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Detoxing by Taxing

A National Tax on Clothes Containing
Chemicals?

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Abstract

Growing wealth and globalization have lead to increasing consumption of clothes and shoes in Sweden. Environmental organizations have shown that some clothes and shoes contain chemicals that are hazardous for both the environment and health. The Swedish Chemicals Agency (KemI) suggests that a tax should be imposed on this group of goods in order to diminish the use of hazardous chemicals. We examine whether such a tax would achieve this purpose by studying consumer behavior in Sweden and by estimating the price elasticity of demand for clothes and shoes. We compare our estimate with elasticities found in literature for Sweden and the UK. Our conclusion is that clothing and shoes are luxury goods in Sweden with our estimated income elasticity being 1.26. Further, Swedish consumers are price sensitive with a price elasticity of demand of -2.80 which indicates that an excise tax would correct for the externality. This might be overestimated due to the simple approach we use, but we do believe that the true elasticity lies somewhere between ours and the ones found in literature.

Keywords: externalities, excise tax, chemicals, clothing, footwear, price elasticity of demand, price elasticity of supply, consumer behavior.

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1. Introduction

The fact that our clothes and footwear contain a variety of chemicals has attracted the attention of Swedish environmentalists, consumers and media in recent years. Organizations such as Greenpeace and the Swedish Society for Nature Conservation (Naturskyddsföreningen) are two of the actors that want to draw attention to the use of chemicals in the textile industry and the environmental and health effects of these, this in order to push companies, agencies and governments to take action to stop the spread of these substances. While organizations are alerting the public about the dangerous chemicals in our clothes, the Swedish clothing consumption continues to increase due to trends, availability of low-priced clothing and higher incomes. Between 2000 and 2009, clothing consumption has increased by 40% (SMED, 2011). The most recent contribution to the chemicals debate is a report published in February 2013 by the Swedish Chemicals Agency (KemI). KemI suggests that taxes could be important tools to control and phase out chemicals that are known or believed to be hazardous. Furthermore, KemI suggests that a national tax on three selected chemicals found in clothing and footwear should be investigated further. This paper will examine whether a tax on certain chemicals in clothing can reduce the spread of these substances. We investigate whether a tax on either consumers or importers can have different effects, by looking at the price sensitivity of the two different groups. We also look at consumer behavior and consumption patterns to explain whether there may be more than the price of clothing that determines how and why we consume clothes the way we do.

1.1 Purpose

The purpose of this thesis is to investigate whether a tax on clothing and footwear containing hazardous chemicals might be efficient, in the sense that it will lead to a diminishing use of these chemicals. We will do this by studying tax theory and elasticities. As a final subject we will briefly look into some behavioral aspects of consumption in order to find out whether there are other determinants behind demand for clothing that might affect the outcome of such tax.

The purpose can be broken down into the following questions:

1. What is the income and price elasticity of demand for clothing? Are consumers price sensitive?
2. Could supply be more elastic than demand in the market for clothes and footwear?
3. Is the tax suggested by KemI feasible?

1.2 Method

In order to answer the questions mentioned above we will do a literature review of economic theory about environmental taxes, demand and supply elasticities and present data on previously estimated elasticities for clothing and footwear.

We then proceed with a quantitative approach by estimating price elasticity of demand for a recent time period. We do this because our expectation is that the elasticities have changed compared to the estimated elasticities for previous periods. The price elasticity of demand will be estimated by dividing the percentage change in quantity by the percentage change in price. The income elasticity of demand will analogously, be estimated by dividing the percentage change in quantity by the percentage change in income. The reason for using this rather simple model of estimation is the lack of data. In order to run a regression yielding reliable results we would need data for monthly or quarterly prices, quantities, incomes etc. so that the number of observations in the regression analysis would be sufficient. Unfortunately we have not been able to find data on price changes on the consumption group of clothing and shoes on a monthly or quarterly basis. Another way to acquire a sufficient number of observations would be to use data on a yearly basis but incorporate a larger number of years. This would, however, yield a result that would not necessarily be representative of today's elasticities. Our expectation is that the elasticity of demand has changed during the last decade or so, thus including data for years previous to 2000 will not yield results that reflect the reality of consumers today.

Due to the limited data and the fact that we wish to estimate elasticities that are representative of today's market we will use the basic way of calculating with percentage changes. Although this is a rather simple model, it is the definition of elasticities, found in any text book on economics. It should thus give an indication on what the elasticities might be today, giving decision makers an idea of how consumers will react to the proposed tax. Since we assume that consumers base their purchasing decisions on many factors other than price we summarize the results of previous surveys in which consumers have answered questions about their purchasing patterns and what they deem important when buying clothes. This will supply us with information about which other factors affect purchasing decisions. Since our model does not incorporate other variables than price the survey answers provide us with information that strengthens our analysis.

When studying the determinants of the supply elasticity we do not calculate any estimates but rather take a theoretical approach. This is partly done because of the lack of data on seasonal supply prices and quantities, but also because we are mainly interested in the consumer's point of view.

1.3 Scope & Limitations

In this thesis we will focus solely on an excise tax as an economic instrument and not on various types of regulations. The main reason behind this is that economic instruments are often decided on a national level as opposed to regulations, which are decided on the EU-level (KemI, 2013a).

The tax proposed by KemI is a national tax on clothes and footwear, thus the focus of this thesis is on the Swedish market for clothing. The price elasticity is also calculated for the Swedish market, as are the elasticities that we have found in previous literature. We do however compare these to elasticities in the UK, in order to check for any differences that might suggest that the elasticities for Sweden are deviating. The UK and Swedish market for clothing and footwear have undergone the same types of changes; therefore a comparison between the two is interesting. When discussing the efficiency of the tax we only consider the purpose of the tax, i.e. efficient in this paper is equal to achieving the desired effect: to reduce consumption of clothing containing hazardous chemicals. We do not consider equity or distribution effects of the tax, i.e. we use a positive analysis approach.

Throughout this thesis we will from time to time refer to the consumption group clothes and footwear as only clothes. This is in order to avoid repetition and does not imply that footwear is not included. Also, we will refer to the producer of textiles as the importer or supplier, since the term producer is somewhat confusing for the textile market in Sweden. Most of our clothing is, according to SMED (2011), imported and sold in Sweden by retailers rather than sold by the actual producer or produced in the country.

A basic assumption made throughout this thesis is that the consumption group of clothing and shoes is a homogeneous group for which it is possible to estimate a single price elasticity of demand. This assumption has to be made in order to calculate our elasticities, and because the quantity and consumer price index is bundled into such group.

There may be other hazardous substances in clothes and shoes that we do not focus on here. We choose to emphasize the three chemical suggested by KemI: highly fluorinated substances, phthalates and biocides.

1.4 Literature Review

Environmental taxes and charges have become more common in the OECD in recent years although their use is still rather limited. 6 – 7 percent of the total tax revenue stems from environmental taxes, while the lion share of these are transport and energy related taxes. About 5 percent of the environmental tax revenues come from taxes on chemical emissions, products, substances, waste and natural resources (Söderholm & Christiernsson, 2008).

A tax on natural gravel was introduced in 1996 in Sweden. However, inventories of its use and alternative materials had already begun in 1983. In order to close the price gap between gravel and crushed rock – the closest substitute – the tax was set at a high enough level. Since 1984, the supply of natural gravel has declined considerably, in both absolute and relative terms (Söderholm, 2004).

In 1984, charges on pesticides were introduced in Sweden in order to reduce the environmental and health risks associated with its use. The charges turned into taxes the following year. Since 1986, the total amount of pesticides used in Sweden has decreased and it had been reduced by 35 percent in 1995 (Söderholm, 2004).

Sweden introduced taxes on fertilizers in 1984 with the goal to reduce nitrogen and phosphorous leakage by reducing demand. In 1994 the tax on phosphorous was replaced by a tax on cadmium. The taxes were levied on both Swedish producers of fertilizer and imported fertilizers, with the tax rate being about 20 percent of the price on fertilizer. These taxes have been shown to reach the wanted effect, since demand for fertilizers were at the lowest when the taxes were the highest (Söderholm & Christiernsson, 2008).

In our work of investigating taxes we have studied Swedish Government Official Reports (SOU:s) concerning value added taxes. In SOU 2005:57, various calculations are made with regard to elasticities, however, these are designed so as not to distort consumer behavior, whereas the tax we are interested in is supposed to alter consumer behavior. The previous estimates on elasticities for the Swedish market for both 1963 – 1996 and 1994 – 1996, are estimated by using time series data on consumption from Statistics Sweden (SCB). The quarterly data for the periods consists of income, expenditures and prices for all consumer

goods and services. The estimations are run simultaneously for every group of goods according the AIDS-model (Almost Ideal Demand System) where every good or service is a function of all prices and income (SOU 1997:17a, Appendix 2). We compare the Swedish estimates to elasticities for the UK market. These have been estimated by multiple regression taking clothing consumption as a function of incomes and relative price changes (Jones & Hayes, 2002).

To the best of our knowledge, this is the first thesis to investigate the effects of a tax set on clothes and whether such a tax will help diminish the use of the hazardous chemicals based on current consumption patterns.

1.5 Thesis Outline

The first part of this thesis aims to give a broad description of chemical use and environmental issues. In this section we describe the chosen chemicals and the consequences on environment and health. We also give a short presentation of the proposed tax. The second part sets the theoretical framework by describing tax theory, externalities and elasticities. This is done mainly by using academic textbooks covering these topics. The description of consumer behavior and consumption patterns are done by using secondary sources such as articles and essays published in economic journals and reports containing surveys and interviews with consumers in Sweden. In the following section we present our results based on our own calculations on elasticities, which we have derived using data from SCB. This is followed by a conclusion and discussion.

2. Background

In order to give a broader understanding of the problem this chapter will describe the issue of environmental and health effects of chemicals in more detail. Because the tax evaluated in this thesis is suggested by KemI, this chapter is concluded by giving a short description of KemI and the tax suggested by them.

2.1 Chemical Use & Environmental Issues

Chemicals are widely used in our society and present in practically all consumer goods we use in our daily lives. They can be found in electrical equipment, hygiene products and even in the food we eat and the clothes we wear. Chemicals are used for a wide variety of reasons, some are used as flame retardants and some make plastics softer, while others are used to

make textile and clothing repel water. According to KemI (2013a) the world production of chemicals has risen from 7 million tons to about 400 million tons per year during the second half of the 20th century, while about 30 000 – 40 000 different chemicals are produced in, or imported to, the EU in volumes larger than 1 ton. We are exposed to a large mix of chemicals every day, yet the risks associated with many of these substances are still largely unknown.

During the life cycle of a product the different chemicals are released in to the environment. When clothes are washed some of the chemicals are rinsed out with the water and eventually end up in our rivers, lakes and oceans where they can damage the ecosystems. In some cases chemicals in clothing can be absorbed by our skin. At the end of a products life chemicals can cause problems in the waste treatment facilities and cause emissions from combustion plants or landfills. Humans are exposed both directly and indirectly to these substances. Indirect exposures comes via the environment since many of these substances cannot be treated at the waste water treatment plants, but rather pass in to the environment where they accumulate at the top of the food chain, i.e. in humans. The knowledge of this type of diffuse spread from products is low. It is also largely unknown how the cocktail of all the different chemicals affects us and the environment. This type of exposure can however be of particular importance to those most sensitive, such as fetuses and young children (KemI, 2013a).

The World Health Organization (WHO) has estimated the health effects of chemical use to about one million deaths per year. The United Nations Environment Program (UNEP) has estimated the environmental effects from the use of chemicals to somewhere between 114 and 585 billion USD in ecosystem losses (Ibid).

2.2 The Swedish Chemicals Agency, KemI

The Swedish Chemicals Agency (KemI) is a regulatory authority under the Ministry of the Environment. KemI:s main responsibility is to ensure that the chemical controls of companies, and the society in general, is conducted in a way that is considered acceptable. This responsibility encompasses both the health of people and the environment. KemI is also the responsible authority for the Swedish environmental quality objective *A Non-Toxic Environment*. The agency works within Sweden, the European Union and globally to limit the risks dangerous chemicals have on health and the environment by suggesting legislation and rules in order to attain the objective. Since the legislation concerning chemicals is harmonized within the EU, a large proportion of the work conducted by KemI is within the framework of the EU (KemI, 2013b).

In order to reach the objective about an environment free from hazardous substances, KemI has many different responsibilities such as controlling companies that manufacture and import chemicals, keeping a register of chemical products, handling permits to sell pesticides, helping local authorities and country councils in their work to check chemicals and also cooperating with other countries regarding legislation and rules (KemI, 2013b).

2.2.1 The Chemicals Chosen by KemI

A number of chemicals are used in clothing and shoes. KemI suggests that three of these be of special importance to deal with through taxation; phthalates that are used in shoes made of plastics and plastic prints on clothing, highly fluorinated substances used to make textile repel water, and biocides used in sportswear and shoes to prevent odor (KemI, 2013a).

Phthalates are widely used in plastics, clothing, cosmetics, food packaging, detergents etc. They are often classified as endocrine disruptors or hormonally active agents (HAAs) and animal studies have shown them to increase fetal death and developmental abnormalities (U.S. EPA, 2007). Some of the phthalates used are known to be toxic to reproduction and suspected to be carcinogenic (Naturskyddsforeningen, 2008). Greenpeace (2012) has shown that a variety of chemicals are present in garments in all price ranges. For example, of 31 tested garments with plastic printing manufactured by 20 global brands ranging from H&M to Armani, all 31 contained phthalates. The four garments with the highest concentrations of phthalates were manufactured by Tommy Hilfiger, Armani and Victoria's Secret. The dominating types of phthalates in these four garments can all be found on the list of "substances of very high concern" in the EU chemicals regulation REACH (Registration, Evaluation, Authorization and restriction of CHEMicals) due to the fact that they are toxic to the reproductive system and have hormone disruptive effects.

Highly fluorinated substances are a large group of substances that are used for water repellent purposes. These substances do not occur naturally in the environment but are manmade and furthermore they are very stable since the chemical binding between carbon and fluorine is one of the strongest chemical bindings known. The stability of these substances are considered positive from a manufacturer's point of view but the same properties can cause problems from an environmental and health perspective because of the fact that they are not biodegradable or chemically degradable. Unlike many other environmental toxins such as heavy metals, these substances do not accumulate in the fat tissue of humans and animals, but instead in blood and the liver. The properties of highly fluorinated substances also make it difficult to determine

the environmental effects since traditional methods of assessing bioaccumulation cannot be used (KemI, 2009).

One well-known highly fluorinated substance is PFOS (Perfluorooctanesulfonic acid), which has been proven very persistent, bio accumulative, toxic to reproduction and to aquatic organisms. The use of PFOS has declined heavily since 2000 and it was banned in the EU in June 2008. PFOS has been replaced in textile impregnation by other substances that to some extent are better from an environmental point of view. However, the substitutes are to a very large extent still highly fluorinated and very persistent, while the knowledge about environmental and health effects of these new substances remain limited (Ibid).

Biocides used as antibacterial agents in clothing are designed to kill or resist organisms and are therefore often toxic. Some of them are toxic to aquatic organisms and studies have shown that some are damaging to the hormone system and reproductive health. These antibacterial substances are usually washed out and accumulate in the sludge at waste water treatment plants. The sludge can be used as fertilizer in agriculture where the substances can accumulate in plants and end up in food for cattle and humans. The use of biocides also raises serious concerns about the risk of these substances contributing to the development of resistant bacteria and cross-resistance to antibiotics (KemI, 2011).

The health and environmental effects of these chemicals, combined with the fact that we are constantly exposed to them, are the reasons to why they are chosen. Further, the already existing EU legislation does not cover chemicals in shoes and clothing, thus some sort of regulation is necessary (KemI, 2013a).

2.2.2 The Tax Suggested by KemI

”The Chemicals Agency deems the following suggestions as appropriate for further investigation: A tax on clothes or shoes containing highly fluorinated substances, biocides and phthalates. The purpose of the tax is to reduce the distribution of these substances whilst encouraging the development of other alternatives and to ease the introduction to the market for the alternatives. The tax should be levied on producers or importers and be handled by The Swedish Tax Agency.”¹ (KemI 2013a, p. 108).

In order to understand how this tax could be a way of reducing the use of the chemicals we turn to economic theory. This will help us answer the question whether a tax is feasible or not.

¹Authors' own translation.

3. Theory

In this chapter we start by presenting economic theory about environmental problems and why they arise, the so called *externality problem*. We describe a proposed solution to the externality problem, an environmental tax, or Pigouvian tax, and investigate what theory has to say about the effects of placing a tax on either consumers or suppliers.

In order to evaluate if the tax will be most efficient placed on consumers or importers, we will also discuss theories on demand and supply elasticities. These theories will be supported by a literature research on previously estimated elasticities for the Swedish market, which will also be compared to the equivalents for the UK market. The chapter is concluded with a literature review of previous surveys about consumer behavior, in order to determine whether this might give additional insights to the clothing market and what drives consumption other than price signals.

3.1 Externalities and Pigouvian Taxation

When an individual or firm, while making a decision, does not consider the full cost for society an externality is present. If this leads to a party being directly harmed by the individual or firms' actions, a so called negative externality occurs. So, if hazardous chemicals are used in clothing, the harm to the environment is an externality. The externality is not incorporated in the price system because the negative effect does not work through prices. The producer does not have to pay for the harm to the environment caused by the chemicals and the consumer price does not incorporate the cost of the environmental damage. Thus, this is considered a market failure which leads to a welfare loss to society. In general there will be too much of the negative externality in an unregulated market since the agents' do not take into account the externality they pose on others. The outcome is therefore not Pareto efficient², which means that there is room for improvement efficiency-wise, since it is possible to make one individual better off without harming another one (Hindriks & Myles, 2006).

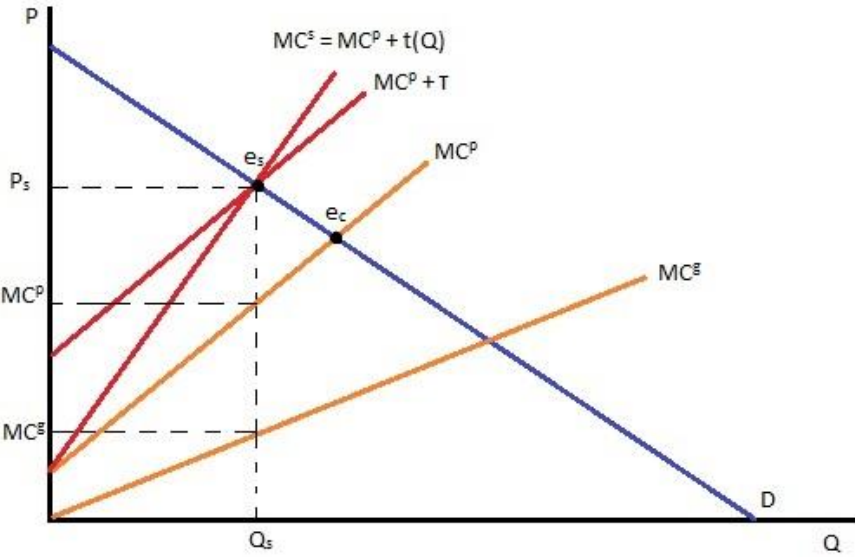
A proposed solution to the externality problem is that whichever agent causing the externality should pay a tax equal to the marginal damage caused by the negative externality. This is

² Pareto efficiency is an economic term that characterizes a resource allocation in which it is impossible to make any individual better off without harming another.

called a Pigouvian tax. The tax causes the agent to incorporate the extra cost in their production decision, making the outcome socially efficient (Pigou, 1932).

In the case of chemicals in clothing and shoes the environmental and health effects are negative externalities that can be corrected for by imposing a tax, if the imposed tax will reduce the demand for these goods. When imposing a tax the price increases, the demand falls and the amount of externality also decreases. When the tax is Pigouvian the equilibrium shifts to the socially optimal point (Perloff, 2008). This is shown in the graph below.³

Figure 1: The Outcome of a Pigouvian Tax



In the figure above the competitive equilibrium (e_c) with an externality present occurs where the marginal private cost crosses the demand curve (D). The marginal cost of the externality (MC^S) has in this case not been taken into account. When imposing a tax per unit the marginal cost curve shifts out by the amount of the tax to $MC^P + T$ and the socially optimal equilibrium (e_s) is reached. Alternatively, an output tax equal to the marginal cost curve MC^S can be set so that the tax varies with output. This is shown by the line $MC^S = MC^P + t(Q)$. The result is the same in either case, the socially optimal quantity (Q_s) is reached (Perloff, 2008).

It is important to note that Pigouvian taxation requires a lot of information. For instance, to set the tax at an optimal level in order to induce the socially optimal outcome, the cost of the marginal damage must be known. It is often difficult to estimate the damage caused by

³ All graphs drawn by the authors' unless otherwise stated.

pollution (KemI, 2007). In the case of chemicals the knowledge of health and environmental damage is still limited and therefore the costs are likely to be difficult to fully estimate (KemI, 2013a).

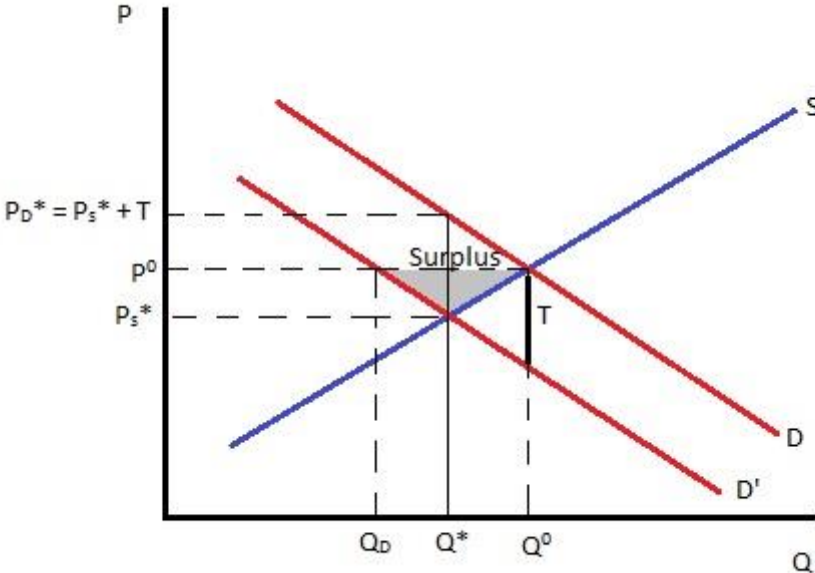
3.1.1 Pigouvian Tax Designed as An Excise Tax

An excise tax, or a so called *sin tax*, is a tax charged on each unit of a good that is sold and is levied per unit of the good. Examples of excise taxes in Sweden include taxes on alcohol, waste, pesticides, lottery and tobacco (Skatteverket, 2013). As these examples suggest, one of the main reasons for an excise tax is to discourage consumption of a certain good. However, excise taxes can be levied as a source of revenue, but we will not focus on this point in this thesis. Excise taxes can be levied on either the consumer or the producer of a good.

3.1.2 Excise Tax Levied on Consumers

Suppose that a tax, T, is imposed on consumers for clothing items containing the hazardous chemicals. The impact of this excise tax is shown in the graph below, in which the tax causes a shift of the demand curve (D) down to D' by the amount of the tax. This, in turn, creates a surplus of the garments (Perloff, 2008).

Figure 2: The Outcome of an Excise Tax Levied on Consumers



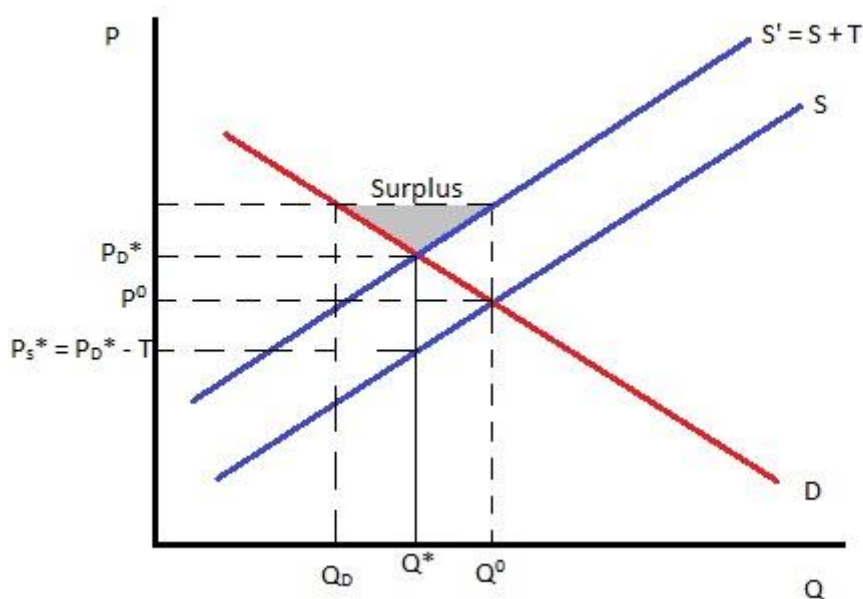
The excise tax has three consequences. Firstly, the overall quantity sold is reduced from Q⁰ to Q*. Secondly, the price paid by consumers for the good has increased from P⁰ to P_D*. Finally,

the price received by suppliers for the good has decreased from P^0 to P_s^* . What is noteworthy is that even though the tax is levied on the consumer, the tax burden is not born solely by the consumer. Whoever bears the burden of the tax is referred to as the tax incidence. In the example above, the tax incidence is split between the consumer and the supplier. The outcomes of different excise taxes depend on the elasticities⁴ of supply and demand, i.e. how price sensitive the consumer or supplier is (Perloff, 2008).

3.1.3 Excise Tax Levied on Supplier

Now, suppose that a tax, T , is imposed on the supplier of the garment containing the chemicals. The impact of this tax is to shift the supply curve (S) by the amount of the tax (Perloff, 2008). This is shown in the graph below.

Figure 3: The Outcome of an Excise Tax Levied on Suppliers



The outcome in this example is identical to the outcome where the tax was levied on the consumer instead, so the tax incidence does not depend on who the tax is levied on. One important difference between the two examples is that when the tax is levied on consumers, their willingness to pay decreases. Given the new tax, suppliers have to reduce the price they charge consumers to get them to buy their good. However, when the tax is levied on suppliers, a portion of this additional cost is passed onto consumers in the form of higher prices. Yet again, the elasticities of supply and demand will navigate the tax incidence.

⁴ Details of supply and demand elasticities are discussed more extensively in Chapter 3.2 below.

An excise tax will fall mainly on the producer when the price elasticity of demand is higher than the price elasticity of supply. Conversely, an excise tax falls mainly on consumers when the price elasticity of supply is higher than the price elasticity of demand (Perloff, 2008).

3.2 Elasticities

3.2.1 Price Elasticity of Demand

The own price elasticity of demand measures the change of quantity demanded due to changes in price. It is the percentage change in quantity demanded regarding a one percent change in price and it is usually negative. The price elasticity of demand (ε) is defined as:

$$\varepsilon = \frac{\partial Q^d}{\partial P} \times \frac{P}{Q^d}$$

The following properties are important to distinguish between:

If $\varepsilon > -1$, demand is inelastic, i.e. demand changes less than price.

If $\varepsilon = -1$, demand is unit elastic and changes by the same percentage amount as price.

If $\varepsilon < -1$, demand is elastic, i.e. it changes more than price.

A price change affects the consumer in two ways. An increased price makes the good more expensive relative to other goods, causing the consumer to substitute away from it. This is called the substitution effect. But the increased price also decreases the consumer's purchasing power which decreases the demand for at least one good. This is called the income effect (Perloff, 2008).

If, however, the demand for a good increases when the price increases - instead of decreasing according to the law of demand - then that good is referred to as a *Veblen good*. In such case, the higher price assigns a greater value to the good, leading to an increase in preferences for the good. Thus, an increase in price may increase the status and the perception of exclusivity, making the good even more preferable (Veblen, 1970). This behavior is common with luxury goods. A decreased price for luxury goods no longer signals the exclusiveness of the good to its target market, which leads to a decrease of sales. An actual example of this is a drop of the price on French champagne from 100 Fr to 99 Fr (before the Euro). The sales of champagne halted and prices had to be decreased even further to find a new market segment with an even lower willingness to pay (Kapferer & Bastien, 2009).

3.2.2 Income Elasticity

Income elasticity (η) measures the percentage change of quantity demanded to a percentage change in income, and is denoted:

$$\eta = \frac{\partial Q^d}{\partial Y} \times \frac{Y}{Q^d}$$

If $\eta > 1$, it is a luxury good.

If $\eta > 0$, it is a normal good, which is common for most goods.

If $\eta < 0$, it is an inferior, i.e. demand of the good decreases when income increases (Perloff, 2008).

3.2.3 Elasticities in Previous Literature

Estimated elasticities for different consumer goods in Sweden show the following results for clothing and footwear:

Table 1: Estimated Elasticities for Clothes and Footwear in Sweden

	Mean own price elasticity		Mean income elasticity	
1963 – 1996	-0.54		1,37	
	Long run	Short run	Long run	Short run
1994 - 1998	-0.26	-0.82	2.61	1.5

Data on 1963-1996: SOU 1997:17b.

Data on 1994-1998: SOU 2005:57, Appendix 6.

The results for 1963 – 1996 suggest that demand was inelastic and that clothing and shoes were considered luxury items. These results should however be interpreted with caution, since the estimations are based on historical data which may not be representative of today's or future demand (SOU 1997:17b). Short run for the period 1994 – 1998 is defined as a quarter. The income elasticities still point to clothing and footwear being luxuries, and even more so in the long run. Somewhat surprisingly the estimates indicate that in the short run consumers are more price sensitive than in the long run. The reason is believed to be that these goods have flexible demand and low habit formation (SOU 2005:57).

These estimated elasticities can be compared to the UK market for clothing and footwear as shown in the table on the following page.

Table 2: Estimated Elasticities for Clothes and Footwear in the UK

	Own price elasticity	Income elasticity
1946 - 1964	-1.11	0.5
1974 – 1991	-0.37	0.9
1987 – 2001	-1.1	2.0

Jones & Hayes (2002).

The UK estimates imply that clothing has evolved from being necessities to luxury goods, which implies that clothes has become to have a demand driven by wants rather than needs. The fact that price elasticity has again reached mid-20th century levels in the last decade of the century could be an indication that the increased price competition in recent years has affected demand, making consumers more price sensitive (Jones & Hayes, 2002). As a concluding remark, clothing and footwear as a consumption group seem to be luxury goods in both Sweden and the UK. Also, Swedish consumers appear to have been less sensitive to price than their British peers.

3.2.4 Supply Elasticity

The price elasticity of supply has an analogous interpretation with the price elasticity of demand, but it measures the change in quantity supplied due to changes in price. When price elasticity of supply is less than one it is inelastic, i.e. supply is not price sensitive. When it is greater than one it is elastic, and when it is equal to zero price changes do not affect quantity supplied. The price elasticity of supply is usually more elastic in the long run.

The main factor affecting supply elasticity is how easily production in the industry can be increased. In the textile industry, all inputs can be readily found at going market prices; hence, output can be greatly increased with little increase in price. The supply elasticity in such case would be relatively large. The time period is another major factor regarding supply elasticities. As the time for suppliers to respond to a given change in prices increases, the effect on the amount supplied tends to be greater. Inputs of labor, materials and capital may be difficult to increase shortly after an increase in price, thus, supply elasticities, in such case, will become larger (Samuelson & Nordhaus, 2001).

3.3 Consumer Behavior

For many consumers today, shopping for clothes is not only about going out and purchasing what they need. Today's consumers have many different ways of justifying their consumption. According to Arnold & Reynolds (2003), there are six different categories of shopping with hedonistic motives. Consumers shop in order to meet friends, reward themselves and to be updated on what is fashionable. Consumers can also find pleasure in shopping for family and friends, but shopping can also contain a hunt for excitement, either through visiting new thrilling places or by making a real bargain. So as much as shopping is about fulfilling purely functional needs, it is also about recreation.

One phenomenon that is typical for the contemporary consumption of clothes is so called *fast fashion*, with well-known actors such as H&M, Zara, Gina Tricot and KappAhl. The characteristics of *fast fashion* are collections with short lifespans, limited editions and low prices. All of these factors contribute to shape the main idea behind the concept, which is to get consumers to act immediately out of fear that there will be no more chances to purchase a certain item. One way to look at it is to look at retailers of *fast fashion* as handling food with a short expiration date, in order to keep the products new, they are constantly renewed. The low price, which is an important part of the success for *fast fashion* as a business concept, is what enables the consumer to impulse buy and hoard clothes that they may not use. It is established that low prices increase the consumers' tendency of collecting items (Ekström et al., 2012).

Niinimäki (2010) states that consumers in the developed world today, are indeed conscious of how their consumption patterns, and hence production, affect the environment. 16.7 % of the respondents in Niinimäki's survey say they have ethical interest in textiles and clothing, yet only 8.9 % actually buy according to their values, revealing a gap between their values and actions. In general, ethical consumption is something consumers are positive about. However, there seems to be a deviation between ethical interest and actual ethical purchasing. 81.4 % of the respondents said that price is a contributing factor in the purchasing decision. Other factors that are important to consumers are "fit, quality, color, compatibility with existing clothes and a real need for new clothes". (Niinimäki, 2010, p. 157).

Ekström et al. (2012) also show a so called *values-action gap* regarding consumption of clothes, which is a gap between consumers' expressed concern for the environment and their actual daily behavior. This in turn indicates that consumers, first and foremost, do not need more information on the negative environmental effects of consumption of clothes in order to

act more environmentally friendly. The gap between expressed concern for the environment and behavior seems to be the greatest in the group young consumers who are the most frequent purchasers of *fast fashion*. One explanation could be that they grew up in a society characterized by globalization and cheap import, whilst the elder generations were characterized by the post-war frugal conditions (Ekström et al., 2012).

In the study a general conclusion regarding consumers in all age-groups, was that in most cases, it was difficult to conclude what would be the best choice concerning the environment. One of the reasons is inadequate labeling and insufficient knowledge of already existing ones. The study also shows that many consumers experienced that there were too many factors to consider and that difficulties in choosing lead consumers to disregard the environment, even though they would have not wanted to. The increase of new collections seems to be one of the main reasons of today's great consumption of clothes, since they quickly make clothes look unfashionable and out of date. According to the consumers in the study, one way to make the consumption of clothes more environmentally friendly would be for big companies to alter their behavior (Ibid).

Since the beginning of the 21st century the market for clothes and footwear in Sweden has gone through changes, with big retailers gaining larger market shares. Since the textile industry exhibits economies of scale, larger companies with greater mark-ups are the ones profiting from this development. The number of companies has decreased since the mid 1990's leading to the ten largest companies covering about 54 % of the Swedish market in 2006 (Retail and Brands, 2008).

3.3.1 Consumption Patterns in Sweden

The average Swedes' clothing consumption has risen by 40 % during 2000 - 2009. This amounts to about 15 kg of clothing per person and year. Shoes and clothes bought abroad are not included in this figure. The consumption patterns are however assumed to vary widely among the population, with young people being the main drivers of the increase in consumption. That would indicate that young people probably buy even more than the 15 kg per year on average (SMED, 2011). Ekström et al. (2012) shows that the most frequent purchasers of clothes are young women, and among these, one third purchase new clothes several times per month. However, even the "typical" consumer purchases new clothes relatively often; a majority buys new clothes at least once every other month. This upward going trend in clothes consumption can not only be seen in Sweden but also in the rest of the

western world. The estimated volume of sold clothes in the United Kingdom has increased by 60 percent during 1995 - 2005. In Sweden, the private consumption of clothes and shoes has increased by 53 percent during 1999 - 2009 (Ekström et al., 2012).

It was also shown that women purchased clothes more frequently than men. There was also a difference in consumer behavior regarding the different age groups; the older you are, the less frequently you buy clothes. 56.3 % of the respondents younger than 35 years answered that they purchase new clothes at least once a month, for consumers 55 years and older the percentage was 21. The frequent consumer of clothes in this study belonged in the group young or young middle-aged, and was typically female. The non-frequent shopper belonged in the group 55 years and older, and was typically male (Ibid).

4. Results

This chapter begins by describing some statistics on income and quantities consumed between 2004 and 2009. These are used to estimate a price elasticity of demand and an income elasticity for the consumption group which will be compared to the estimated elasticities found in previous literature. Our estimates are then used to analyze the outcome of the tax. The chapter is concluded by analyzing the supply elasticity from a theoretical point of view.

4.1 Descriptive Statistics

When choosing which years to use for our estimations on elasticities we begin by looking at mean incomes, quantities consumed of clothing and footwear and consumption per capita. This is done in order to be able to choose a period which we believe is representative of consumption today. We study data for the years 2004 – 2009 since we want to base our calculations on years as recent as possible. Studying data for years as close as possible to the present was the main reason for choosing these years, since the market for clothes – and hence consumption patterns - has undergone significant changes during the last decades.

Mean incomes per capita in the 2011 price level is retrieved from Ekonomifakta (2013). These will be used for calculating the income elasticity. What should be noted is that the mean income per capita increases every year. The percentage shares of total expenditure on clothes and shoes lie between 4.2 and 4.8, which can be considered as somewhat even. The share of total expenditure per household is retrieved from SCB (2013a).

Information about the quantities sold of clothes and shoes in Sweden is today limited. It is difficult to find estimates on the consumption in terms of quantities. In order to obtain estimates of quantities on clothes and shoes in tonnes per year, we calculate the net inflow using trade statistics, in accordance with SMED (2011). The net inflow of clothes and shoes in tonnes is calculated by subtracting exports from imports. We have, in this study disregarded the domestic production completely since it is small in comparison (SMED, 2011). Further, we assume that the entire net inflow is consumed during the year in question. This assumption may not be straightforward, but due to lack of data this assumption is our best estimate and necessary in order for us to calculate elasticities.

The consumption per capita in kilograms is simply calculated by dividing the net inflow with the population for the year in question. It is to be interpreted as a mean for the entire population. The data on trade statistics and population have all been retrieved from SCB (2013b) and SCB (2013c). The consumer price index (CPI) is retrieved from SCB (2013d). According to SCB (2000) it is better to use sub-indices when working with a particular group of consumption goods, rather than using the CPI for the whole economy. Therefore, we use the CPI for the consumption group Clothing and Footwear as an indicator for price changes. All calculations can be found in Appendix A.

Table 3: Income and Consumption for Sweden for 2004 and 2009

	Mean income/capita, SEK, 2011 price level.	% of total expenditure/household.	Net inflow, tonnes.	Consumption/capita, kilograms.	CPI for clothing and footwear
2004	158 500	4.4	106 834	11.9	161.40
2005	161 900	4.6	110 169	12.2	159.60
2006	166 500	4.4	111 025	12.2	164.67
2007	172 900	4.8	121 047	13.2	168.65
2008	174 900	4.4	119 571	12.9	166.89
2009	181 400	4.2	106 661	11.4	169.38

Ekonomifakta (2013), SCB (2013a), SCB (2013b), SCB (2013c) and SCB (2013d).

As shown in the table above, the effects of the financial crisis on the Swedish market can be seen in the decreasing quantities for the years 2007 to 2009. These years will therefore not be used when estimating elasticities. When looking at the consumption per capita, the years 2005 - 2006 show no change. This makes these years useless for our estimation of elasticities since the percentage change between these years is equal to zero. The years 2004 - 2005 exhibit the properties we would expect, that is that clothes and shoes are normal goods, i.e. when price decreases, demand increases and vice versa. The consumer price indices for the years 2004 - 2005 show decreasing prices for these years, as the quantities consumed increase. The mean income per capita for 2004 – 2005 increases as well. This leaves us with the period 2004 - 2005 as a base for our estimations.

4.2 Estimated Elasticities

Using the data above we calculate the price elasticity of demand and the income elasticity. From our sample, we choose to focus on the years 2004 and 2005 which we assume are representative for the consumption of clothes in Sweden. We avoid the years during and after the financial crisis since these years are not considered as representative for consumption patterns in general. The results of our calculations are presented in the first row of the table below. The rest of the table shows elasticities found in previous studies. We present our calculations in Appendix B.

Table 4: Elasticities for Clothing and Footwear

	Price elasticity of demand	Income elasticity
2004 - 2005	-2.80	1.26
1994 – 1998, short run	-0.82	1.5
1994 – 1998, long run	-0.26	2.61
1963 – 1996	-0.54	1.37
UK 1987 – 2001	-1.1	2.0
UK 1974 – 1991	-0.37	0.9
UK 1946 – 1964	-1.11	0.5

1994-1998 data: SOU 2005:57, Appendix 6. 1963-1996 data: SOU 1997:17b.

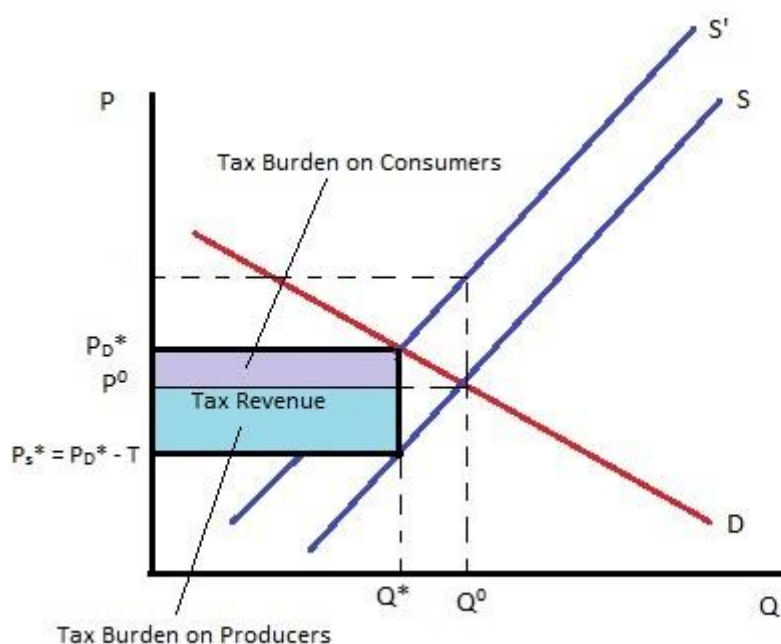
UK data: Jones & Hayes (2002).

According to our calculations, the price elasticity of demand is -2.80 for the years 2004 and 2005, which indicates that a one percent increase in price yields a 2.80 percent decrease in the quantity demanded. This supports the inverse nature of the relationship between price and quantity demanded as the law of demand describes it. According to our calculations, the income elasticity for this period is 1.26. This kind of high elasticity implies that an increase in income yields a relatively large increase in the quantity demanded. As can be seen in the table above, our estimated income elasticity is in line with previous estimates for Sweden. This indicates that clothes and shoes are still considered luxury goods.

Our estimate for the price elasticity of demand is the one that differs mostly from the previous estimates. While the previous estimates for Sweden indicate that demand is inelastic, our estimate shows that consumers are very price sensitive. This may suggest that our result is not reliable due to the underlying assumptions we made. It is however interesting to compare it to the price sensitivity of the UK consumers. It is clear that consumers in the UK have become more price sensitive during the last decades. Jones & Hayes (2002) believe that the increased price competition in the market has led to consumers becoming more price sensitive. We would like to draw attention to the fact that since the market in Sweden has undergone significant changes, the elasticities for the nineties may not be representative for today. It is possible that consumers today have become more price sensitive in Sweden as well, although perhaps not to the same extent as our estimate indicates.

Assuming that the price elasticity of demand is in fact -2.80, an imposed excise tax would lead to a decrease in the quantity demanded by 2.80 times more than the increase in price. Suppose that we set a tax of 10 percent on clothes and shoes containing hazardous chemicals then the demand for these goods would fall by 28 percent. If the elasticity of demand in this case would be greater than the elasticity of supply, the tax burden would fall mainly on suppliers, leading to a diminishing revenue and profit mark-ups. This in turn, could be a driving force for the companies to substitute away from hazardous chemicals and find more suitable alternatives in the long run. The graph on the following page shows how the tax burden will be split between producers and consumers. The demand curve, which in this case is flatter than the supply curves, indicates that the price elasticity of demand is in fact more elastic than the price elasticity of supply. With a more elastic demand, consumers purchase a smaller quantity with the tax increase, leaving producers to pay for the tax increase with lower revenue.

Figure 4: Outcome of the Tax when Demand is More Elastic than Supply



Note that in the graph we have illustrated a tax levied on suppliers. This can be seen by the upward-shift of the supply curve. As we have shown in the Theory chapter, this does not matter, since it is the elasticities that determine the outcome.

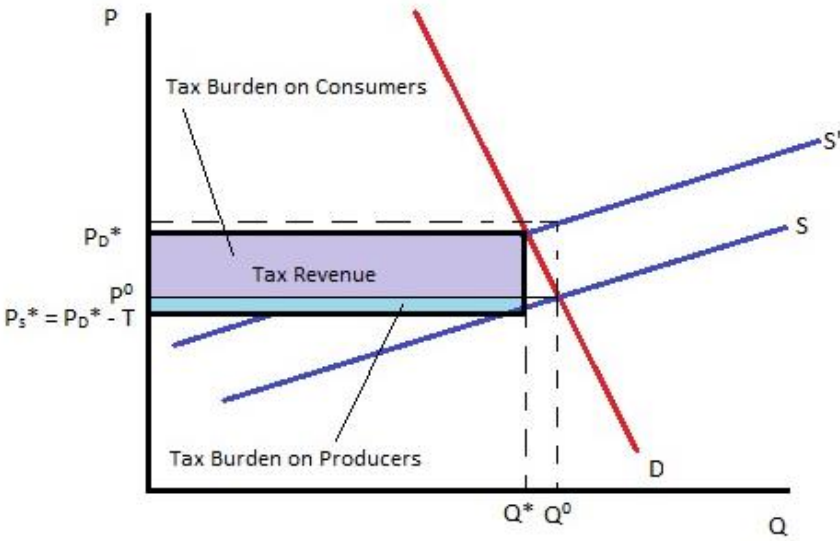
4.3 Supply Elasticity

We have not estimated any supply elasticities, nor have we found any in the literature. However, theory suggests that the supply elasticities for the textile industry should be relatively elastic. Output can be easily increased since the production process does not require high skilled labor or complex facilities; the production process is relatively simple. The idea of supply being elastic is supported by the fact that unskilled labor globally is in plenty and multinational companies can easily move production if costs increase. As stated in the Theory chapter, the major factor affecting supply elasticity is how easily output can be increased (Samuelson & Nordhaus, 2001).

Due to difficulties in estimating supply elasticities for the entire textile industry, we assume, based on theory, that the supply elasticity is elastic. Furthermore, we assume that companies maximize their profits. Imposing a tax would indicate higher costs for the suppliers, which in turn would decrease the profit mark-ups. The companies supplying the Swedish market are big publicly traded companies with profit goals and responsibilities toward shareholders. This

leads us to believe that the supply elasticity may be more elastic than the price elasticity of demand. When also considering that our estimate for the price elasticity of demand was significantly deviating implies that the actual price elasticity of demand might be lower. This in turn might suggest that the elasticity of supply is in fact more elastic. If this is the case, the previous outcome would be rendered obsolete. The graph below shows how the excise tax falls mainly on consumers, due to the fact that the price elasticity of supply is higher than the price elasticity of demand.

Figure 4: Outcome of the Tax when Supply is More Elastic than Demand



In this case, the supply curves are flatter than the demand curve, indicating that the price elasticity of supply is indeed higher than the price elasticity of demand. With a less elastic demand, the tax burden on consumers will be greater than that on producers. This in turn would indicate that consumers would purchase less clothes containing chemicals, since according to the survey discussed in the Theory chapter, price is one of the major factors behind the purchasing decision. But if consumers are less price sensitive they would not decrease the quantities consumed as much as in the previous case. However, if supply is more elastic than demand, suppliers would supply less of the now more expensive good.

5. Discussion

In this chapter, we will analyze the results in more detail and link them to the theory. We will also discuss the implications of the assumptions we have based our calculations on. This is done by answering our research questions one at a time.

1. What is the income and price elasticity of demand for clothing? Are consumers price sensitive?

Our estimated income elasticity is 1.26, which is in line with previous estimates. We believe that clothes and shoes, up to a certain point, are necessities. Given the wealth of consumers in Sweden, shopping for clothes has become more of an interest and a pastime rather than a necessity for certain groups. Following fashion and trends has become more and more important for certain groups and the fast fashion concept has enabled low-income groups to pursue this lifestyle. This indicates that shopping for clothes and shoes is not a necessity, and it is thus reasonable to assume that this group of goods is, as our estimate suggests, luxury goods.

Our estimate on the price elasticity of demand is -2.80, which is greater than the previously estimated elasticities for both the Swedish and the UK market. Our elasticity may be overestimated due to our simple model and our assumptions. However, we would not suggest applying the older estimates on today's market since it would give a faulty picture of current consumer behavior. We do believe that the Swedish consumer is more sensitive to prices today as are the consumers in the UK. It is thus safe to assume that the real price elasticity of demand lies in between our estimate and that for the Swedish market in the nineties. The implications for an imposed excise tax would be that quantity demanded would not fall as much as we discussed in the previous chapter.

Since the consumption group of clothes and shoes is such a differentiated group there may be some other interesting aspects that further diminish the effect of the tax. One such aspect is the effect of a price increase on a Veblen good mentioned in the Theory chapter. A part of the clothes and shoes consumed consists of luxury items which face a different demand and exhibit the properties of Veblen goods: when price increases the demand for these goods increases as well. Ergo, the price increase might be misinterpreted by consumers. This mechanism would offset the actual purpose of the tax, which was to decrease demand for clothing containing chemicals. The group of Veblen goods may be relatively small

considering the entire market for clothes but it is still important to consider this deviating effect when imposing a tax, especially since it is shown that some of these high-end luxury clothes contained more hazardous chemicals than the low-priced ones.

2. Could supply be more elastic than demand in the market for clothes and footwear?

Weighing together the theory and results presented in this thesis, we would assume that supply is more elastic than demand. This would imply that setting an excise tax on suppliers would lead to consumers bearing the majority of the tax. How much the quantity demanded decreases, depends on how price sensitive the consumers are. Substitutes for clothes containing hazardous chemicals are available since the chemicals are only used in certain types of clothes. If clothes that contain chemicals are still demanded for the qualities they possess and if consumers are not as price sensitive as suppliers, quantity demanded will not be affected as much as otherwise.

However, the tax would still imply a higher price for suppliers, leading them to supply less of the now more expensive good. Even if the supply elasticity is high, indicating that consumers are the party bearing most of the tax burden, the revenue for suppliers would decrease. Decreasing revenue would imply an incentive to find substitutes, leading to the wanted outcome. We have however not investigated if there are any substitutes on the producer front. If a tax is imposed and substitutes are non-existent, companies will try to reduce costs in other ways. This would lead to companies not prioritizing finding harmless substitutes.

3. Is the tax suggested by KemI feasible?

The purpose of imposing an excise tax was to decrease the amount consumed, either by distorting consumer behavior or by making suppliers substitute away from hazardous chemicals. Given the price elasticity we derive we conclude that consumers in Sweden are price sensitive. This implies that a tax that increases market prices will lead to consumers demanding less clothes and footwear. Thus, an excise tax could be efficient, in the sense that demand for clothes containing hazardous chemicals would fall. If the price elasticity of demand is -2.80 then a tax of ten percent would lead to a decrease in demand of 28 percent.

However, consumer behavior states that there are other factors determining what consumers buy. One other important aspect is the quality. If the quality that the chemicals give the garment is desired by consumers, such as water-repelling qualities, consumers may be willing to pay more to get what they want. In combination with lack of information about why the tax

is imposed this would lead to consumers still purchasing the garments containing the hazardous chemicals. On the other hand, the values-action gap indicates that consumers do not need more information about environmental aspects since it is already difficult to navigate among the information available today. This is especially true for young consumers for which the consumption levels are high. This may again indicate that a price signal in the form of a tax could be efficient in reducing demand.

It is of importance to consider the size of elasticity when deciding on implementing this tax. An inelastic demand may not yield a sufficient effect in order to justify implementing the tax since the costs might exceed the benefit.

5.1 Further Research

Since we used a simple approach in estimating elasticities, it would be interesting to compare our results to those of a regression analysis for a recent period. We do believe that if variables such as prices of other goods and the cross price elasticity within the group clothing and footwear are controlled for, a more comprehensive picture of price sensitivity will emerge. As already mentioned, consumer behavior is a complex process depending on many factors and it is important to understand consumer and supplier behavior when implementing a tax. This will enable policy makers to reach the desired outcome. Further, a survey based on a sample that is representative for the population would help to better understand what consumers value the most when purchasing clothes.

5.2 Conclusion

We have found that many factors affect purchasing decisions in the market for clothing. Other than price, which is straightforward, aspects such as quality, fit, trends and marketing contribute to the decision making process. Our estimate on the price elasticity of demand is -2.80 which indicates that consumers are price sensitive. This leads us to conclude that in order to diminish the use of phthalates, highly fluorinated substances and biocides in clothes and shoes, an excise tax would be efficient.

References

Printed Resources

- Ekström K. M., Gustafsson, E, Hjelmgren, D & Salomonson, N. (2012) *Mot en mer hållbar konsumtion – En studie om konsumenters anskaffning och avyttring av kläder*. Bohus: Ale Tryckteam AB.
- Greenpeace. (2012) *Toxic Threads: The Big Fashion Stich-Up – How Big Brands are Making Consumers Unwitting Accomplices In the Toxic Water Cycle*. Amsterdam: Greenpeace International.
- Hindriks, J. & Myles, G. D. (2006) *Intermediate Public Economics*. Cambridge, Massachusetts: The MIT Press.
- Kapferer J. N. & Bastien V. (2009) *The Luxury Strategy – Break the Rules of Marketing to Build Luxury Brands*. London: Kogan Page Limited.
- Kemikalieinspektionen. (2007) *Kan ekonomiska styrmedel bidra till en giftfri miljö?* No. 07/2007. Sundbyberg: Kemikalieinspektionen.
- Kemikalieinspektionen. (2009) *Högfluorerade ämnen i kläder, skor och kemiska produkter – ett tillsynsprojekt*. No. 04/2009. Sundbyberg: Kemikalieinspektionen.
- Kemikalieinspektionen. (2011) *Antibakteriella ämnen läcker från kläder vid tvätt – analys av silver, triklosan och triklokarban i textilier före och efter tvätt*. No. 04/2011. Sundbyberg: Kemikalieinspektionen.
- Kemikalieinspektionen. (2013a) *När kan ekonomiska styrmedel komplettera regleringar inom kemikaliområdet?* No. 01/2013. Sundbyberg: Kemikalieinspektionen.
- Perloff, J. M. (2008) *Microeconomics: Theory and Applications with Calculus*. Boston: Pearson Education, Inc.
- Pigou, A. C. (1932) *The Economics of Welfare*. London: Macmillan.
- RNB Retail and Brands. (2008) *Årsredovisning 07/08*. Stockholm: RNB.
- Samuelson, P. A. & Nordhaus, W. D. (2001) *Economics*. New York: McGraw-Hill.
- SOU 1997:17a. *Skatter tjänster och sysselsättning: Betänkande av Tjänsteskatteutredningen, Bilagor*. Stockholm: Fritzes Offentliga Publikationer.
- SOU 1997:17b. *Skatter, tjänster och sysselsättning: Betänkande av Tjänstebeskattningsutredningen*. Stockholm: Fritzes Offentliga Publikationer.
- SOU 2005:57. *Enhetlig eller differentierad mervärdesskatt?* Stockholm: Fritzes Offentliga Publikationer.

Svenska MiljöEmissionsData. (2011) *Kartläggning av mängder och flöden av textilavfall*. No. 46/2011. Norrköping: Sveriges Meteorologiska och Hydrologiska Institut.

Söderholm, P. (2004) *Extending the Environmental Tax Base: Prerequisites for Increased Taxation of Natural Resources and Chemical Compounds*. No. 5416/2004. Stockholm: Naturvårdsverket.

Veblen, T. B. (1970) *The Theory of The Leisure Class: An Economic Study of Institutions*. London: Unwin.

Articles

Arnold, M. J. & Reynolds, K. E. (2003) Hedonic shopping motivations. *Journal of Retailing*, vol. 2003, no. 79, pp. 77-95.

Jones, R.M. & Hayes, S.G. (2002) The Economic Determinants of Clothing Consumption in the UK 1998-2000. *Journal of Fashion Marketing and Management*, vol. 6, no. 4, pp. 326-339.

Niinimäki, K. (2010) Eco-Clothing, Consumer Identity and Ideology. *Sustainable Development*, vol. 18, no. 3, pp. 150-162.

Statistiska Centralbyrån. (2000) Kompensation för ändrade priser, *VälfärdsBulletinen*, vol. 2000, no. 4, pp. 1-2.

Statistiska Centralbyrån. (2009) Mer pengar på fritid än mat, *Välfärd*, vol. 2009, no. 3, pp. 6-7.

Söderholm, P. & Christiernsson, A. (2008) Policy effectiveness and acceptance in the taxation of environmentally damaging chemical compounds, *Environmental Science & Policy*, vol. 11, no. 3, pp. 240-252.

Electronic and Internet Resources

Ekonomifakta. (2013) *Hushållen inkomster*. (Available Online):

<<http://www.ekonomifakta.se/sv/Fakta/Ekonomi/Hushallens-ekonomi/Hushallens-inkomster/>> (May 10, 2013)

Karlsson, M. & Dahl, U. (October 18, 2012) Danskt förbud mot ftalater bör visa vägen. *Svenska Dagbladet*. (Available Online): <http://www.svd.se/opinion/brannpunkt/danskt-forbud-mot-ftalater-bor-visa-vagen_7550940.svd> (March 13, 2013)

Kemikalieinspektionen. (2012) *Ny Biocidförordning i EU*. (Available Online):

<<http://www.kemi.se/sv/Innehall/Nyheter/Ny-biocidforordning-i-EU/>> (March 23, 2013)

Kemikalieinspektionen. (2013b) *Om Kemikalieinspektionen*. (Available Online):
<<http://www.kemi.se/sv/Om-Kemikalieinspektionen/>> (April 2, 2013)

Naturskyddsföreningen. (2008) *Gifter kan spridas från kläder till hushållsdamm*. (Available Online): < <http://www.naturskyddsforeningen.se/nyheter/gifter-kan-spridas-fran-klader-till-hushallsdamm>> (April 10, 2013)

Skatteverket. (2013) *Alla punktskatter*. (Available Online):
<<http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/allapunktskatter.4.58d555751259e4d6616800010841.html>> (May 2, 2013)

Statistiska Centralbyrån. (2013c) *Folkmängd efter region, civilstånd, ålder & kön. 1968-2012*. (Available Online):
<http://www.scb.se/Pages/SSD/SSD_SelectVariables.aspx?id=340487&px_tableid=ssd_extern%3aBefolkningNy&rxid=4e7aee8e-2107-4ac9-a2bf-91789e2371c3> (May 15, 2013)

Statistiska Centralbyrån. (2013b) *Handel med varor och tjänster*. (Available Online):
<<http://www.ssd.scb.se/databaser/makro/Visavar.asp?yp=tophi&xu=90148001&huvudtabell=ImpExpKNTotAr&deltabell=01&deltabellnamn=Varuimport+o+varuexport+efter+varugrupp+KN+2%2Dsifferniv%2C+bortfallsjust%2E+%2C5r&omradekod=HA&omradetext=Handel+med+varor+och+tj%2E+nster&preskat=O&innehall=ExportTkr&starttid=2000&stoptid=2012&Prodid=HA0201&fromSok=&Fromwhere=S&lang=1&langdb=1>> (May 2, 2013)

Statistiska Centralbyrån. (2013e) *Klassifikationsdatabasen: Produktindelningar: KN 2013*. (Available Online): <<https://www.h2.scb.se/metadata/klassdb.aspx>> (April 21, 2013)

Statistiska Centralbyrån. (2013d) *Konsumetprisindex (KPI)*. (Available Online):
<http://www.scb.se/Pages/TableAndChart____33907.aspx> (April 23, 2013)

Statistiska Centralbyrån. (2013a) *Utgifter för hushåll (0-79 år)*. (Available Online):
<http://www.scb.se/Pages/SSD/SSD_SelectVariables____340487.aspx?px_tableid=ssd_extern%3aHUTutgift1&rxid=c2cecc98-5651-40df-9c79-e8a572a67344> (April 15, 2013)

U.S. Environmental Protection Agency. (2007) *Phthalates*. (Available Online):
<http://www.epa.gov/teach/chem_summ/phthalates_summary.pdf> (April 17, 2013)

Appendix A – Calculations for Table 3

Data on quantities consumed (in tonnes) cannot be found at SCB, but can be estimated as a net inflow according to SMED (2011). The net inflow of clothing and shoes in Sweden is calculated as the import during a year, minus the export during the same year. As explained in chapter 4 we do not consider Swedish production since it is assumed to be insignificant. Quantities imported and exported are retrieved from SCB (2013b). For clothing and shoes we use the groups 61 *Kläder och tillbehör till kläder, av trikå*, 62 *Kläder och tillbehör till kläder, av annan textilvara än trikå*, 64 *Skodon, damasker o.d.; delar till sådana artiklar* and 65 *Huvudbonader och delar till huvudbonader* in accordance with descriptions at SCB (2013e). The calculations are shown in the following table.

Table A.1: Net Inflow of Clothes and Footwear, tonnes

	2004		2005		2006	
	Import	Export	Import	Export	Import	Export
61	52 563	9 797	53 301	10 543	57 214	10 985
62	53 760	11 188	55 659	12 027	53 451	12 650
64	24 454	4 568	26 736	4 791	28 420	6 127
65	2 776	1 166	2 948	1 114	3 121	1 419
Sum	133 553	26 719	138 644	28 475	142 206	31 181
Net inflow	133 553 – 26 719 = 106 834		138 644 – 28 475 = 110 169		142 206 – 31 181 = 111 025	
	2007		2008		2009	
	Import	Export	Import	Export	Import	Export
61	62 191	12 595	63 895	12 317	59 048	11 794
62	56 973	12 824	58 101	13 357	50 922	12 629
64	31 503	6 320	28 185	6 304	24 678	5 353
65	3 774	1 655	3 463	2 095	3 134	1 345
Sum	154 441	33 394	153 644	34 073	137 782	31 121
Net inflow	154 441 – 33 394 = 121 047		153 644 – 34 073 = 119 571		137 782 – 31 121 = 106 661	

The table shows a decrease in consumption from 2007 and onward which indicates that these years are showing effects of the financial crisis and will therefore not be used in our estimations.

The per capita quantities in kilos are calculated by dividing the net inflow by the population size for the year in question. Figures on population size are collected from SCB (2013c). Per capita consumption can be interpreted as the mean quantity consumed in Sweden and is therefore comparable to mean income. The means are used to calculate the income elasticity (see Appendix B). Calculations are shown in the following table.

Table A.2: Consumption per Capita

	Net inflow, tonnes	Population	Consumption/capita, kilograms
2004	106 834	9 011 392	11.9
2005	110 169	9 047 752	12.2
2006	111 025	9 113 257	12.2
2007	121 047	9 182 927	13.2
2008	119 571	9 256 347	12.9
2009	106 661	9 340 682	11.4

As with the total net inflow, the per capita consumption for the years 2007 – 2009, represent decreasing consumption due to the financial crisis. The years 2005 - 2006 show no change in consumption using one decimal. Using more decimal points will not be of much interest when considering that these are quantities in kilos. Since the percentage change between these two years is equal to zero, they will not be of any use when estimating our elasticities.

Appendix B – Elasticities for Table 4

When estimating a price elasticity of demand we use the simple approach of calculating percentage changes in price and quantity between two years. This is in accordance with the theory of price elasticities described in chapter 3, where we described the price elasticity as:

$$\frac{\% \text{ change in quantity}}{\% \text{ change in price}}$$

The percentage change in quantity stems from the change in the net inflow, not the consumption per capita. We chose to use the net inflow instead in order to minimize the number of calculations and thus also the risk for errors. Due to the fact that we do not have any data on the price of our consumption group we use the consumer price indices for clothing and shoes to calculate an approximate percentage change in price. When estimating the income elasticity however, we use the percentage change in quantity per capita because the data on mean income is a per capita income. The income elasticity is estimated as follows:

$$\frac{\% \text{ change in quantity}}{\% \text{ change in income}}$$

The calculations are shown in the tables below:

Table B.1 Price Elasticity of Demand

	CPI	% change in price	Net inflow	% change in net inflow quantity
2004	161.40	$\frac{(159.6 - 161.4)}{161.4} \times 100 = -1.12$	106 834	$\frac{110169 - 106834}{106834} \times 100 = 3.12$
2005	159.6		110 169	

$$\frac{\% \text{ change in quantity}}{\% \text{ change in price}} = \frac{3.12}{-1.12} = -2.80$$

Income elasticity is calculated in the same manner and is shown on the following page.

Table B.2 Income Elasticity

	Mean income per capita	% change in income	Kilograms per capita	% change in kilograms per capita
2004	158 500	$\frac{(161900 - 158500)}{158500} \times 100 = 2.15$	11.86	$\frac{12.18 - 11.86}{11.86} \times 100 = 2.71$
2005	161 900		12.18	

$$\frac{\% \text{ change in quantity}}{\% \text{ change in income}} = \frac{2.71}{2.15} = 1.26$$