



**LUND UNIVERSITY**  
School of Economics and Management

## Sustainable fishing

How and why to change the industry

by

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August 2018

Master's Programme in Economics

## Abstract

This thesis aims to investigate what kind of policy measure – financial or informative that can be used to push the market towards a more sustainable fishing industry. Consumer reactions and behavior towards these instruments are of great interest in this study. Financial instruments include taxes, subsidies, quotas and grants and the informative instruments include the use of information campaigns. The results of this thesis suggest that the Swedish market for fish and seafood could benefit from an intervention that increase demand and supply of certified fish and seafood. The commercial fisheries are already using available funds to use more sustainable fishing methods and the majority of the population wants to purchase certified fish and seafood, but lack incentives or the nudge to do so.

Keywords: Fishing, Aquaculture, Sustainability, Eco-labels, Financial and Informative Instruments

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# 1 Introduction

The world is facing a challenge when it comes to feeding the future population of the world. Population is expected to reach 8.6 billion by 2030 (United Nations, 2017, np.) and fish and seafood will be an important source of protein, especially in developing and least developed countries (SOFIA, 2016). At the same time the population in Sweden and other industrial countries are being encouraged to eat more fish and seafood due to its beneficial nutrients, such as omega3 fatty acids and as a substitution to red meat (Livsmedelsverket, 2017, np.). Global warming is another argument for substituting red meat for fish due to its relatively lower Green House Gas (GHG) emission per kg (Röös, 2012).

For a long time fish was seen as a renewable and endless resource, however with the current industrial fishing some of the global fish stock is already over fished and the majority is being fished at the limit of capacity. Fish stocks are divided into three categories (SOFIA, 2016);

1. under fished stocks
2. fully fished stocks
3. over fished stocks

Fully fished stocks indicate that they are fished at the Maximum Sustainable Yield (MSY), that is; they are fished within biologically sustainable levels but with no opportunity for increased catch and need strict management to remain at the MSY level. Under fished stocks are thus fished below the MSY level and the over fished stocks are fished above the MSY level and hence fished at biologically unsustainable levels. Overfishing is reducing fish production with negative social and economic effects as well as negative ecological consequences and can only regain full productivity after active and strict plans for reproduction (SOFIA, 2016).

The percentage of overfished stocks have increased from 26 percent in 1990 to 31.4 percent in 2013 (SOFIA, 2016) In the same period the amount of fully fished stocks have increased to 58.1 percent leaving only 10.5 percent below the MSY level (SOFIA, 2016). Overfishing is one of the main reasons for the extinction of marine species in coastal ecosystems (Jackson *et al.*, 2001). Another worrisome trend is the reduction of mean trophic level which has occurred in the oceans as well as in inland fisheries, however the largest effect has been observed in the Northern Hemisphere (Pauly *et al.*, 1998). Perhaps the most famous incidence is the collapse of

several fish stocks outside New England in the 1960s. Overfishing led to an estimated reduction of fish stock by more than 50 percent and altered the food-web structure in the area (Fogarty & Murawski, 1998). With more than 30 percent of the world's fish stock fished above the MSY level it is a valid concern that such a collapse could occur again.

Aquaculture has been a growing trend in the production of fish and seafood and it is recognized as a way to relieve the pressure on the ocean fisheries. In 2014 aquaculture produced 44.1 percent of total fish production (SOFIA, 2015), and according to the Food and Agriculture Organization (FAO) of the United Nations it has now reached 50 percent of total fish and seafood production. It is thus an important sector for both employment and food supply. However, aquaculture is also related to a number of environmental issues such as lice and disease outbreaks within fish farms and with risk of spillover to wild fish stocks due to escaping fish, as well as changes in land use and pollution of neighboring waters with effluents (Kobayashi *et.al*, 2015).

Within the fishing industry there exists a large problem with illegal, unreported and unregulated fishing (IUU) and to a smaller extent substitution of the declared content of a product with a different species than that declared on the package. The European Union did an extensive investigation in 2015 on white fish products and found that 6 percent of the samples did not contain the species declared on the label (European Commission, Fish substitution, 2015, np).

There exist several different eco-label and certification schemes that aim to inform consumers of whether a fishery is managed sustainably or not and with a guarantee of known origin. The long run goal of these eco labels and certifications is to force fisheries to adapt to a more sustainable production through market powers (SOFIA, 2016). This puts a lot of responsibility on the consumers of fish and seafood and raises the question of whether or not labelling and certification of fish and seafood is enough to change the consumption patterns.

## 1.1 Aim and Objectives

This thesis aims to investigate what kind of policy measure – financial or informative that can be used to push the market towards a more sustainable fishing industry. Consumer reactions and behavior towards these instruments are of great interest in this study. Financial instruments include taxes, subsidies, quotas and grants and the informative instruments include the use of information campaigns. What are the externalities associated with the fishing industry and what are the possible remedies? Should the government use a supply side approach and correct the market failure through a Pigouvian tax or use a demand side approach with informative instruments and nudging?

- What kind of policies can help remedy the problem of negative externalities in the fishing industry?
- How does consumers respond to the use of nudging, financial instruments such as taxes, subsidies, grants and quotas and informative instruments such as information campaigns?
- What effect would an economic or informative instrument have on the Swedish market of fish and seafood?

## 1.2 Research Limitations and Method

This thesis is written with a willingness to cover a large and problematic area that stretches over a financial, political, legal and informative range. The scope of this thesis is not large enough to include every angle that affects the global fishing and aquaculture industry and numbering the angles that are missing from this thesis would be improbable. This thesis thus focuses on investigating the underlying problem of overfishing and consumer response to nudging and informative and financial instruments when consuming fish and seafood. There is currently an immense lack of detailed data regarding both trade and consumption of fish and seafood as well as difficulty obtaining data on and from the different certification organisations. The first detailed mapping over Swedish consumption of fish and seafood were done in 2017 by RISE, hence there exists no comparable data over time. The data thus presented in this thesis is a presentation of the data currently available and the statistics on the share of certified fish and seafood consumed might look slightly different if data from KRAV and ASC were available.

However the detailed mapping done by RISE corresponds well to the data available from MSC and any additional data from the other certification organisations would not have had any significant effect on the conclusions drawn in this thesis.

The main sources of literature researched within this thesis are comprised of peer reviewed academic journal articles, books, and official policy reports. Previous research within this area is quite scarce and as the reader will find research regarding excise taxes are at large written with a focus on health benefits and hazards and where there is a sustainability perspective the target is usually mitigations from the food industry at large. However, the combination of research from different areas within excise taxes and information policies has given a reasonable background on how individuals react when faced with taxation on food products or new information as well as general behaviour and attitudes towards environmental labels.

### 1.3 Outline of the Thesis

This thesis starts by presenting the theoretical problems associated with the fishing industry in sections 2.1 and section 2.2 followed by the solutions as presented in economic theory in sections 2.3 and 2.4. The thesis then presents the previous research made on environmental and health related food taxation and information campaigns in section 3. Section 4 gives a brief introduction to the different financial-, informative-, and legal instruments used in Sweden today. Data is provided on the attitude towards and knowledge about the most popular certification brand of fish and seafood as well as data over Swedish consumption of fish and seafood in section 5. In section 6 the thesis analyses the possible effects of financial and informative instruments as well as the possible effects from nudges on the Swedish market and the resulting effects on the problems identified in section 2.1 and 2.2. The conclusions are then presented in section 7.



## 2 Theoretical Review

This chapter will give a theoretical review of the underlying problem of overfishing and the possible remedies to that problem. Starting by specifying the problems chapter 2.1 will give an introduction to externalities and public goods. Chapter 2.2 will then proceed to introduce ways in which the problem can be mitigated.

### 2.1 Problem Specification

#### 2.1.1 Externalities

An externality arises when the welfare of a third part is directly affected by the production or consumption of a good or service. The person or firm that is the cause of the externality will not bear all the cost and the third party will not be compensated for the loss in welfare, since it lies outside the price mechanism. Because the producer does not bear all the cost/ receive enough benefit of/from the externality it is not incorporated into its market decisions, which in turn creates inefficiencies in the market (Rosen & Gayer, 2014).

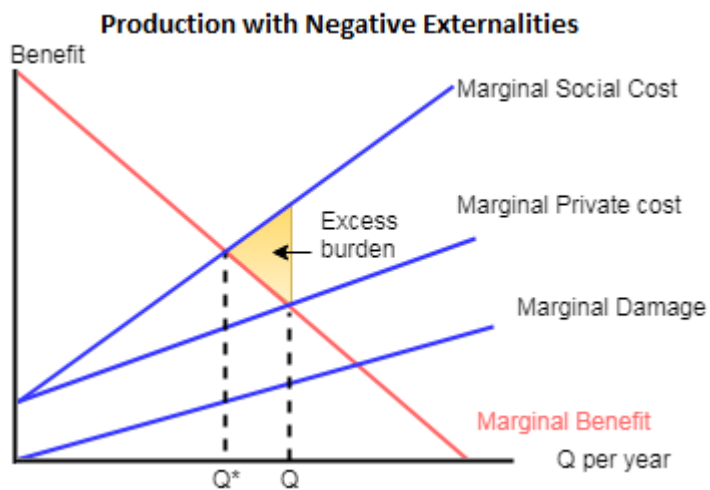


Figure 2.1 Production with negative externalities

Figure 2.1 illustrates the issue when the cost of externalities is not included in the production cost of the producer. The Marginal Benefit (MB) curve shows the marginal benefit of the producer at each level of output, it is decreasing due to the assumption of diminishing marginal utility of output. The Marginal Private Cost (MPC) curve shows the cost of input for the producer and is assumed to increase with output. The production causes an externality that decreases the utility of society; this is reflected in the Marginal Damage (MD) curve, also assumed to increase with production. The producer maximizes profit by producing quantity  $Q$  where the  $MPC = MB$ , this is however inefficient due to the negative externality caused by the production. The excess burden caused by the production is depicted in the yellow triangle. From the point of view of the society the quantity produced should be  $Q^*$  where the Marginal Social Cost (MSC) curve meets the MB curve. The MSC curve includes both the Marginal Private Cost of the producer and the Marginal Damage inflicted by the externality. This rather simple graphical analysis shows that where negative externalities exist the free market has a tendency to produce more than the efficient output (Rosen & Gayer, 2014).

Externalities can be divided into two broad categories, a production externality and a consumption externality; the former is when the effect of an externality is on a profit relationship and the latter when the externality affects the utility (Hindriks & Myles, 2013). Relating this back to the fishing industry the externalities that arise are likely to affect both the profit relationship and the utility of consumers. When the source (fish and Seafood) diminishes to a certain point the producers (fishermen etc.) will lose their livelihood and the utility of the consumers decline when they can no longer consume the amount of fish and seafood that maximizes their utility level.

### 2.1.2 Public good

A public good is defined as non-rival and non-excludable; that is, once the public good is provided the cost of another person consuming the good is zero and to prevent another person from consuming the good is impossible or very expensive. A *pure* public good fulfills both these requirements but there are goods that fulfill one but not the other and some that fulfill the requirements to some degree, these are the *impure* public goods (Rosen & Gayer, 2014).

The oceans have long been treated as a pure public good; mankind has believed the oceans and the seas to have an endless supply of fish and seafood. Now it is known that the big scale fishing industry has been harmful to the fish and seafood stock. Today the seas and oceans could be classified more in terms of an impure public good. The non-rivalry condition is not met, additional fishing boats lead to additional reduction of already endangered fish stocks, and in the worst case scenario, to the fish completely disappearing from an area. However the non-excludable condition still holds; making it next to impossible to prevent the increase of fishing boats to the already existing fleet. The rivalry of a finite public good is commonly referred to as the “common pool problem” where the absence of property rights is the cause of inefficient use/exploitation of the source.

Sweeney, Tollison, and Willet (1974) give a rather beautiful explanation for how the fishing industry suffers from the common pool problem; the catch of today will determine the catch of tomorrow, if today’s catch is low and fish has time to reproduce the catch of tomorrow will be larger. This of course means that all fishermen would benefit from limiting today’s catch and forgo some of today’s profit, however since nobody owns a fish until it is caught and due to the difficulty of observing each fisherman, everybody has incentives to cheat. Abstaining from further fishing will thus not affect tomorrow’s harvest for the individual fisherman if all the rivals are cheating. As a consequence all will neglect the effects of his or hers actions on future resource availability and instead exploit as much as is profitable now.

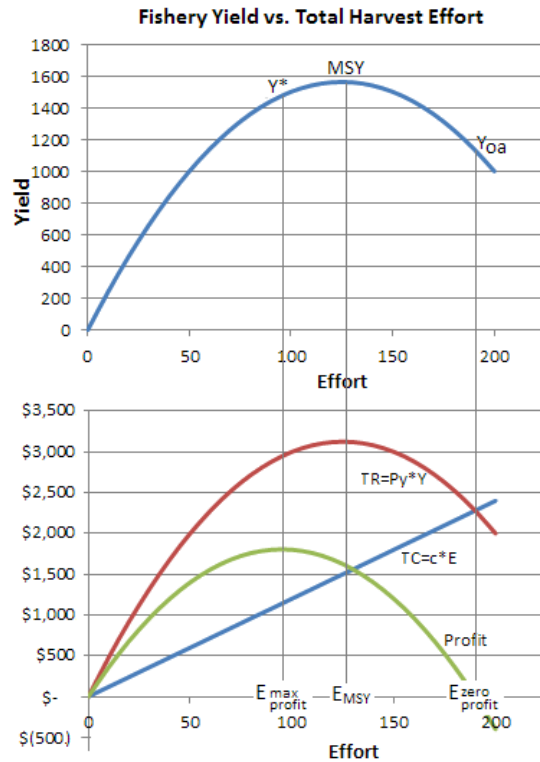


Figure 2.2 Fishery Yield vs. Total Harvest Effort (Mackenzie J., 2014)

The intuitive explanation of the common pool problem above can also be explained graphically as in figure 2.2. In this graph it is assumed that all variable inputs to harvesting fish are lumped into a single variable which is here referred to as “Effort” or  $E$ ,  $Y$  is the Yield the fishermen receive from the Effort they put in. In the upper panel the long-run relationship between aggregate fishing Effort  $E$  and Fishery Yield  $Y$  is shown. Additional Effort increases Yield up until the Maximum Sustainable Yield (MSY) is reached, beyond that point the Yield will begin to decrease with addition Effort.

The Effort-Yield relationship is then translated into dollars in the lower panel. Supposing each unit of Effort costs  $\$C$ , and each unit of fish sells for  $\$P$ . The Total Cost is then  $TC = C * E$  and the Total Revenue  $TR = P * Y$ . The industry profit is thus  $TR - TC$ .

In an efficient market the industry would maximize its profit by applying Effort level  $E^* = 95$  (in this example) and thus receiving Yield  $Y^*$  which lies to the left of the MSY point. However a profit making competitive market will attract additional actors seeking to be part of that profit. With more boats entering the fishing industry the aggregate Effort  $E$  will increase and the Yield

will move beyond the MSY point and thus reducing the efficiency of Effort for all, that is; the Yield per unit of Effort declines for the entire fishery. The inefficiency arises because the fish is a finite public good, in contrast, in an ordinary competitive industry, new actors that enter the market would not affect the productivity of the rivaling firm’s input, but in the case of the fishing industry it does. The cost per unit of harvest will increase as the efficiency of Effort declines. The increasing cost of Effort will decrease profit until  $TR - TC = 0$ . The profits the industry would have received are wasted on too much fishing effort and too many boats.

Figure 2.3 below illustrates the effect of the overconsumption described above on the carrying capacity of the oceans and future consumption. The dotted black line is the carrying capacity of the oceans and the red line shows consumption of fish and seafood. Where the red line meets the dotted line is the Maximum Sustainable Consumption Level, equivalent to the MSY point in figure 2.2. When consumption increases past this point the carrying capacity of the oceans start to decline as depicted by the bold dotted line until eventually the carrying capacity has degraded to the point where the resource (fish and seafood stock) collapses, this collapse is also known as the “tragedy of the commons” which is an effect of the externalitite problem.

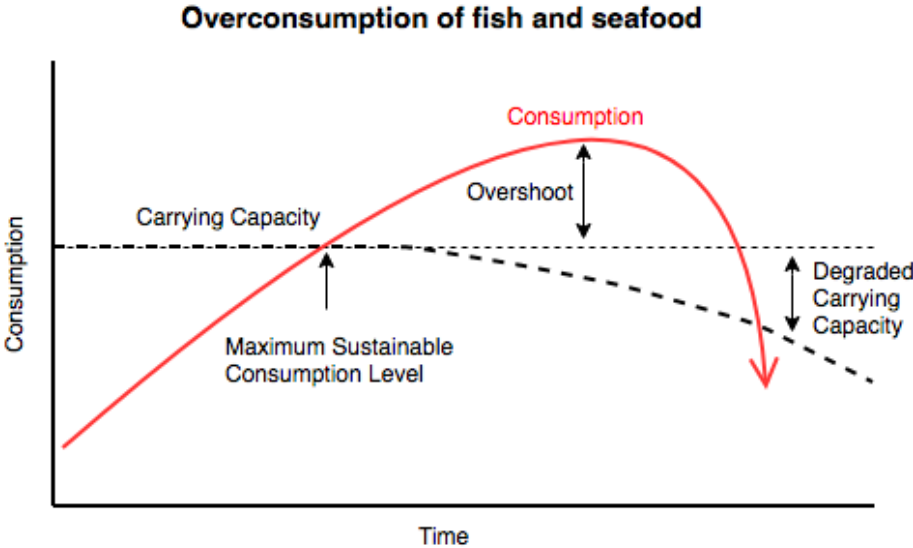


Figure 2.3 Overconsumption of fish and seafood

## 2.2 Remedies

### 2.2.1 Pigouvian tax

A popular way to handle externalities is through a Pigouvian tax where the producer is taxed on each unit of output in an amount equal to the Marginal Damage (MD) it inflicts at the efficient level of output. In this way the tax makes up for the fact that the production cost is too low and will thus increase the effective marginal cost of production. The cost of the externality will now be included in the production cost and profit maximizing level of output will be equal to the efficient level (Rosen & Gayer, 2014).

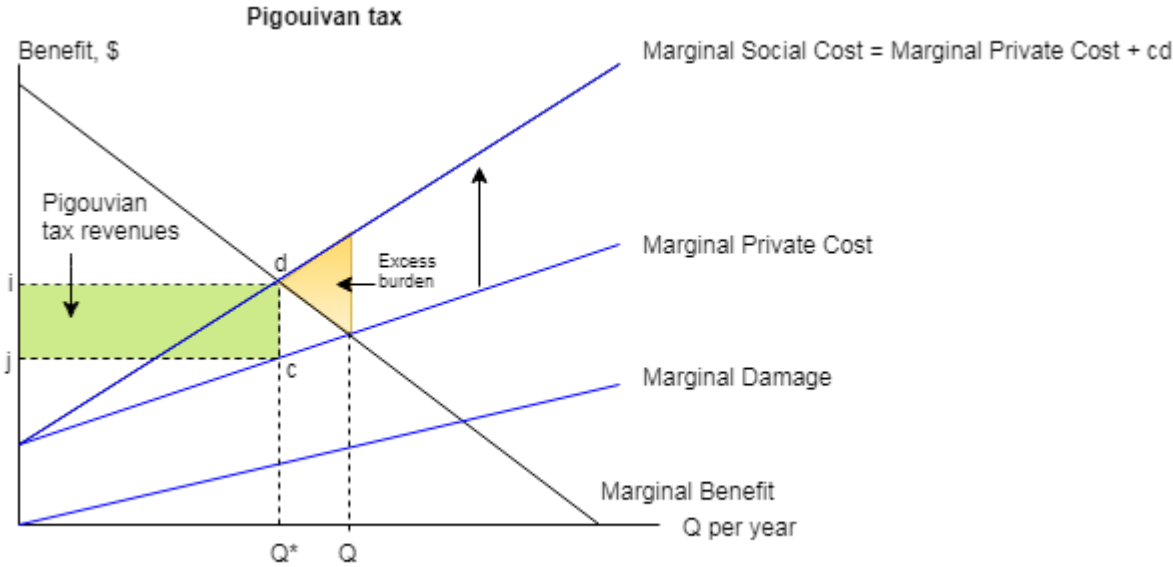


Figure 2.4 Pigouvian tax

Looking at the graphical analysis of production with negative externalities in figure 2.4 one can see how a Pigouvian tax can correct for the exclusion of the cost of the externality in the Marginal Private Cost (MPC) and thus reach efficient production. The MD inflicted at the efficient level of output  $Q^*$  is shown by the distance  $cd$ , this equals the Pigouvian tax. The tax thus increases the effective Marginal Private Cost (MPC) of the producer by  $cd$  giving  $MPC + cd = \text{Marginal Social Cost}$ . The producers profit maximizing quantity is now where the curve  $MPC + cd$  crosses the MB curve, which is at the efficient output  $Q^*$  (Rosen & Gayer, 2014). The tax thus forces the producer to account for the externality cost in the cost of the production

and this gives incentives to produce efficiently. The tax revenue received from the Pigouvian tax is shown by the rectangle ijcd.

**Specific Excise Tax**

One way to design a Pigouvian tax is through a specific excise tax. A specific excise tax is levied on each unit of a commodity sold; such that, the price paid by consumers is not the same as the price received by the suppliers (Rosen & Gayer, 2014). A specific excise tax will increase the price of the good creating a fall in demand according to the income and substitution effect, suppliers who now face a higher production cost per unit and a market with less demand for their product will respond by reducing production (Hindriks & Myles, 2013).

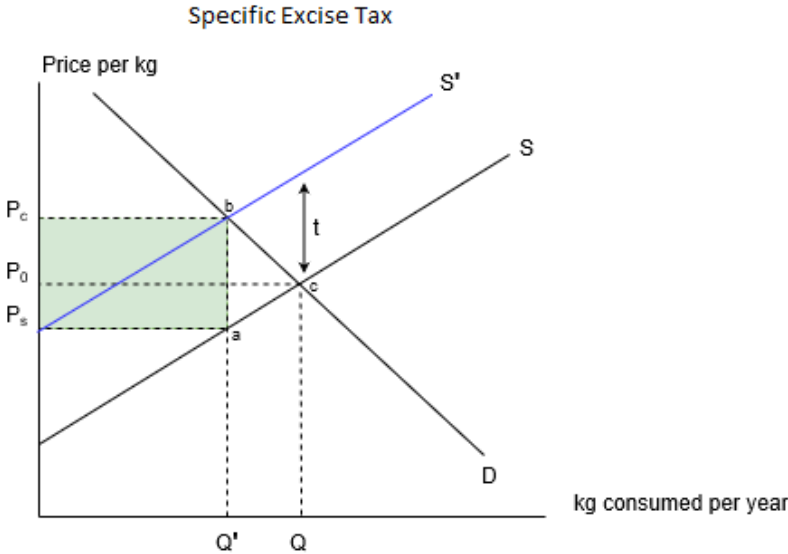


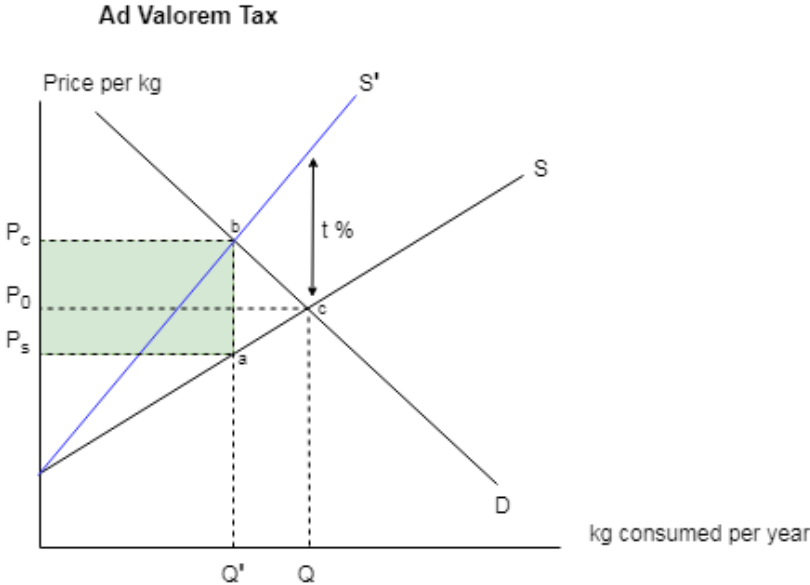
Figure 2.5 Specific excise tax

In figure 2.5 the the equilibrium before a tax is introduced is found in point  $c$  where the producer produces profit maximizing output  $Q$  which sells at price  $P_0$ . When the unit tax of amount  $t$  is imposed the effective production cost of each unit increases and the supply curve  $S$  shifts upwards by the distance  $t$  to the new supply curve  $S'$ . The new equilibrium is thus found where the new supply curve  $S'$  meets the demand curve  $D$ , point  $b$  with output  $Q'$ . The price the consumer face is now  $P_c$  and the price received by the producer is thus  $P_c - t = P_s$ . The revenues collected are depicted in the green rectangle  $P_c P_s b a$ . The tax amount required to reach efficient

production is dependent on the amount produced each year. Were the graphical analysis shown in a different point than the current  $Q^*$  the tax  $cd$  required to reach efficient production would be different than what is shown in the current graph.

**Ad Valorem Excise Tax**

Another possible way to design a Pigouvian tax is as an Ad Valorem excise tax which is quite similar to the specific excise tax, the difference being that the ad valorem excise tax is a tax set as a proportion of the price of the good. This implies that instead of the supply curve shifting up parallel to the original supply curve by the size of the tax, the ad valorem tax shifts the supply curve proportionally. In figure 2.6 below the original equilibrium is found in point c with price  $P_0$  and quantity  $Q$ . After the tax is introduced the price faced by the consumers is  $P_c$ , the price received by the producer is presented by  $P_s$  and the new equilibrium quantity will be reduced from  $Q$  to  $Q'$ .



*Figure 2.6 Ad Valorem Excise Tax*

In figures 2.5 and 2.6 above the price the consumer face is not the full increase of the tax  $t$ ,  $P_c - P_0 < t$ . The producers pay part of the tax in the form of lower price received per unit sold (Rosen & Gayer, 2014). Who ends up bearing the economic incidence of the tax depends on the elasticities of supply and demand. The more elastic the demand the easier it is for consumers



to turn to other products when the price goes up; this implies that a larger share of the tax burden will fall on the producer and vice versa (Rosen & Gayer, 2014). The division of the green rectangle in figures 2.5 and 2.6 above between consumers and producers will thus look different if supply and demand elasticities are different than what is depicted in the figures.

### 2.2.2 Cap-and-trade

A cap-and-trade system is an alternative to using taxes when wanting to reduce emissions or fishing capacity. Under cap-and trade an initial aggregate emission level is decided. It is set as close to the social optimal quantity as possible. The aggregate emission is then divided into quotas which are distributed among the emitters. The producer, or emitter, then receives a permit for each unit of pollution within their quota. These permits, or quotas, can then be traded with other producers.

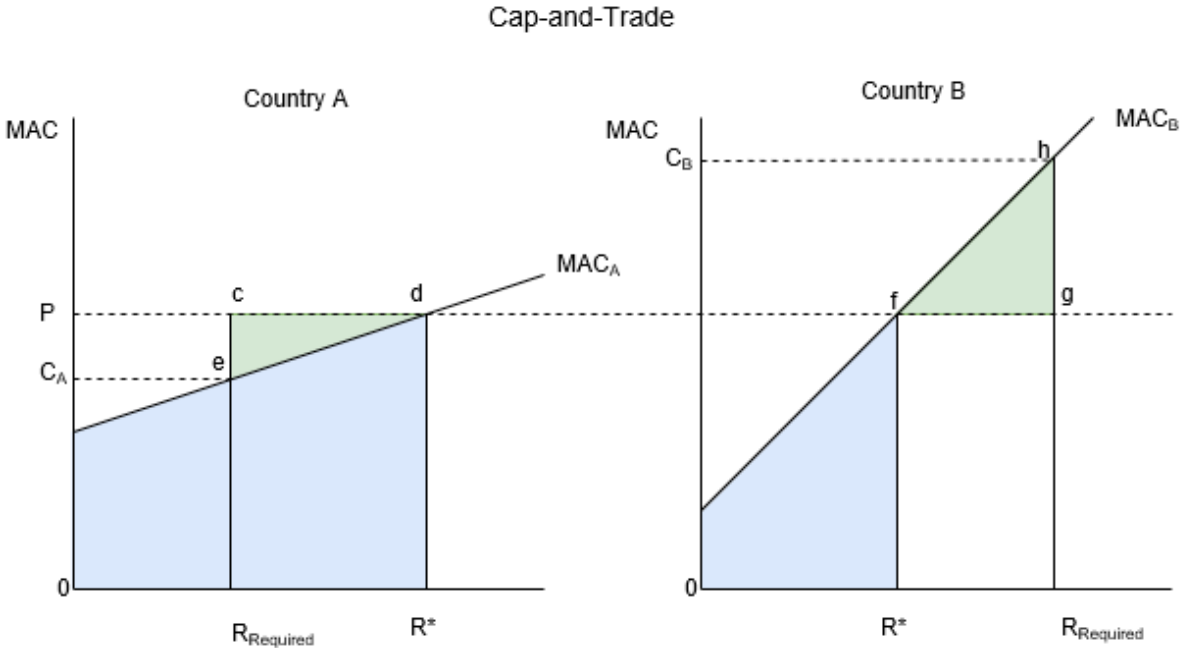


Figure 2.7 Cap-And-Trade

The cap-and-trade system is based upon the assumption that the cost of reducing emissions or forego a fish and seafood catch is different for different countries or firms. In the example above country A has a lower Marginal Abatement Cost (MAC) than country B, as shown by the steeper MAC curve of country B. A permit for one unit of emission can be sold on the market

for the price of  $P$ . Each country is given a set of emission permits and a requirement to reduce their emissions by  $R_{Required}$ . Country A can reduce its emission by  $R_{Required}$  at the cost of  $C_A$  and still have emission permits left. This means that Country A can make a profit by abating more emissions than required and selling the remaining permits. For Country B on the other hand the cost of reducing its emissions by  $R_{Required}$  is higher than the cost of buying additional emission permits at price  $P$  and only reducing its emissions by  $R^*$ . Country A thus makes a profit as shown by the green triangle  $cde$  by selling the additional permits and country B saves the cost of  $fgh$  by buying the permits instead of reducing its emissions. The total emission reduction is thus the same as it would have been using an emission fee, such as an emission tax, but with a cost-effective outcome. A weakness with the cap-and-trade system is that in order to reach a cost-effective outcome the initial aggregate emission level ought to be as close to the social optimal level as possible. However, finding the social optimal level can be difficult.

### 2.2.3 Subsidy

The government can use subsidies to encourage the production of certain goods. It can be used as a complement or as an alternative to taxing goods with negative externalities. For instance, subsidizing public transport to decrease emissions from cars, or subsidising fruit and vegetables to reduce consumption of red meat are subsidies of substitute goods. In figure 2.8 below a market with perfect competition is assumed, such that, Marginal Cost (MC) equals Price (P).

In the figure below the producer faces a high MC (due to high costs of input or high investment costs) and produces quantity  $Q$  at price  $P$ . The government can subsidise the producer and thus effectively reduce its MC leading to an increase in output,  $Q^*$ , which sells at the new price  $P_S$ . Subsidies is thus a way to create incentives to produce or consume a good that has been deemed superior. The green rectangle represents the cost of providing the subsidy, when compared to the tax schemes above one can see that the cost of providing a subsidy is larger than the revenues received from taxes.

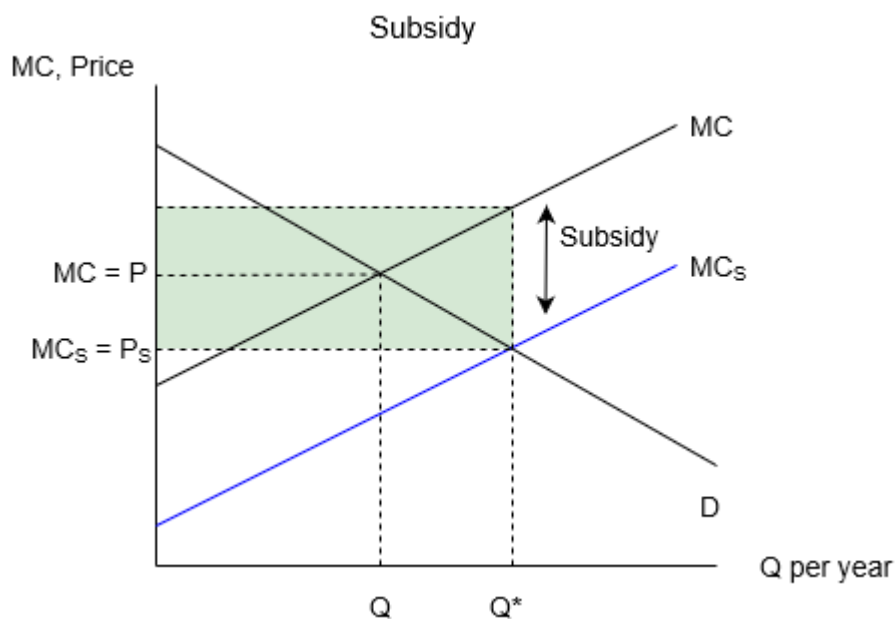


Figure 2.8 Subsidy

## 2.2.4 Information Campaigns and Nudging

The goal of an information campaign is to have consumers choose a consumption bundle deemed superior to the one they are currently purchasing. By informing the public of the negative/ positive effects of a good the hope is to change the demand for the good in question. Information can be provided through large information campaigns, labelling on packages and so on. Nudging on the other hand is a term within the field of behavioural economics, “nudging” refers to altering consumer behaviour without creating economic incentives or reducing consumption options by law. The goal of a nudge is thus the same as that of an information campaign when applied to consumption – to increase or decrease consumption of a certain good. In the book *Nudge – improving decisions about health, wealth and happiness* (2008) by Richard H. Thaler and Cass R. Sunstein the authors identify three main choice situations in which people could need a nudge to make the right decision. The first being when the choice implies delayed effects; such as, when the choice implies work now, but the benefits are received in the future or when the benefits are instant, and the cost of the choice do not have to be accounted for now. The second is when choices are difficult and only occur in rare situations and when the consequences of the choice are hard to measure. And third; when the choices we make cannot be made based on experience. Figure 2.9 shows the effect of an information campaign or nudging on demand where there are negative effects involved in the consumption. As shown the demand curve shifts down from D to D' and the new equilibrium quantity decreases from Q to Q'. Figure 2.10 shows the opposite effect when the benefits of a good are the focus of the information campaign or nudge, in that case the demand instead shifts up from D to D' and the new equilibrium quantity increases from Q to Q'.

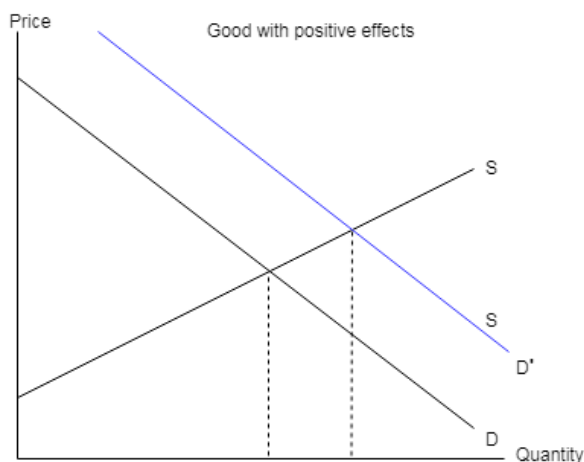


Figure 2.10 Positive change in demand

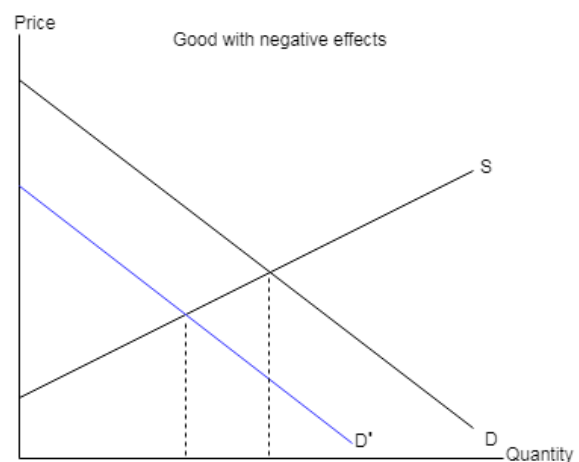


Figure 2.9 Negative change in demand

## 2.3 Summary

The common pool problem gives rise to externalities created by the fishing industry. The oceans are an impure public good, such that, it is non-excludable with a finite supply of fish and seafood. The non-excludability gives rise to an overcapacity of fishing fleets and vessels who all tries to profit maximize by bringing in as large a catch as possible each day. Consequently, many fish stocks are fished above or on their respective MSY level, which leads to a decline of the carrying capacity of the oceans and an ever-declining daily catch. Using tools such as nudging, and/or informative- and financial instruments can help remedy these externality problems. A Pigouvian tax is a common financial instrument to internalize the cost of the externality into the production cost, and thus decrease output until it reaches the social optimal amount. A Pigouvian tax can be design in different ways, one way is as a specific excise tax where the tax is levied on each unit of a commodity sold. Another way is as a Ad valorem excise tax, where the tax is set as a proportion of the price of the good. Another financial instrument used to controll production which cause negative externalities is the cap-and-trade system. The goal of the cap-and-trade system is to reduce the aggragate amount of emission or fishing effort (or anything that causes the externality in question) but allowing the producers to trade emission or fishing permits with eachother in order to reach a cost-effective solution. Finally a subsidy program can be used to create incentives to produce or consume substitute goods that do not create a negative externality. Such as subsidising public transport or fruit and vegetables.

Using informative instruments and thus informing the public of the negative externalities associated with a good, the hope is to decrease demand for the good in question. Information can be provided through large information campaigns, labelling on packages and so on. Nudging refers to creating a “nudge” such that consumers respond by choosing a product which does not create a negative externality and thus increase demand for that product.

## 3 Previous Research

This chapter gives a review of previous research made on the effect on consumption after the introduction of nudging and financial or informative instruments. Research regarding nudging and information campaigns are found in chapter 3.1 followed by research on financial instruments in chapter 3.2.

### 3.1 Informative instruments

Informative instruments can be divided into two sub parts – the mandatory informative instruments and the voluntary informative instruments (Lorek, *et.al*, 2008). Included in the mandatory informative instruments are the use of mandatory labels for comparison of environmental performance of different products and raising awareness through obligatory education and special training. Evidence suggest that mandatory labelling of products is effective in changing consumption choices (Mathios, 2000, Tiesl *et al*, 2002, D’Souza, 2000). The mandatory “dolphin friendly” labelling on tuna has been shown to have a strong effect on the consumption of tuna in both the US and Australia (Tiesl *et al*, 2002, D’Souza, 2000). When information reached the public in the US that a large amount of dolphins were killed due to the fishing methods of yellow finned tuna the consumption of canned tuna dropped, when the “dolphin safe” label were then introduced the consumption increased again (Tiesl *et al*, 2002). The same behaviour can be seen in Australia where the consumers choose to consume tuna produced by firms that are perceived to be more environmentally friendly and trustworthy and that “dolphin safe” was an important factor when consuming canned tuna products (D’Souza, 2000). The results of the researches made on the tuna market suggest that consumers do take mandatory environmental labels into account when making purchasing decisions.

The voluntary information instruments are very similar to the mandatory, both aims to inform the public of an issue in order to change a behavior, the main difference between them is stated in the name. Where the mandatory is forced upon one or more agents the voluntary is as suggested – voluntary. One such large voluntary information campaign was issued in 2001 by the US Food and Drug Administration (FDA). The aim of the campaign was to reduce at risk individuals’ consumption of fish due to the presence of methylmercury in commercial fish and seafood. At risk individuals were identified as women of childbearing age, pregnant, or

breastfeeding. Fish targeted as a health hazard for the specific group were shark, swordfish, King mackerel, and tilefish (Shimshack, Ward, Beatty, 2007).

As a result of the information campaign consumption of canned fish declined in some households of the targeted group. Within the targeted group consumption fell in educated households but no decline could be found in less educated households. When using newspaper readership as a proxy for access to information it was found that among newspaper reading households canned fish expenditure was reduced by 19 percent due to the advisory, however no difference was found in the response between targeted and non-targeted readers (Shimshack *et. al.*, 2007). The result of the information campaign offers an insight in how the public reacts to an information campaign on the health effects of fish, the problem of isolating the effects on different species of fish leaves a lot of questions unanswered. The information campaign was not only targeted towards a specific at risk group in society but also targeted four specific species of fish that were deemed a health hazard. The results offer no explanation for what species of fish are included in the product group “canned fish”. Thus the conclusion of a reduction in the consumption of canned fish gives no indication of the spill over effect between species or if the information campaign were able to reduce consumption of all targeted species or just some.

When using informative instruments such as environmental labels or information campaigns there are issues regarding both consumer recognition as well as consumer confidence in the label or information that must be taken into consideration (Crespi & Marette, 2003; Sörqvist *et. al.*, 2016; GlobeScan Incorporated, 2016; Zepeda, *et. al.*, 2013 etc.). For instance when the information of dolphin mortality reached the consumers they responded by changing their consumption behavior. However, it took some time before the consumption increased again after the “dolphin safe” label were introduced, this could be due to the time it took before the consumers began to trust the “dolphin safe” label or that it took time before the consumers realized there was a “dolphin friendly” alternative (Tiesl et al, 2002). This is part of the obstacles of reaching the intended group, whether it is, as in the FDA campaign, an at risk group or, in the case of the dolphin safe label, the great mass. Likewise, where there exists plenty of information on the issue consumers sometimes find it hard to distinguish between reliable and unreliable sources in which case it ends up being the greatest marketing campaign that gets the best spread (Lorek, Giljum, Bruckner, 2008).

There exists evidence that point towards that consumers care about origin and how the product is produced (if eco-friendly and fair traded etc.) such as with the “dolphin friendly” label, as well as evidence that there exists a willingness to pay for such products (Hainmueller, Hiscox & Sequeira, 2015, Rousseau, 2015). One such study was made by Hainmueller *et al.* (2015), they found that when keeping price constant and introducing a fair trade label on coffee the sales of the labelled coffee increased by 10 percent and decreased the consumption of the non labelled substitute by 9 percent, however when testing for price sensitivity they found a significant difference between high and low income consumers. Consumers who normally purchase the more expensive brand of coffee were found to be less elastic and were willing to pay an 8 percent premium for the labelled coffee, but consumers who normally purchase the cheaper brand were more elastic and tended to switch to a cheaper non labelled brand when faced with an increase in price. Studies made on consumer attitudes towards eco –friendly and fair trade labels are quite consistent when based on questionnaires, when asked consumers state to a high level that they buy or intend to buy environmental and fair trade products (Carrington *et al.*, 2016, Rousseau, 2015, Heinmueller *et al.*, 2015, Auger *et. Al.*,2003, etc.). There seems however to be gap between the stated willingness to consume environmental friendly products and the actual consumption of these products, in other words, consumers do not seem to translate their ethics into their consumption behaviour (Carrington *et al.*, 2016, Chatzidakis *et al.*,2007, Cowe & Williams, 2000, etc.).

Providing more information does not necessarily help to close this attitude – behaviour gap because behaviour is usually automatic and intuitive (Abrahamse *et al.*, 2005; Steg and Vlek, 2009). Using nudges as a mean of changing behaviour instead of additional information works because it influences behavior in situations where the cognitive part of the human brain is not being used (Thaler and Sunstein, 2008). One such situation in which people act largely according to habit is when purchasing and consuming food products, consequently nudging could be an effective tool in changing food consumption behavior (Lehner, Mont & Heiskanen, 2015). *Simplified information and signifies, changes to the physical environment, and social norms and ideal-type behaviors* are identified as three ways to influence food related behaviour (Lehner, Mont & Heiskanen, 2015). The Swedish burger chain MAX increased sales by 16 percent of low carbon footprint food after introducing carbon labels on their products (van Gilder Cooke, 2012). It has been shown that people consume more ice cream if the ice cream cooler does not have a lid (Wansik, 2004) and placing a sign at a hotel restaurant buffet reading “*Welcome back! Again! And Again! Visit our buffet many times. That’s better than taking a lot*



*once*” resulted in a 20.5 percent reduction on food waste (Kallbekken and Sälen, 2012). Experiments made on nudging has shown that there is great potential in using nudging to change behaviour, however, when trying to implement nudging on a larger scale outside a controlled environment the results has been less successful (Lehner, Mont & Heiskanen, 2015). Part of the issue when using nudges in a uncontrolled environment is that people are also being influenced by other factors that might be contradicting the nudge, such as product marketing. This however does not mean that the nudge does not have an effect, but other uncontrolled factors are affecting the purchasing behaviour as well. Moreover, it has been shown that nudges are most effective on individuals who are already positive to the behaviour the nudge is trying to affect which in turn means that nudges sometimes fail to affect those it is aimed towards (Lehner, Mont & Heiskanen, 2015).

## 3.2 Financial Instruments

One way to define a financial instrument is that it promotes more favourable forms of production and consumption through positive or negative financial incentives by making the consumers internalize the negative externalities their consumption impose on society. This includes taxes and fees, subsidies, grants, and tax exemptions. Taxes can be a helpful tool to incentivize people to change from one good to another. Financial instruments can be divided into two sub parts – mandatory Financial instruments and voluntary Financial instruments (Lorek, Giljum, Bruckner, 2008). The mandatory instruments include taxes and subsidies and the voluntary are restricted to support environmental investments.

A pigouvian tax is a popular tool among economists to internalize externalities and remedy the market inefficiencies that arise with externalities. However, arguments have been made that a Pigouvian tax on output can only be efficient in the short-run in which the number of producers is fixed, for long-run efficiency the Pigouvian tax thus has to be complemented by a lump sum entry tax or subsidy to reach efficient level of production (Carlton & Loury, 1980). If a Pigouvian tax cannot fully offset the externality, a way to mitigate the problem of the externality is to target goods related to the externality (Hindriks & Myles, 2013). The related good should thus be a some sort of substitute to the polluting good, for example subsidizing public transport in order to lessen the pollution from cars (Hindriks & Myles, 2013, p.239).

Using complementary subsidies or taxing goods that already has an existing substitute has been found to be effective, in fact the most effective taxes are found where there already exists a substitute to the taxed good (Lorek, Giljum, Bruckner, 2008). More evidence of the benefit of a tax / subsidy program was found through controlled lab experiments and a cost benefit analysis conducted by Stephan Marette, Jutta Roosen and Sandrine Blanchemanche (2008) where they concluded that a tax/subsidy program dominates an information policy in the case of fish consumption with health objectives. Additionally, if there are no subsidies involved, it has been found that if a health tax is accompanied by a clear earmarking of the tax revenue the public support for the tax would tend to be higher (A. Wright, K. E. Smith & M. Hellowell, 2017).

Multiple studies has been made on the effects of food taxation, where some focus on health objectives, such as the Danish tax on saturated fat, others focus on the emissions of GHG related to food consumption. Although the results differ most find some reduction in consumption of the targeted goods. The Danish tax on saturated fat reduced the consumption of saturated fat by approximately 4 percent (Smed, Scarborough, Rayner & Jensen, 2016). Food related emissions could be reduced by 4.3-6.3 percent in the United Kingdom if an emission tax were introduced (A. Kehlbacher, R.Tiffin, A. Briggs, M. Bernes-Lee & P. Scarborough, 2016). Another study found that food related emissions in Denmark could be reduced by 2.3-88 percent if an emission based food tax were introduced (L. D. Edjabou & S. Smed, 2013). This seemed to indicate positive results, however, unintended substitution effects and spillover effects has to be taken into consideration. The Danish tax on saturated fat led to an increased consumption of vegetables, fruits and fibres which was a positive side effect, however, it also led to an increase in consumption of salt which was an unexpected negative side effect (Smed, Scarborough, Rayner & Jensen, 2016). Issues regarding the possible substitution effect between products were found due to the emission tax in the United Kingdom as well, some health effects could occur due to a decrease in consumption of undesirable nutrients, but it is difficult to estimate what spill over effects the tax would have on beneficial nutrients, such as fibres (A. Kehlbacher, R.Tiffin, A. Briggs, M. Bernes-Lee & P. Scarborough, 2016). However, when it comes to substitution between fish and other non-seafood proteins it seems that consumers generally do not substitute between fish and red meat, seafood products seem to be substituted with other seafood products (Asche, Bjørndal and Gordon, 2005, Salvanes and DeVortz, 1997). A few papers have tried to answer the question of substitution between fish. However the problem of researching substitution of fish is that the demand structure for fish differs significantly

different between markets and different periods of time (Asche, Bjørndal & Gordon, 2005). This makes sense since the demand for one fish in one country could be, and most likely are, very different from the demand in another country. However, demand does seem to be price elastic in most markets, but canned seafood is most likely demand inelastic (Asche, Bjørndal & Gordon, 2005). Although the substitution effect varies across species a research on the European market shows that expenditure elasticities are close to 1 for most species (Hellandsjø, 2015). Demand seems however to get less and less elastic for species whose production is increasing quite fast, as for aquaculture salmon and catfish (Asche, Bjørndal & Gordon, 2005).

### 3.2.1 Summary

The informative instruments have been found to have a varying effect on consumption behaviour. Information campaigns can have a massive impact but appear to have a limited effect in general due to the difficulties of reaching the great mass of the population or the targeted group. Likewise, where there exists plenty of information on an issue, consumers sometimes find it hard to distinguish between reliable and unreliable sources in which case it ends up being the greatest marketing campaign that gets the best spread (Lorek, Giljum, Bruckner, 2008). However, evidence suggest that mandatory labelling of products is effective in changing consumption choices (Mathios, 2000, Tiesl et al, 2002, D'Souza, 2000). Furthermore, there are evidence that points towards that consumers care about origin and how the product is produced as well as evidence that there exists a willingness to pay for such products. There seems however to be a gap between the stated willingness to consume environmentally friendly products and the actual consumption of these products, in other words, consumers do not appear to translate their ethics into their consumption behaviour (Carrington *et al.*, 2016, Chatzidakis *et al.*, 2007, Cowe & Williams, 2000, etc.). Experiments made on nudging has shown that there is great potential in using nudging to change behaviour, however, when trying to implement nudging on a larger scale outside a controlled environment the results has been less successful (Lehner, Mont & Heiskanen, 2015).

Although Pigouvian taxes are a popular tool in theory, some argue that for long-run efficiency the Pigouvian tax must be complemented by a lump sum entry tax or subsidy to reach efficient level of production (Carlton & Loury, 1980). If a Pigouvian tax cannot fully offset the externality, a way to mitigate the problem of the externality is to target goods related to the externality (Hindriks & Myles, 2013). Moreover using complementary subsidies or taxing

goods that already has an existing substitute has been found to be effective, in fact the most effective taxes are found where there already exists a substitute to the taxed good (Lorek, Giljum, Bruckner, 2008). Additionally, if there are no subsidies involved, it has been found that if a health tax is accompanied by a clear earmarking of the tax revenue the public support for the tax would tend to be higher (A. Wright, K. E. Smith & M. Hellowell, 2017).

Although the results differ most find some reduction in consumption of the targeted goods. This seemed to indicate positive results, however, unintended substitution effects and spill over effects must be taken into consideration.

## 4 Instruments on the Swedish market

This chapter introduces the instruments currently used in Sweden which aim towards creating a more sustainable fishing and aquaculture industry. The informative instruments are introduced in chapter 4.1. and is followed by the financial instruments in chapter 4.2. The legal instruments are presented in chapter 4.3. and the chapter concluded by a short summary.

### 4.1 Informative Instruments

There are a few voluntary informative instruments on the Swedish market. There are three large labels for fish and seafood that are caught and farmed in a sustainable way. There is also plenty of information to be found on different websites, both on the respective websites of the labels and certifications as well as on government websites and different websites of NGOs. It is thus up to the individual consumer to find and use the information available as well as look through the frozen seafood counters at grocery stores for products marked with a label or asks the personnel when shopping for fresh fish.

#### **WWF fish and seafood guide**

The World Wildlife Fund (WWF) has created a consumer guide for sustainable fish and seafood which is available online and as an app. It lists popular food fish and seafood and colour codes it depending on the grade of sustainability. Green for go ahead, yellow for be careful, and red for do not purchase (WWF, 2018)

#### **Marine Stewardship Council**

MSC is an international institute that certifies fish and shellfish products, they have developed a set of requirements for what is regarded a sustainable fishery; that is, conserving marine biodiversity, productivity and the ecological processes in the oceans and seas. In these requirements good working conditions on board and minimizing of bycatch is included (WWF, 2015).

#### **Aquaculture Stewardship Council**

The ASC is the youngest of the certification institutes and certifies farmed fish and shellfish. The first ASC certificates were given in 2012. Apart from also considering the working

environment the ASC demands a responsible usage of feed fish and limitations on nutrients that leads to eutrophication (WWF, 2015).

## **KRAV**

Perhaps the most well-known to the Swedish public is the KRAV certification. KRAV certifies farmed fish and shellfish as well as for fish and shellfish caught in the wild. They focus on safe methods, sustainable population, low environmental impacts and traceability of origin (WWF, 2015).

## 4.2 Financial instruments

There are currently no mandatory financial instruments in place in Sweden in terms of taxes on uncertified fish and seafood. However, some financial instruments are currently being used. One example is the 2014 - 2020 ocean and fishery program which is a voluntary financial instrument run by the Swedish board of agriculture. It is partly financed by the European ocean and fishery fund and aims to increase the competitiveness of small and medium-sized enterprises (SME: s), protect the environment and promote sustainable use of resources, as well as promote employment. Those who are qualified can apply for financial support for investments that fulfils the requirements of the goals above (jordbruksverket, havs- och fiskeriprogrammet 2014-2020). The financial support includes investments in more environmentally friendly equipment or investments that raise the quality of the fish and seafood products, investments in development of new and improved equipment or techniques, financial support for education and information of fisheries, aquaculture or marine environment etc (jordbruksverket, stöd i havs och fiskeriprogrammet, 2016-12-29, 2018). Withing the ocean and fisheries program there are approximately thirty different goals. Six of these thirty goals are directly aimed towards commercial fisheries and aquaculture; 1) Improvement of equipment to decrease the amount of by-catch, 2) investments that increase the quality and value of caught fish, which aims to ensure sustained growht and profitability while decreasing the overcapacity of fishing vessels, 3) greater diversification among species, which aim to increase competitiveness among SME:s by introducing more sources of income and decrease the preasure on certain speices, 4) investments in aquaculture equipment to increase competitiveness among SME:s and create a more sustainable aquaculture with decreased risk of contamination of wild stock with lice and disease, 5) investments in aquaculture to decrease

environmental impacts, and 6) start-up grant for aquaculture. 1.2 percent of the total grant is budgeted for investments in commercial fisheries (1-3) and 4,5 percent of the total grant is budgeted for investments in aquaculture (4-6). The largest posts of the budget are grants for collection of data (21.7 %) and supervision and verification (22%)<sup>1</sup>.

Sweden is also part of an EU cap-and-trade system for fishing quotas. The Total Allowable Catch (TAC) is decided by the European Commission and updated annually (for most fish stocks) (European Commission, Fisheries, 2018). The TAC is divided into national quotas, and the EU countries can trade quotas with each other. Each country is responsible for distributing their national quotas among their fishermen and to ensure that the quotas are not exceeded (European Commission, Fiskekvoter, 2018).

### 4.3 Legal instruments

The national and international fish and seafood market are at large regulated by law. The regulations on commercial fisheries and aquaculture in Sweden are mostly regulated by the European common fisheries policy (CFP) (Hav- och Vattenmyndigheten, 2018). The CFP consists of policies regarding fisheries management, international policy, market and trade policy, and funding of the policy, as well as rules on aquaculture and stakeholder involvement. Together these policies aim to protect and conserve European fish stocks, ensure environmentally friendly aquaculture, and allow European fishermen to compete fairly with equal access to EU waters and fishing grounds (European Commission, fisheries, 2018). To reach the common goals set by the member states here are laws regarding minimum size and instructions for release, use of equipment, and protected species and areas. Sweden also have national regulations for Swedish fishing and aquaculture which regulates standard of equipment, by-catch, fishing licences, protected species etc. (Sveriges Riksdag, Fiskelag 1993:787 §29).

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<sup>1</sup> Percentage are calculations made by the author based on the budget published in the National Action Plan, Ocean and fishery program 2014-2020, version 2018-07-05, Dnr 3.3.17-12166/15.

## 4.4 Summary

There are a few voluntary informative instruments on the Swedish market. There are three large labels for fish and seafood that are caught and farmed in a sustainable way. There is also plenty of information to be found on different websites, both on the respective websites of the labels and certifications as well as on government websites and different websites of NGOs. Additionally, Sweden is part of a cap-and-trade system for fishing quotas as well as a grant-based program for encouraging sustainable and environmentally friendly fishing and aquaculture. There are also national and EU-level regulations regarding the protection of marine environment and fishing, such as minimum size and instructions for release, use of equipment, and protected species and areas. Sweden also have regulations for Swedish fishing and aquaculture which regulates standard of equipment, by-catch, fishing licences, protected species etc. (Sveriges Riksdag, Fiskelag 1993:787 §29).



# 5 Consumption and Consumer Attitudes

This chapter aims to give an overview of the attitude and knowledge of certification of fish and seafood among Swedish consumers as well as provide data on current consumption of fish and seafood in Sweden.

The demand for eco-labelled and environmental friendly food has increased rapidly during the last years in Sweden, in 2017 the value of eco-labelled consumption were three times that of 2014 (SVD, February 13<sup>th</sup> 2017). The same trend can be seen in the supply of certified fish and seafood which has increased steadily since the start almost 20 years ago, both in number and in different species available (MSC, 2015). In 2017 24 percent of fish consumed in Sweden were certified by MSC or ASC and according to MSCs own estimates 28 percent of wild caught fish consumed were certified, still, when asked only half of Swedish consumers can recall seeing the MSC label when shopping (Globescan INC, 2016), and although the consumption of certified fish and seafood is increasing, only 10 percent of yearly total world catch is certified by MSC according to the global impacts summary report (2015).

## 5.1 Knowledge and attitude towards certification among Swedish consumers

The MSC Consumer insight Globescan report (2016) provides information of consumer perceptions of the MSC brand and ocean sustainability as well as fish and seafood consumption in Sweden. The report is based on survey answers from 1002 Swedish consumers of fish and seafood.

75 percent of Swedish seafood consumers believe that fish and seafood have to come from a sustainable source in order to save the oceans. Almost as many, 74 percent agrees that consumers should be prepared to change their consumption towards more sustainable fish species. However 35 percent priorities price and taste over sustainability and 22 percent believes that the reports of the negative changes in the oceans due to overfishing are greatly exaggerated and that the single reason for ecolabelling is to increase price of fish and seafood (MSC, 2016).

The majority of consumers want to know that the fish and seafood can be traced back to a trusted source. However, half of the consumers sometimes doubt that the label on fish and seafood products are correct and matches the actual content of the fish and seafood product. Two thirds of the participants are more likely to trust the stated origin of the product if it is ecolabelled (MSC, 2016).

In a question regarding which institutions the consumers believe are best at contributing to protecting the oceans NGOs, scientists, and the UN are rated highest, whereas national government, large companies, retailers, and media are rated lowest (MSC, 2016).

When asked about their consumption 20 percent of the participants never buy ecolabelled fish and seafood or has never heard of ecolabelling while 80 percent say they buy ecolabelled fish and seafood occasionally or as often as they can. However, when asked of the general opinion of eco-labels as many as 35 percent believes that sustainability is important but they do not take note of ecolabelled products when shopping (MSC, 2016).

There is in general a positive attitude towards ecolabelled fish and seafood, the large majority strongly believes that eco-labels provides the highest standard of environmentally friendly fishing and that it makes it easier to reward those who practice responsible fishing. The MSC brand in particular is associated with qualities such as providing encouragement for more sustainable shopping and helping to guarantee that fish and seafood will be available for future generations as well. However among the general public, just over half (51 %) can remember seeing the MCS label before they participated in the survey, a slight increase from previous years surveys (MSC, 2016).

## 5.2 Swedish consumption of fish and seafood

The data below on Swedish consumption of fish and seafood is gathered from a research report done by RISE in 2017. This is the first detailed mapping done on Swedish consumption of fish and seafood. Total consumption in Sweden 2015 were 11 kg per person which corresponds to 25 kg un-quartered fish and seafood, the total amount consumed were 109 000 ton. The numbers presented in the figures below are tons of quartered fish and seafood, that is; eatable parts such as files and seafood without shells.

Figure 5.1 below shows consumption of the most popular fish and seafood species in Sweden. The red indicates that the share of imported fish and the blue the share of domestically produced fish salmon, cod, and herring are the dominating species. The majority of salmon is imported from Norwegian aquaculture. The figure shows the share of imported and domestic fish and seafood, there are however some uncertainties with these estimates. The problems with the estimates are due to difference in the presentation of species when imported and exported. A species can be presented on species level when imported but presented as “other salmonids” (RISE, 2017 p.9) when exported.

Species that dominates Swedish consumption of fish and seafood (1000 ton eatable part)

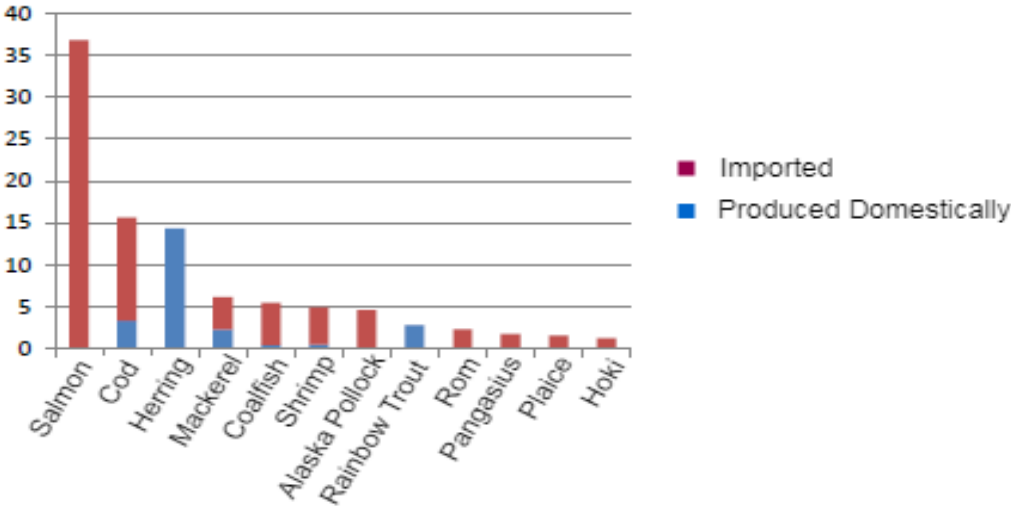


Figure 5.1 Species dominating Swedish consumption of fish and seafood

Figure 5.2 shows the share of Swedish consumption that is wild caught and from aquaculture respectively. Fish from aquaculture represents 40 percent of Swedish consumption of fish and seafood, most of this is due to the dominating consumption of salmon from Norwegian aquaculture.

Share of fish produced by aquaculture and wild caught

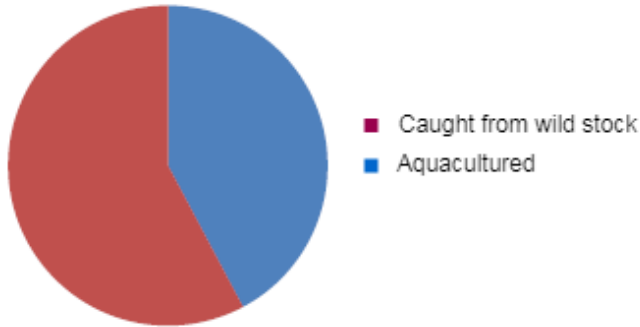


Figure 5.2 Share of fish produced by aquaculture and wild caught

Swedish fishery and aquaculture makes up less than 30 percent of fish and seafood consumed in Sweden, close to 75 percent is imported.

Share of imported and domestic fish and seafood

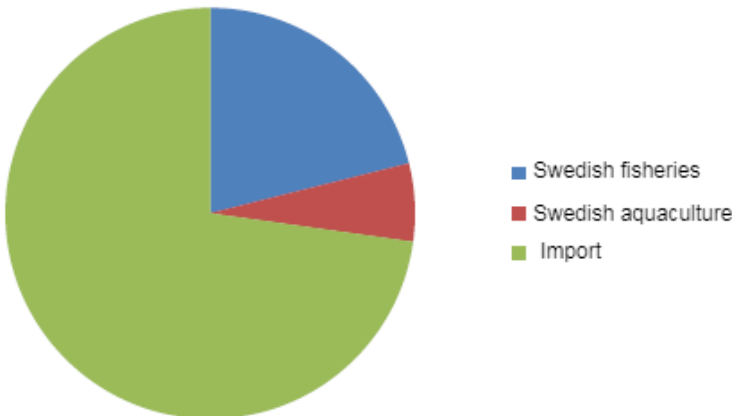


Figure 5.3 Share of imported and domestic fish and seafood

Figure 5.4 shows the amount of aqua cultured fish and seafood consumed of the most popular species and the share of which are certified and uncertified. Figure 5.5 shows the correspondent share of certified and uncertified fish from wild caught stock. RISE estimates that 24 percent of total consumption of fish and seafood is certified, the share of certified fish is larger among fish and seafood from wild stock than among fish from aquaculture. This corresponds quite well with MSCs own estimates in 2017 where 28 percent of wild caught fish and seafood sold in Sweden is certified by MCS (MSC, 2017 np.). The lower total score is likely due to the fact that the ASC certification is a lot lower than the MSC certification (RISE, 2017).

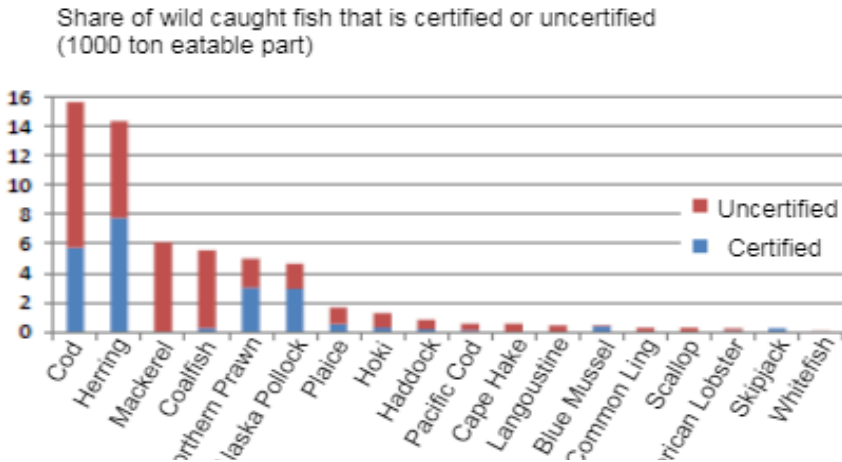


Figure 5.4 Share of certified and uncertified fish and seafood wild caught

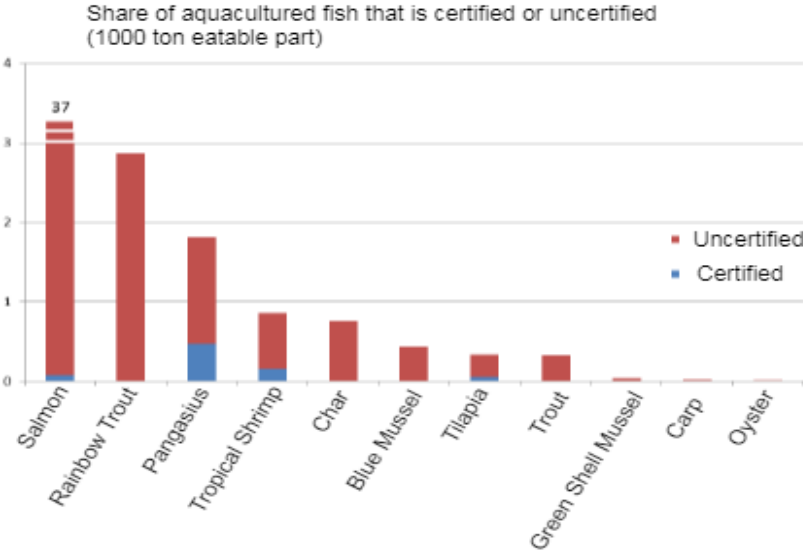


Figure 5.5 Share of certified and uncertified fish and seafood aquaculture

## 5.3 Summary

There is in general a positive attitude towards eco labelled fish and seafood, but the labels appear to suffer from a lack of consumer recognition. A high percentage of Swedish fish and seafood consumers believe that fish and seafood have to come from a sustainable source, and that consumers have to change their consumption behaviour towards more sustainable fish and seafood in order to save the oceans. However, many still believes that overfishing is greatly exaggerated and priorities taste and price over sustainability. There is a concern among consumers regarding the origin of fish and seafood, and many do not trust the stated origin to be true or even that the content matches that which is stated on the package. However, where there is an eco-label on the package the trust of stated origin and content increases. When asked the great majority states that they do purchase eco labelled fish and seafood occasionally or as often as they can, but there is still a high percentage that recognizes the importance of eco labelled fish and seafood but does not take that into consideration when choosing what to consume. Looking at the actual consumption data of fish and seafood, most of the fish and seafood consumed in Sweden comes from imported fisheries and aquaculture. Swedish consumption of fish and seafood is dominated by imported aqua-cultured Salmon from Norway. It is estimated that approximately one quarter of all fish and seafood consumed in Sweden is eco labelled.

# 6 Effect of financial and informative instruments on the Swedish market

This chapter aims to analyse the effects of using nudging or financial and informative instruments on the Swedish market as well as analysing what effect it might have on the allocated effort on the international market.

## 6.1 Financial Instruments

The voluntary financial instrument used in Sweden today promotes a sustainable fishing industry by giving grants for investments that benefits a sustainable fishing industry and aquaculture. Being given a grant effectively reduces the costs for producers to transform their fish and seafood production into a more sustainable production and thus increases the amount of sustainable fish and seafood produced.

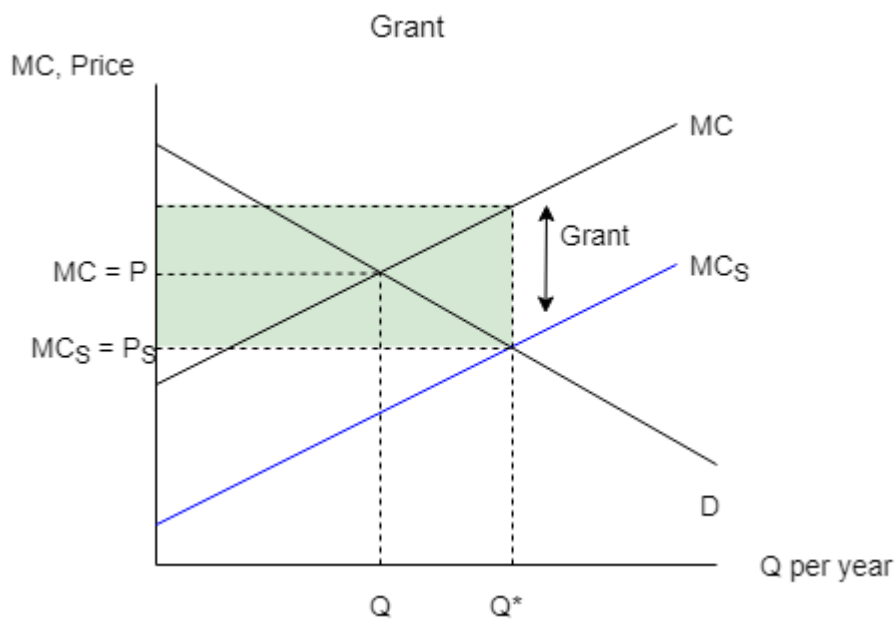


Figure 6.1 The effect of a grant for SME: s

This grant program can be categorised as a substitute subsidy in that it encourages production of a product that does not give rise to a negative externality, and thus hopes to decrease the production of the product that does give rise to the negative externality. Moreover, it increases the SME:s chance of getting certified by one of the large certification programs and thus being awarded with an environmental friendly label. The grants earmarked for SME:s within commercial fishery and aquaculture are relatively small, 1,2 percent and 4.5 percent respectively of the 2014 – 2020 ocean and fisheries program budget (budget referens). As by August 2018, with two more years of the program left, five of the six grants for SME:s within commercial fisheries and aquaculture are finished<sup>2</sup>. This indicates there is indeed a demand within commercial fishing and aquaculture to transform their production into a more sustainable production. Moreover one can assume that if there were more funding in place more fisheries and aquaculture could make further investments in sustainable production. Grants are however a cost, as shown by the green rectangle in figure 6.1, and the funding has to come from somewhere. One way to raise the funding needed and create greater incentives for production transformation would be to use a Pigouvian Tax.

However, when introducing a pigouvian tax program in Sweden there is a difficulty in estimating the cost of the externalities. One of the obstacles is the relative low share of consumed fish and seafood produced by Swedish fishery and aquaculture. Less than 30 percent of consumed fish and seafood is produced in Sweden and the possibility of estimating the cost of the externalities of imported fish and seafood is greatly limited due to lack of available data. The limitation of available data is due to a number of different issues. One of the issues is the lack of surveillance programs and the gathering of data in some countries, another is the issue with IUU and the lack of known origin of some fish and seafood, and yet another is the lack of detailed data of Swedish imports and exports of fish and seafood (RISE, 2017). However, looking at the data in chapter 5.2 figure 5.1 of species that dominate Swedish consumption of fish and seafood, four of the dominating species are produced in Sweden at a significant level. Herring and Rainbow trout are only produced domestically, a little less than half of consumed Mackerel and 25 percent of consumed Cod comes from Swedish producers. Of these are about 60 percent of Herring, 40 percent of Cod, but none of Mackerel and Rainbow Trout certified

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<sup>2</sup> The time in which the author received the information the grants were finished, however, the grants could have been finished before August 2018.



by MSC. Although the difficulties of estimating the value of the externalities involved in the production remains, the Swedish environmental protection agency together with the Swedish agency for marine and water management has one of the most extensive environmental surveillance programs in the world (Naturvårdsverket, 6<sup>th</sup> of april 2018). The externalities that occurs due to the Swedish production of fish and seafood would thus be easier to estimate than the externalities in global industry. Moreover, an argument against a pigouvian tax is that it can only be efficient in the short-run, when the number of producers are fixed. For long-run efficiency a lump sum entry tax would have to complement the pigouvian tax, however, thanks to the requirements of a fishing license in order to practice commercial fishing in Sweden (Sveriges Riksdag, Fiskelag 1993:787 §29) it would be relatively easy to control the number of producers and thus reach long-run efficiency.

Regarding the difficulties in estimating the cost of externalities of imported fish and seafood; it might be close to impossible make a precise estimate of the externalities and the costs involved, however, any estimate that reduces the negative externalities is better than no estimate at all. A Pigouvian tax that fully internalizes the cost of the externality would increase the MPC curve until it equals the MSC curve as pictured in figure 6.1. The Pigouvian tax would thus decrease output until it reaches efficient level of output at  $Q^*$ . With an imperfect estimate of the cost of the externality the MPC curve would increase by the estimated cost as pictured in figure 6.2. Instead of crossing the MB curve at the optimal point d it would cross the MB curve at point o which lies below the optimal point d. The resulting output  $Q^e$  is thus higher than the optimal output  $Q^*$  but below the starting value of  $Q$ . The Swedish market for domestic fish and seafood could thus reach a more sustainable production through a Pigouvian tax without necessarily internalizing the full cost of the externality as is shown by figure 6.2. The revenue raised by the Pigouvian tax could thus be used to finance and extend the current voluntary financial instrument already in place or be invested in further research of the marine environment and protection programs.

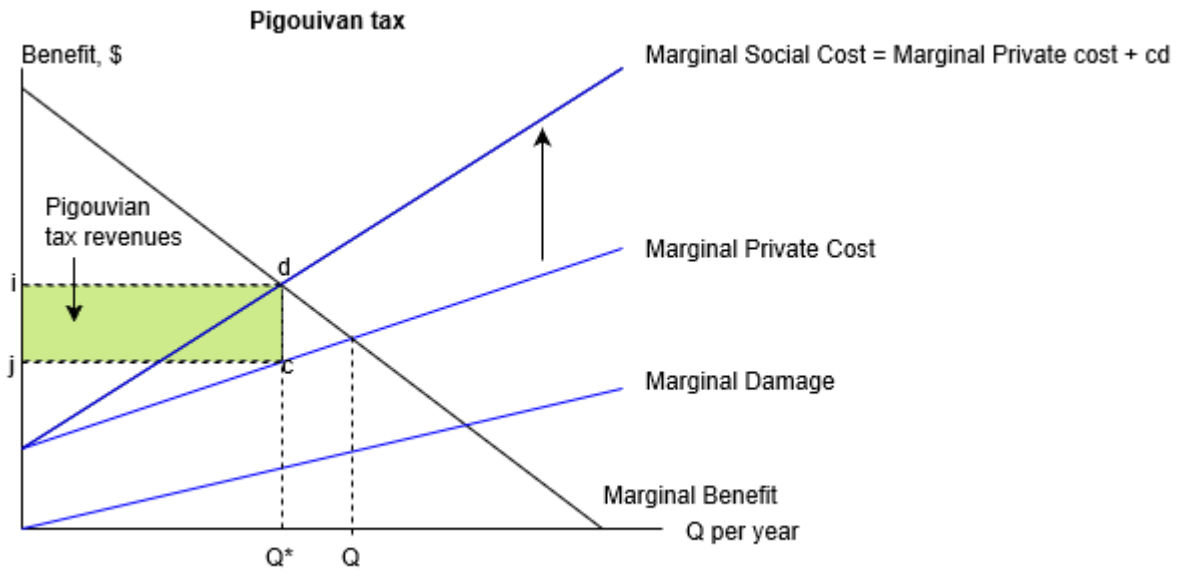


Figure 6.2 Pigouvian tax with a perfect estimate

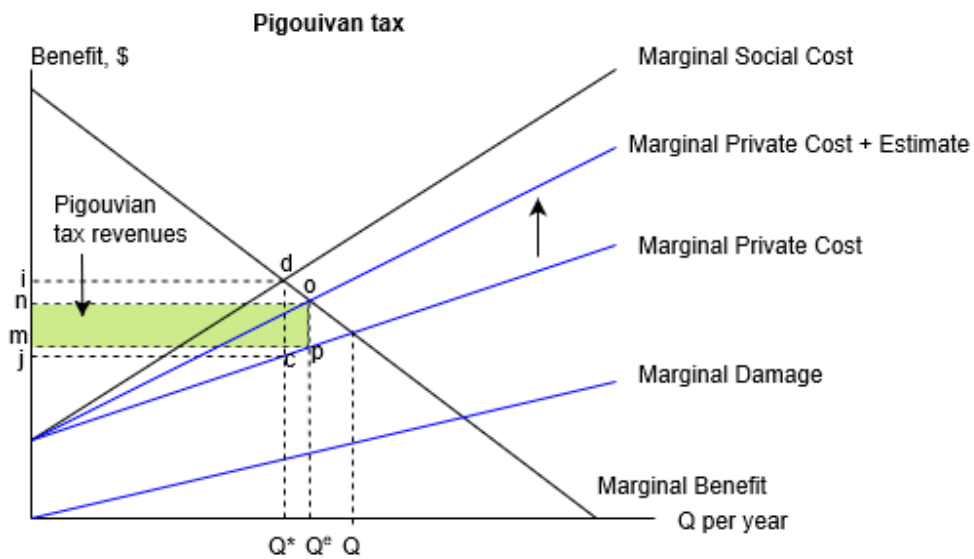


Figure 6.3 Pigouvian Tax with imperfect estimate

As shown in the theory section a Pigouvian tax can be implemented as an excise tax which in turn can be implemented as a specific excise tax or an Ad Valorem excise tax. An excise tax is levied on the producer and is (usually) passed on to the consumer through an increase in the price of the product. The incidence of the tax depends on the elasticities of supply and demand and the market structure. If consumers are more elastic it is easier for them to turn to other products and thus avoid the tax, which means a higher part of the tax incidence is put on the producer and vice versa (Rosen & Gayer, 2014. p.304). An excise tax on uncertified fish and seafood could thus increase the price of uncertified fish and seafood products faced by the consumers, and according to basic economic theory when price of a good is raised demand for the good falls. Assuming that Swedish consumers acts according to the findings made by previous research and does not necessarily treat fish and seafood and other protein sources such as red meat as substitutes, but rather substitute between different species of fish. One can assume that the Swedish demand elasticity for fish and seafood is similar to the european market in general, and thus one can assume that the elasticity is close to one for most fish species (perhaps less elastic for salmon that currently dominates Swedish consumption, see fig 5.1). A tax on uncertified fish and seafood should thus not create a significant reduction of fish and seafood consumption in general, but reduce the consumed amount of uncertified fish and seafood in particular. Looking at fig 5.4 in chapter 5, one can see that among the eight most consumed species in Sweden, seven are in some part certified. This implies that, since it already exists a perfect substitute for these particular uncertified species<sup>3</sup>, if the implemented tax raised the price of the uncertified fish and seafood options to equal that of the certified it is a reasonable assumption that consumers would instead choose the certified option. Some evidence of this behavior can be seen in Jens Hainmueller, Michael J. Hiscox, and Sandra Sequeira's (2015) coffee experiment, when price was held equal consumers would choose the brand with an eco-label. Figure 6.3 shows an example of a possible substitution between uncertified and certified Cod after an introduction of an excise tax. According to the mapping of Swedish consumption of fish and seafood done by RISE (see figure 5.4) Swedish consumption of uncertified cod is approximately 60 percent of total cod consumption. In the figure a consumer with a budget constraint that allows a purchase of x units of uncertified Cod or y units of certified Cod (given  $x > y$ ) would thus purchase a units of uncertified Cod and b units of certified Cod. After an

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<sup>3</sup> A perfect substitute would be a substitute between for example certified cod and uncertified cod. Substitution between fish species would be categorised as an imperfect substitute.

introduction of an excise tax that internalizes the cost of the externality the price of uncertified Cod would equal that of the certified. The new budget constraint now allows the consumer to choose between  $y$  units of uncertified Cod and  $y$  units of certified Cod (given  $y = y$ ). Again, considering the coffee experiment and treating consumers' tendency to overestimate the amount of certified fish and seafood they purchase as a willingness to, and knowledge they should, purchase certified fish and seafood. It is a reasonable assumption that given the new budget constraint consumer would choose to purchase  $y$  units of certified Cod and 0 units of uncertified.

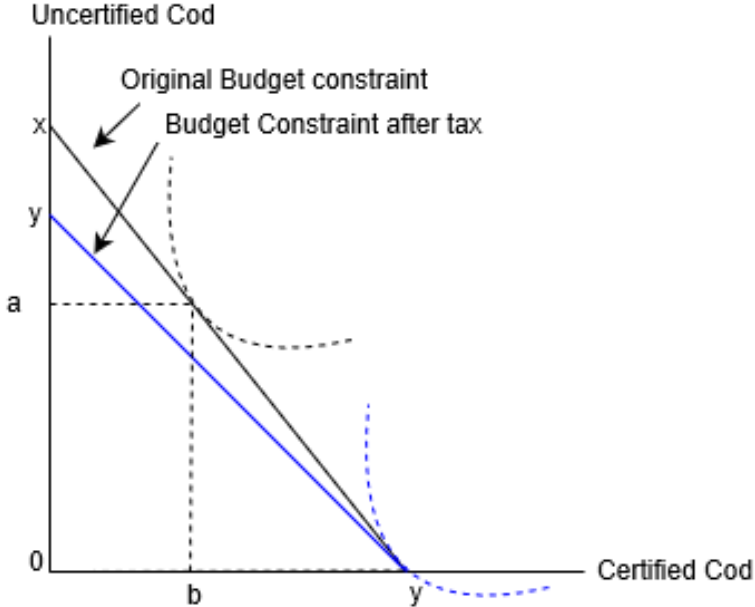


Figure 6.4 Substitution between certified and uncertified cod

Of the total amount of consumed fish and seafood approximately 24 percent (see chapter 5.2) are certified. In figure 6.4 below a consumer with a budget constraint that allows a purchase of  $x$  units of uncertified fish or  $y$  units of certified fish (given  $x > y$ ) would thus purchase  $a$  units of uncertified fish and seafood and  $b$  units of certified fish and seafood. After an introduction of an excise tax that internalizes the cost of the externality the price of uncertified fish would equal that of the certified. The new budget constraint now allows the consumer to choose between  $y$  units of uncertified fish and  $y$  units of certified fish (given  $y = y$ ). Again, assuming demand elasticity close to one and a preference for purchasing certified fish over uncertified, where there exists a perfect substitute (as in the cod example) the consumer would act according to figure 6.3 above. The remaining species which lack a certified counterpart would in some

cases be substituted by some different certified species or be substituted by cheaper uncertified species. It is thus not likely that the consumers would purchase  $y$  units of certified fish and 0 units of uncertified, however, a large shift of the indifference curve towards the certified options would be expected, in the example below a consumer would thus purchase  $d$  units of certified fish and  $c$  units of uncertified.

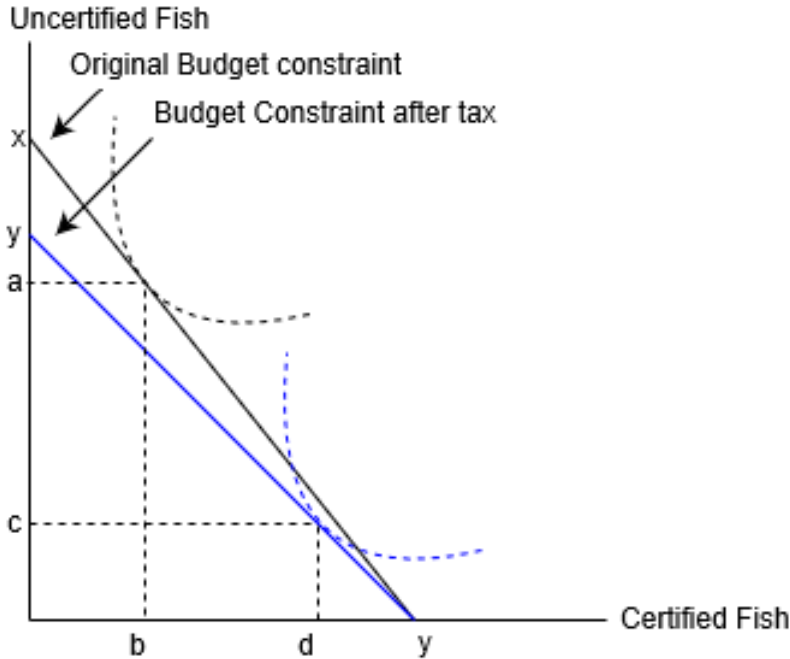


Figure 6.5 Substitution between certified and uncertified fish and seafood

When evaluating the use of excise taxes it can be appropriate to recall that specific excise taxes are sometimes criticized to fall disproportionately on lower income households, as was the case of the emission tax in the UK. A specific excise tax that would increase the price equally regardless of the current price could fall more heavily on the lower income households than an ad valorem excise tax that increases price proportionally. Lower income households that already choose to purchase cheaper species of fish and seafood would thus not pay a relatively larger amount than those that purchase the more expensive species. However to fully compare the two options one would need to analyse mikrodata on price distribution between species and household consumption, which lies outside the scope of this thesis.

A larger shift of consumption towards certified fish and seafood could be achieved if the tax were accompanied by a subsidy on certified fish and seafood which simultaneously lowered the

price for the certified options. It would further increase demand for certified fish and seafood and possibly create a larger support for the tax among the public, as evidence suggest by previous studies on health taxes. The subsidy could be financed by the revenues raised by the tax.

The European cap-and-trade system for fish and seafood is an effective way to control and reduce the aggregate fishing effort within the European Union fishing fleet. The TAC is decided by the European Commission and based on scientific advice from different advisory bodies (European commission, Fiske). The TAC does not include all fish that is fished within the European Union but targets those stocks with the highest commercial value (European Commission, Fiske). The 2018 quotas were lower in comparison to 2017 for most stocks, however NGO: s such as WWF has criticized the 2018 quotas, claiming the quotas are still too high for many species (WWF, “fiskekvoter för 2018 drabbar redan hårt pressade bestånd”, 2017-10-10). The European cap-and-trade system can thus be effective in reducing the aggregate fishing effort within the European Union, but it does not necessarily stop fishing of stocks fished above their respective MSY level. An example of such stocks are Cod from the Baltic Sea and Eel, of which both are on the WWF red list but still fished by countries within the European Union.

## 6.2 Informative instruments and nudging

There is a relative high recognition of particularly the MSC label in sweden and the attitude towards the label is in general positive. However looking at the data on consumer knowledge and attitudes towards certification one can see that there is room for further education of the impact of fisheries on the marine environment. As some previous research suggest an informative campaign could increase the awariness of the benefits involved in consuming certified fish and seafood, and thus also increase consumption. However issues with voluntary informative instruments remains, it is difficult to reach the great mass of the population and when the information is out there it will still be up to the consumer to decide how to make use of the information. In addition there exist some evidence for the suggestion made Ölander and Thøgersen (2014) that “information has not been proven a very successful means to promote voluntary behaviour change to protect the environment” (p.341) and they conclude in their research that in order to reach the intended results a combination between nudging and

information is the best approach. The combination approach is appealing when looking at the surveys made by MSC, where 80 percent state that they buy ecolabelled seafood occasionally or as often as they can, however only 24 percent of consumed fish and seafood has a sustainability label which indicates that the willingness – purchasing gap (between the stated willingness to pay for environmental friendly goods and the actual purchasing decisions) seems to be quite present on the Swedish market for fish and seafood. Taking into consideration that there exists an upwards trend on consumption of certified fish and seafood even though consumer recognition of the certification label is just above 50 percent, an information campaign that manages to reach a large part of the population could help to increase consumer recognition of the label. Used together with an appropriate nudging tool that help consumers translate the intention of buying certified fish and seafood to action when making the purchasing decision could thus decrease the current willingness – purchasing gap. Although there is an ongoing dispute of what is considered a nudge and what is to be considered an informative instrument, eco- and environmental labels are usually considered an informative instrument and are thus used and designed from that angle (Lehner, Mont & Heiskanen, 2015). Simplification and framing could be used to complement the label in such a way that it immediately becomes clear as to what the label is. In that way consumer recognition of the label and previous knowledge of what it implies is not the sole factor in the purchasing decision. Changes in the physical environment is an already popular nudging tool to affect consumption behavior, such as product placement on shelves and where in the store the items are found (Lehner, Mont & Heiskanen, 2015). An attractive placement together with increased accessibility and visibility of certified fish and seafood could thus nudge individuals into picking these over the uncertified options. Placing a large sign above the fish counter or freezer where the certified fish and seafood are placed reading “*Thank you for saving our oceans!*” or some other motivational text could affect our choices due to people’s general willingness to following social norms and ideal-type behavior. Hence, increasing consumer recognition of sustainability labels on fish and seafood combined with nudging tools could thus decrease demand of unlabelled fish and seafood and increase demand of the labelled options.

As can be seen in figure 6.6 when demand for unlabelled fish and seafood decreases the quantity produced will fall until a new equilibrium is reached at quantity  $Q'$ . The corresponding effect on the market for labelled fish and seafood would be an increase in demand for these products, see figure 6.5. As demand increases more output will be produced to meet this new demand. Fisheries that have previously been acting on the market for unlabelled fish and seafood will see

decreasing revenues on their market and increasing revenues on the market for labelled fish and seafood. According to economic theory this should mean that more fisheries attempt to transform their current production into a production that meets the standards for certification in order to be able to compete for the increasing revenues in the market for certified fish and seafood. The speed of production transformation from uncertified to certified depends on how elastic the production is. The new equilibrium will thus depend both on the effect of the information campaign and nudging instrument as well as how quickly fisheries can transform their production to meet the certification standards.

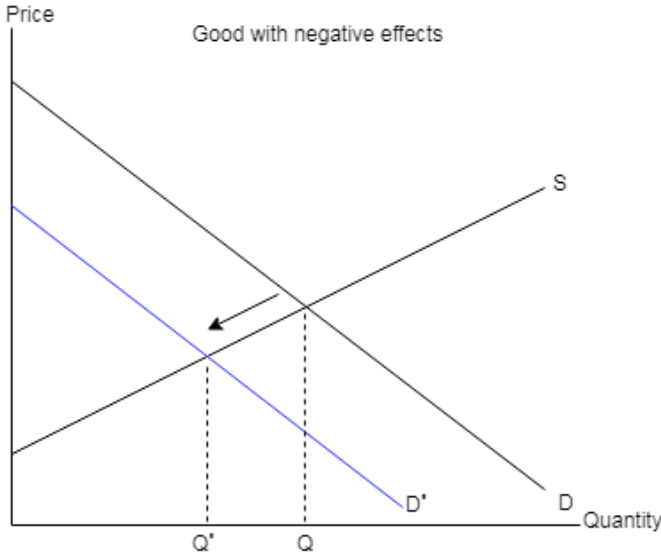


Figure 6.6 Negative Shift in demand

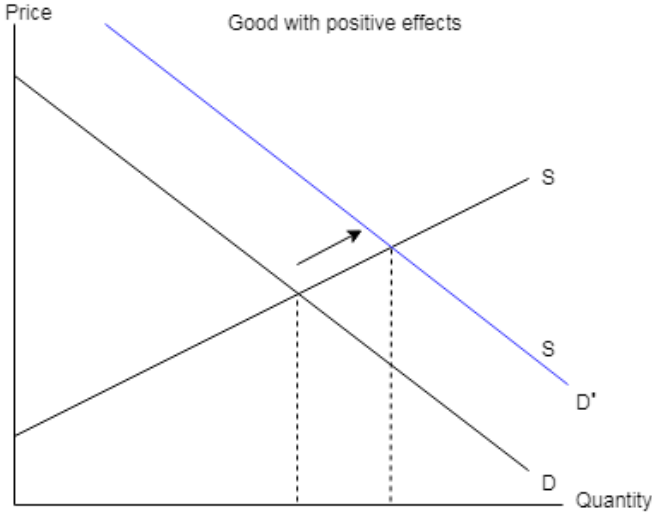


Figure 6.7 Positive shift in demand



### 6.3 An international problem

So far it has been established that from a social benefit perspective, where there exists a negative externality the free market tends to overproduce that which causes the externality. In the marine environment much of the negative externalities arise from overfishing of marine species and the overfishing in turn exists largely because of the common pool problem. The long-term goal of information campaigns, nudging and financial interventions on the market of fish and seafood is thus to reduce the negative impacts of the fishing industry on the marine environment. Changing the current consumption pattern of fish and seafood to a more sustainable consumption and thus increasing the amount of certified fish and seafood could reduce the aggregated amount of “Effort”,  $E$ , in figure 6.8 below. In the current situation most species are fished on or above the MSY point in the figure, and the additional effort beyond this point has already led to a decrease in Yield per unit of effort and thus to decreasing profits. Decreasing the aggregate amount of “Effort” until it reaches  $E_{Max\ profit}$  with corresponding Yield  $Y^*$  will thus increase profit for those active in the fishing industry and lead to a more stable future Yield.

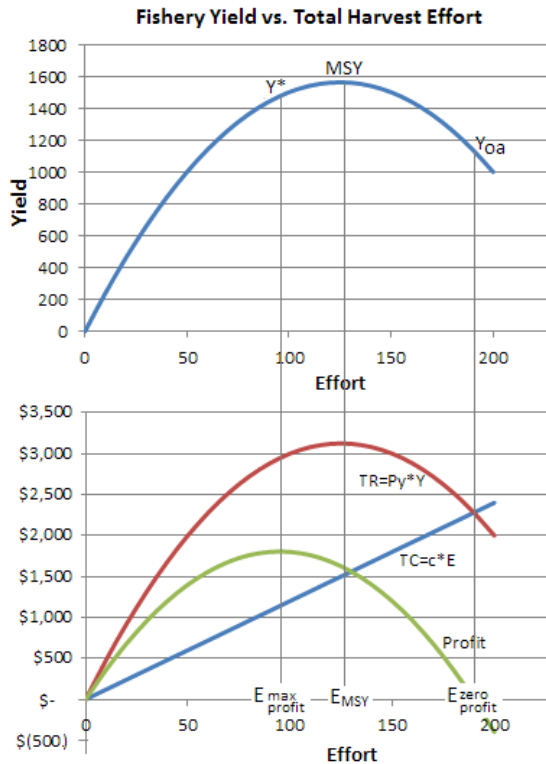


Figure 6.8 Fishery Yield vs. Total Harvest Effort (Mackenzie J., 2014)

Looking at the effects of reduced input of “Effort”, such that it equals  $E_{Max\ profit}$  on the carrying capacity of the oceans. If consumption were to match the MSY level the bold dotted line which shows the degraded carrying capacity would, given time to recover, return back to its natural state.

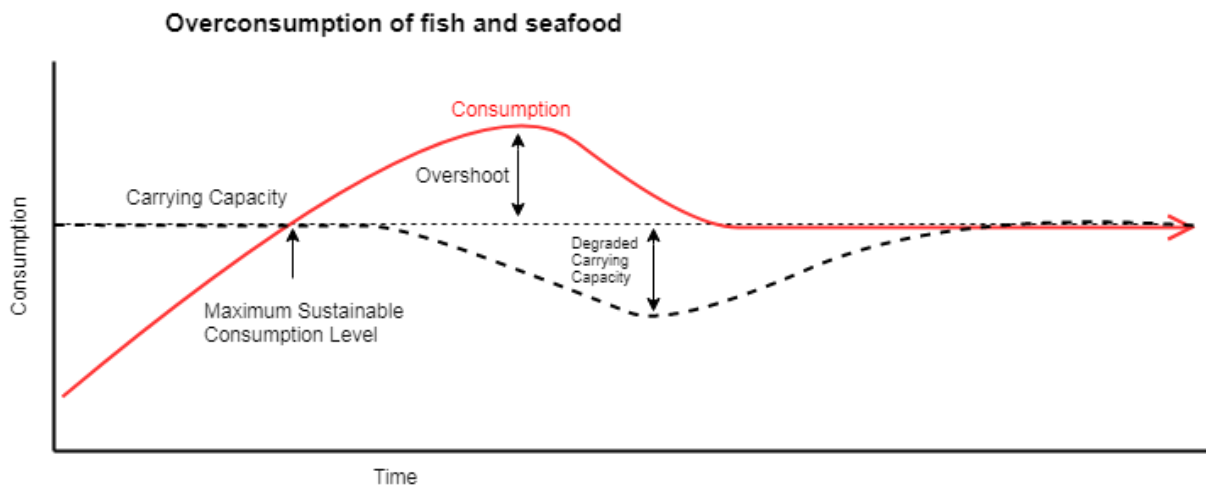


Figure 6.9 Overconsumption of fish and seafood

The question thus remain if the policies discussed above can help remedy the problem of negative externalities in the fishing industry. Assuming now that taxes or an information campaign combined with nudging tools creates a significant shift on demand towards certified fish and seafood on the Swedish market, in order to have an effect on the aggregate amount of effort the Swedish market for fish and seafood would have to be substantially larger than it is. Sweden is a small economy and can thus not affect world price or have a significant impact on world supply and demand for fish and seafood. It is thus unlikely that any interventions on the Swedish market alone can manage to reduce the amount of aggregate effort needed to have an effect on future Yield and the carrying capacity of the oceans. In order to reduce the aggregate amount of effort and thus reach the goal of a more sustainable fishing industry market interventions has to be made on an international scale. With this in mind Sweden is part of the European Union which is a far larger market than Sweden alone and Sweden has a possibility to impact the policy decisions of the European Union. Additionally, Sweden tops the ranking lists of implementation and adoption of innovating environmental policies and environmental pioneers has a way of spreading the uptake of advanced environmental policies to other countries (Jänicke, 2005).

## 7 Conclusion

The present study set out to investigate how different instruments and tools can be used to create a more sustainable and environmentally friendly market for fish and seafood. One aim was to identify different ways to remedy the externality problem within the fishing industry. The other aim was to examine how these remedies would affect the Swedish market for fish and seafood if implemented in Sweden. A focus of this thesis has been consumer behaviour; how consumers would react to different policy measures with regards to current attitudes towards certified fish and seafood as well as with regards to current consumption behaviour.

This thesis has included five different tools that can help remedy the negative externality problem in the fishing industry. Divided into financial instruments which include; Pigouvian taxes, Cap-and-trade, and subsidies, and Informative Instruments which include; Information campaigns and labelling. Nudging has in some ways been included into the informative instruments to simplify the structure of the thesis, but at the same time been treated and analysed as separate tool.

The two existing financial instruments on the Swedish market already works towards creating a more sustainable fishing industry. Looking at the evidence from the 2014-2020 ocean and fishery program, there exists an interest within the commercial fisheries and aquaculture to transform their production into a more sustainable one. At least when funding of the transition is available. The European Union cap-and-trade program for fishery quotas reduces the aggregate effort within the European Union fishing fleet, leading to a more long-term sustainable yield of the fish stocks included in the European Union TAC. The current cap-and-trade program does however include fish stocks that some NGO: s deem is already overfished and instead of a reduced quota would need an active and strict plan for reproduction to regain full productivity again.

The investigation into consumer attitudes towards certification labels on fish and seafood and the current data available on Swedish consumption, suggests that the willingness-purchasing gap found by other researchers exists on the Swedish market as well. Although this indicates that it is difficult to transform consumer behaviour by information alone it also points towards, that what is lacking, might not be awareness of the problem but incentives to act on it. Previous research on nudging on the other hand shows that it is possible to change consumer behaviour

without necessarily creating economic incentives. Grocery stores especially is a place where nudging has already been used, successfully. Nudging people into making the right purchasing decision could have an impact on the demand structure for fish and seafood.

Implementing a Pigouvian tax could not only help create incentives but also help to increase funding for the ocean and fisheries program. Even though it would be hard to fully internalize the cost of the externalities, being able to internalize part of the cost of the externalities could render a production closer to the social optimal. Whether the pigouvian tax is designed as a specific excise tax or as an ad valorem excise tax, it would increase the price of uncertified fish and seafood and thus make the consumer face a truer cost of the product. Given the willingness to purchase environmentally friendly goods that already exist, the shift in demand towards labelled fish and seafood should be quite substantial.

Taken together, these results suggest that the Swedish market for fish and seafood could benefit from an intervention that increase demand and supply of certified fish and seafood. The commercial fisheries are already using available funds to use more sustainable fishing methods and the majority of the population wants to purchase certified fish and seafood, but lack incentives or the nudge to do so.

With the lack of both data and previous research on this topic, this study has gone some way towards tying different aspects of consumption behaviour, policy tools, and instruments together and combining them into a research of a so far largely un-investigated issue.

This research has brought up many areas in need of further investigation; evaluating of the effect of the grants on the Swedish fish and seafood market can increase the understanding of substitute subsidies on the fish and seafood market, more data and especially time series data on fish and seafood consumption is needed to draw conclusions of what trends exists within sustainable fish and seafood consumption.

Continued efforts are needed to create a more sustainable fishing industry in order to avoid further degradation of the carrying capacity of the oceans and its consequences.

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