-3.6	0.2	-1.7	-1.7
Fish	-1.6	-2.5	1.6	1.8	1.9	-0.2	-0.1
Flour, bread etc.	1.3	8.6	1.7	1.9	0.4	7.0	1.7
Sugar	0.2	-3.3	6.4	6.4	-15.8	-6.5	-3.1
Potatoes, fruits and vegetables	7.8	5.1	3.3	3.3	1.0	5.5	7.6
Fats	-0.7	-0.5	-6.1	-5.9	1.2	-2.5	-2.3
Saturated fats	-1.1	-1.1	-7.2	-7.4	1.4	-3.6	-2.9
Fibres	4.1	6.7	2.3	2.4	0.7	6.1	4.3
	Million DKK						
Consumers' surplus	1094	1555	-1647	-1461	-1242	-41	-41
Net tax revenue	-1134	-1596	1606	1420	1201	0	0
Net welfare cost	41	41	41	41	41	41	41

Source: Jensen and Smed, 2007

As can be seen from the table all scenarios, except scenario 5, result in a substitution from animal-origin foods towards plant-origin foods. Considering the change in the intake of fats, saturated fats and fibres, scenario 1 and 2 give similar results. With decreases of about 0,5 to 1.1 percent in the intake of fats and saturated fats and an increase of the intake of fibres with about 4 to 6 percent. However, in the second scenario, in which the consumption of fibres is subsidised, there is a reduction in the consumption of sugar, whereas there is a slight increase in the consumption of sugar in the first scenario where the VAT rate on fruits and vegetables is reduced.

Although the tax on fats (scenarios 3 and 4), has a desired effect on the intake of fats, which is reduced by 6-7 percent, it also has an undesirable effect in terms of increased consumption of sugar. In contrast to taxes on fats, a tax on sugar (scenario 5), only reduces

¹² The authors assume that food suppliers are price elastic, which imply that changes in VAT rates and taxes are fully transferred to consumer prices.

the consumption of sugar but increases the consumption of all other food categories. From the last two columns in the table we see that the tax revenue neutral scenarios (which combine the subsidies with increased taxes on fats/saturated fats and sugar) result in about the same increase in the intake of fibres as scenario 1 and 2. However, there is a larger decrease in the intake of fats and saturated fats compared to scenario 1 and 2, as these nutritional components now are taxed. As sugar is also taxed in the tax revenue neutral scenarios the intake of sugar decreases, with about 6.5 percent in scenario 6 and 3 percent in scenario 7.

A difference between the subsidy scenarios and the tax revenue neutral scenarios is the economic implications that these scenarios have for the consumers and the government budget. In the first two scenarios there is a considerable transfer from the government to the consumers, with a larger redistribution for the fibre subsidy compared to the VAT reduction on fruits and vegetables. This is due to the fact that the fibre subsidy concerns a larger share of the food budget than fruits and vegetables do. As a result of the construction of the revenue neutral scenarios, the welfare loss is equal to the loss in consumers' surplus of 41 million DKK, which corresponds to a welfare loss of 18 DKK per household in Denmark.

As the results in Table 8 indicate, the most efficient way to impose a tax on food is to impose the tax directly on the considered nutritional variables, if these are the target variables. The results suggest that the effectiveness of a tax on nutrients is 10-20 percent more efficient (in terms of increased/decreased intake of saturated fats, fibres and sugar) than a tax that is directed towards the consumption of different food categories, in the form of increased/decreased VAT.

In general the results in Smed and Denver (2005) support the results in Jensen and Smed (2007), i.e., they find that the effectiveness of the tax concerning intake of specific nutrients is higher when the tax is imposed on nutritional variables instead of changing the VAT rate. As Smed and Denver (2005) used household data, their study makes it possible to study behavioural differences between different social groups. As a result of imposed taxes, the results in Smed and Denver indicate that the largest decrease in the intake of saturated fats occurs for the age group 30-39 years and for those in the youngest age group, i.e. for people with an age below 26 years. For fibres, the increase in consumption is more equally distributed among the different age groups, the exception is the youngest age group, for which the intake increases the most. Smed and Denver (2005) also find that the consumption of sugar increases in an undesired way in those scenarios where saturated fat/fibres are taxed/subsidized, and point out that the introduction of taxes implies the same

change in conditions for all consumers, and thus not yields the possibility to target the regulation towards the segments where the needs for adjustment are most desirable. Nevertheless, a tax or subsidy on nutrients/food will affect the consumption patterns and thus the intake of different nutrients, and thereby it will be possible to improve the quality of food intake and the health conditions for most consumer groups. But to reduce the intake, of e.g. fat and sugar, to recommended levels for consumer groups that deviate significantly largely from these recommendations it will probably be necessary to complement the economic policy instruments with other policy instruments, such as information campaigns. As low income households spend a larger share of their disposable income on food and also have a more unhealthy diet one can expect that a tax on unhealthy food will have a regressive distributional effect. So from this perspective a subsidy on fruits/vegetable would be preferable.

It is also evident that the administrative cost will differ between the different policy instruments. Taxes or subsidies on ingredients like saturated fats and fibres will be more demanding with respect to documentation and control than a change in the VAT on specific goods like fruits and vegetables. So from an administrative point of view changes in the VAT is preferable. As the appendix illustrates, there exists considerable experience in managing differentiated VAT schemes in a number of countries.

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Appendix Table A. Value Added Tax rates in European countries 2004

	Standard sales tax	VAT or Reduced rates on certain goods
Denmark	25	0% passenger transport, financial transactions
Sweden	25	12% food, tourism, hotels, passenger transport
Hungary	25	6% culture, newspapers, magazines, cinemas, sports 12% food, medicine
Iceland	24,5	0% pharmaceutical products
Norway	24	14% certain food, Icelandic books, hotel rooms 12% food
Slovakia	23	11,11% certain fish-sales
Czech Republic	22	10% food, medicine
Finland	22	5% food and most services 17% food 8% medicine, books, passenger transport, accomodation, events
Poland	22	0% subscribed newspaper 7% processed food
Belgium	21	3% unprocessed food 12% coal
Ireland	21	6% food, books, services, gold 1% 12,5% fuel, restaurants, constructions 4% cattle
Italy	20	0% food, books, children cloths
Austria	20	10% or 4% specific products
France	19,6	10% food, books, newspapers, private rents 7% books, culture 5,5% food, electricity 2,1% newspaper, medicine
Netherlands	19	6% food, certain services
Latvia	18	
Estonia	18	9% books, newspapers, medicine, healthcare equipment, heating 5% theaters, concerts
Lithuania	18	0% schoolbooks, subscribed newspapers & magazines, insurance & financial service, tourism, culture, renewable energy, stamps etc. 9% heating 5% passenger transports
Greece	18	0% education, books, newspapers, magazine, medical treatment, rents, construction, financial services, int.travel & transportation
United Kingdom	17,5	8% food
Portugal	19	0% food, books, newspapers, fuel, power, energy 12% food industry, canned food 5% books, newspapers, medicine, hotels, transportations
Germany	16	0% food, essential items
Spain	16	7% food, books, newspapers 7% food, dwellings 4% basic necessities
Luxembourg	15	0% books, water supply, medicine, exports 12% fuel, wine, tobacco
Switzerland	7,5	6% gas, electricity 3% food, children cloths, books, newspapers, medicine, water supply 3,5% hotels and lodging services 2,3% food, medicine, newspapers, water supply

Source: <http://www.worldtaxpayers.org/statvat.htm> (http://www.ita.doc.gov/td/tic/tariff/country_tariff_info.htm)