



Sveriges lantbruksuniversitet  
Swedish University of Agricultural Sciences

Department of Economics

## **Evaluating the effects of a tax increase**

- How the Swedish demand for snus will react to the new tax increase proposed by the government

*Karin Ericsson*

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*Karin Ericsson*

**Supervisor:** Sebastian Hess, Swedish University of Agricultural Sciences,  
Department of Economics

**Examiner:** Ing-Marie Gren, Swedish University of Agricultural Sciences,  
Department of Economics

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# Abstract

This thesis deals with the concept of how price affects demand for a good by estimating various price elasticities of demand for snus sold in Sweden. Information was gathered on price development for snus and cigarettes as well as sales data from Swedish Match, the largest supplier of snus in Sweden. Income-, price- and cross-price elasticities were estimated based on log-log regression. Results show that snus is an inelastic good since the coefficient for price of snus was  $-0.536$ . This proved that a 1% increase in price causes a 0.536% decrease in quantity demanded. One of the main arguments from the government for increasing the tax on snus and thereby increasing price was to collect more tax revenue for reformations within the educational system. An elasticity of  $-0.536$  indicates that an increase in tax will decrease demand and therefore also intended revenue. This proves that tax on snus should probably be lowered, since consumers have the possibility of choosing other products similar to snus such as cigarettes or moist snuff that is now considered equally expensive.

# Sammanfattning

Den här studiens syfte var att undersöka hur konsumtionen av snus i Sverige påverkas av prisförändringar. Data samlades in från Statistiska Centralbyrån, Eurostat samt från Swedish Match AB och justerades för inflation från åren 1996-2012. Metoden som valdes till studien var pris elasticitet som jämför hur pris påverkar efterfrågan. Genom att genomföra en regression med variablerna efterfrågan på snus, pris på snus, pris på cigaretter, disponibel inkomst samt en dummy variabel för rökförbudet på baren som infördes 2005 kunde koefficienterna för de olika variablerna räknas ut. Resultatet från metoden visade på en koefficient för pris på snus på -0.536 vilket innebär att om priset höjs med 10% så kommer efterfrågan på snus minska med 5.36%. Detta kan innebära minskade skatteintäkter för regeringen samt en ökad illegal import av snus samt andra substitut från andra länder med lägre skatter och färre restriktioner.

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# 1. Introduction

*The first section of this thesis will explain the background of the chosen topic, the area of study, any previous study made on the subject and will with this as a base discuss what problem the thesis aims to provide a solution to. The research question is based on the purpose of the study.*

## 1.1 Background

Tobacco is one of the most consumed goods in the world and the usage of cigarettes has increased throughout the years but is now starting to slow down (Eriksen, M., Mackay, J & Ross, H. 2014). During many years tobacco has been a debated subject due to the health risks associated with its usage and according to the World Health Organization approximately 6 million people die each year from it (World Health Organization WHO 2013). This has caused a global effort to reduce smoking by introducing smoking prohibitions at restaurants and bars and also by limiting commercials associated with it as well as educating people about the dangers. Research has shown that even though tobacco consumption is decreasing worldwide there is a slight increase in consumption in certain low- and middle-income countries, due to the fact that these products are relatively cheap there (WHO 2013). Tobacco has always been heavily taxed by most governments due to its health dangers as a way of trying to decrease consumption of it.

In Sweden there is a substitute to cigarettes called snus that is a smokeless tobacco intended for oral use. This smokeless tobacco has not been as heavily taxed as cigarettes and is therefore cheaper compared to them (Statistiska Centralbyrån 2010, pp 339-340). The Swedish population is consuming approximately equal shares of snus and cigarettes in their total consumption of tobacco, which proves that they can be seen as substitutes (Folkhälsomyndigheten 2013). The consumption of tobacco however has decreased in Sweden with the most significant decrease stemming from the consumption of cigarettes. From 2004 to 2013 daily consumption of tobacco has decreased from 27% to 21%. Daily cigarette use decreased from 16% to 11% while snus consumption decreased only slightly from 12% to 11% during the same period (Folkhälsomyndigheten 2013). The decrease in

cigarette consumption and the substitution effect towards snus has been seen as positive due to the fact that snus has fewer proven negative health affects on the user and does not affect others in a negative health aspect either (Swedish Match 2012).

Sweden is one of the largest producers of snus and has a long history of production of tobacco stemming from the Swedish monopoly on tobacco in 1915 where the government needed funds for infrastructure and military defense (Swedish Match 2013) and since then Sweden is well known for their snus. Sweden is not allowed to export snus to any of the countries within the EU, however they are allowed to export to countries outside meaning that some of the largest importers of Swedish snus are Norway and USA. It is however legal to import snus into Sweden for private consumption up to a certain amount, after which the consumer has to pay tax on the good if the consumer is caught (Tullverket 2014). This means that a lot of snus is brought into the country without the government's knowledge. The consumption of unregistered snus during 2010 was approximately 14,6 millions of packages which is an increase compared to 2009 when only 13,4 millions of packages was consumed unregistered (Sohlberg, T. 2011).

## **1.2 Area of study**

Since snus has not been as heavily taxed as cigarettes it has been cheaper to purchase snus and many see it as an alternative to cigarettes with more restrictions on cigarettes being imposed. Recently the government suggested a new regulation however that will increase price of snus (Regeringskansliet 2014). The new regulation states that snus should be taxed even further meaning that price per package will increase. The reason for this tax increase is due to a new reform of the educational system that needs to be funded beyond the current resources that the government holds. There have been several suggestions for changes that will fund this reformation and the increase in tax on snus is one of them. The new budget proposal suggests a 22% increase meaning that price per package (24 gram) will increase by 2,54 SEK (Regeringskansliet 2014). Since 2006 tax on snus has increased by almost 210% meaning that it currently costs 382 SEK per kilo (Mellgren, F. 2012). The new proposition from the government suggests that price be increased from 382 SEK per kilo to 471 SEK per kilo. This makes a package of snus and a package of cigarettes almost equally expensive. Figure 1.1 shows price development of snus and cigarettes in Sweden calculated in mean prices from 1980 until 2012.

In the proposition from the government it states that the primary purpose of the tax increase is to increase the tax revenues and not to decrease consumption of snus in Sweden. The government hopes that they will be able to collect approximately 0,79 billion SEK through this tax increase on tobacco (Regeringskansliet 2014). When applying a tax on a good it is important that the tax is well developed and that the government is aware of how consumers react to price changes. If the aim is to increase tax revenue and consumers react a lot to price changes, then the tax will only decrease demand and therefore also revenue (Laporte, A. 2006).

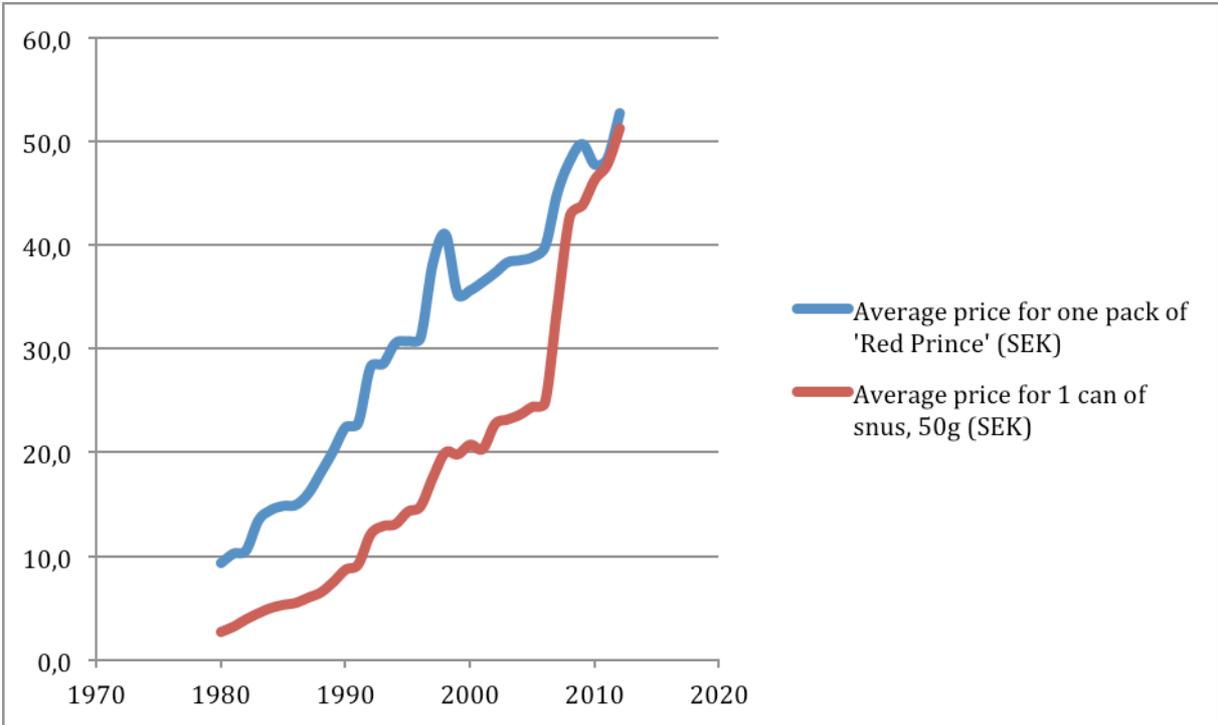


Figure 1.1 Price increase in cigarettes and snus in Sweden from 1980-2012

Source: Own depiction based on data from SCB

### 1.3 Previous research

The research area of tobacco taxes has been discussed from many different angles and opinions throughout the years and it is still a very debated subject. Most of the research in this area has been done with respect to taxes on cigarettes instead of snus (Laporte, A. 2006; Ross, H., Powell, L., Tauras, J. & Chaloupka, F. 2005; Bishop, J., Liu, H. & Meng, Q. 2006). Due to this, the literature underlying this thesis is based on tobacco taxes in general, which can be applicable to this research due to the fact that both are addictive goods and can be seen as

substitutes. In previous research the most commonly used method of research is price elasticity of demand meaning that researchers have examined how price changes affects demand. In an article by Frank J. Chaloupka (1998) he concludes that price elasticity for cigarette demand falls between -0.3 and -0.5 meaning that a 10% increase in price will decrease demand by approximately 3-5%. Many other studies that examine price increases on tobacco receive similar results. Sheu, M., Hu, T., Keeler, T., Ong, M. & Sung, H. (2004) examined smoking prevalence in California and how consumers reacted to a major price increase. They stated that in real terms the price of cigarettes increased by 63% in two years from 1997 to 1999. Their study was conducted in three different major cities in California with several different variables such as price, income, ethnicity and other cultural differences. The result from their study indicated a price elasticity of demand at -0.46, which is within the limits of the price elasticities discussed by Chaloupka. Becker, G. & Murphy, K. (1988) discusses in another article their theory about rational addiction and explain that tobacco is seen by many as an addictive good that would cause consumers to continue purchasing a good despite its price but that the consumer would make rational decisions about future prices and adjust consumption thereafter. Their discussion also revolves around the concept of addiction and that it is difficult to establish addiction among goods since individuals view addiction in different ways. However, due to previous research and studies it is reasonable to view tobacco as an addictive good. In a study conducted by Galbraith, J. & Kaiserman, M. (1997) they mention the importance of including the possibility that when price is increased on an addictive good it will result in an increase in illegally imported goods. They mention the rational addiction model by Becker, G. & Murphy, K. (1988) and argue that the habits that consumers have are difficult to break out of and to abandon a habit would cause the entire demand function for the consumer to change. Their discussion regarding rational addiction is of importance in this discussion since they consider how the rational aspect of the model will affect long-term addiction of a good. Either increased taxes and prices will help reduce demand in the long run causing consumers to change their entire demand function or it will cause a shift of demand towards other types of the product, such as illegally imported products. This is something that will be discussed further on in this thesis since future tax increases and policies might affect the consumers will to continue purchasing this product which in turn will affect predicted tax revenue.

A research conducted in Sweden stated that a 10% increase in price on tobacco decreases consumption by 4%, indicating a price elasticity of demand at -0.4 (Folkhälsomyndigheten

2009, p. 17). This will be the base for the calculations performed in this thesis and the results will be compared with this.

#### **1.4 Definition of problem**

This thesis will focus on what effect an increase in tax will have on demand for a good. When a tax is applied it has to be taken into account how consumers will respond to the increase in price and if they are willing to pay the extra amount charged for the good or if they will find substitute goods or change their habits due to it. This is called price elasticity of demand and measures how a 1% change in price causes demand to change as well. Since snus has not been as heavily taxed as other tobacco goods such as cigarettes previously it is interesting to see how this new change will affect demand since it will now be as expensive as its substitute good. The differences in health damages between these two goods should be relevant for the government since an increase in price in snus might cause an increase in demand for cigarettes. This means that the government might have to reconsider their policies regarding smoking and implement even stricter policies to limit smoking as a result of the tax increase. Another aspect of this problem is that the amount being imported to the country might increase due to higher restrictions on smoking meaning that consumers are not willing to switch to this good even if price for cigarettes were to decrease and it might be necessary to look into new policies that will change rules and regulations for this as well. Currently it is legal to import tobacco up to a certain amount and then you have to pay tax for it, but unfortunately, a lot of tobacco is being imported without ever being registered, meaning the government is taking a loss of tax revenue. This new regulation, if not being properly outlined, might increase this import leading to decreasing amounts of tax revenue for the government.

#### **1.5 Purpose**

An increase in tax on snus will probably cause demand to decrease depending on how elastic the product is. However, if demand decreases on snus produced in Sweden it means that demand might increase on other substitute goods such as cigarettes that have a more profound negative effect on health. The purpose of this thesis is therefore to study to what extent demand might decrease for snus and then discuss if this will cause an increase in demand for

substitute goods or illegally imported goods from abroad meaning that the intended tax revenues will decrease.

## **1.6 Research question**

The purpose of this thesis therefore is to investigate the questions: how will the increase in tax on snus affect its demand in Sweden? What possible effects will the tax increase have on the predicted tax revenue? These two questions are what this thesis aims to answer.

## **1.7 Limitations of the research**

This research will only investigate consumption and sale of snus and cigarettes in Sweden and therefore no other tobacco products. Statistics of illegally imported products are discussed in the beginning and in the discussion of this thesis but will not be used in models or calculations. I will also limit the scope of this thesis by only looking at taxes on snus and cigarettes and policies concerning the decrease in consumption of these goods such as the prohibition of smoking in bars introduced in 2005. I will not look further into data on advertising, public knowledge about health hazards, education or demography but will however include this in the discussion. Previous research has mostly looked at tobacco overall and not specifically snus but this has been regarded in the research when comparing elasticities. I will also consider usage of tobacco in Sweden as regional data and not compare different parts of Sweden. Data has been collected from Sweden Match and due to their large market share in Sweden their sales data has been seen as representative for the Swedish demand in this thesis.

## **1.8 Disposition**

This thesis is disposed in such a way that first the background, purpose and previous research that gave rise to the research question will be discussed in the first section, "Introduction". After that the theoretical background that the thesis is based on will be discussed in the second section, "Theoretical framework". The third section, "Method and material", discusses what method the thesis is based on and that will be used and also how material was collected as well as what implications might arise in this step. In the fourth section, "Results", the data that has been collected in the previous part will be brought forward and presented given the method chosen. After this the results will be discussed and compared to other results from

previous studies in the fifth section, “Analysis and discussion”. After that references and attachments will be presented for the reader’s consideration.

## **2. Theoretical Framework**

*The theoretical framework will build the base for this thesis by explaining what fundamental concepts it is based on and what theories regarding the models used later on that are of utter importance.*

### **2.1 Demand, supply and equilibrium**

Economic theory states that two forces called demand and supply globally determine markets and their equilibriums (Perloff, J. 2014, p. 32). Consumers demand goods and companies try to supply these consumers with enough goods to keep their needs satisfied. Markets and their equilibrium usually decide the market price that consumers pay for the goods if there are no other interventions from governments or other organizations. There are some occasions where the equilibriums might be distorted due to external or internal factors affecting demand and supply (Perloff, J. 2014, p. 45). An example of an external factor is a natural disaster that might create a shortage of crops during a year causing supply to shift upward and thereby increasing price of the remaining crops on the market. An internal factor might be when a company is planning a restructuring of their company where they need more funds in order to do this and have to increase prices and cut down on wages meaning that supply is decreased and equilibrium is shifted upwards. There are some factors influencing the market equilibrium that are dependent on external factors institutionalized by governments or organizations such as taxes, quotas or subsidies (Perloff, J. 2014, p. 61). All of these distorts the market equilibrium and induces a potential misallocation of resources within the economy. Figure 2.1 below illustrates a fictional scenario of how the Swedish snus market is affected by a tax increase that causes a shift of the supply curve and a shift in the market equilibrium.

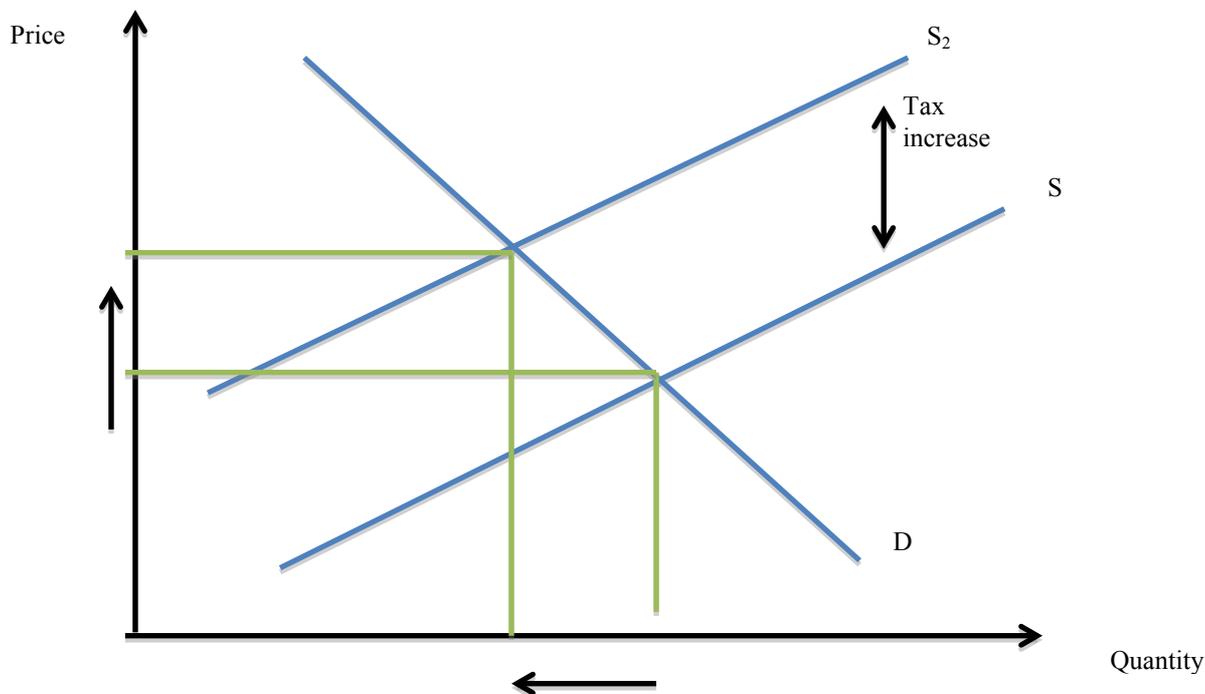


Figure 2.1 Tax effect on market equilibrium

Source: Own depiction of snus market based on fictional data

There are different types of groups of goods that are characterized by how demand and supply react to changes in prices and income. There are four types of goods known as normal goods, necessary goods, luxury goods and Giffen goods (Perloff, J. 2014, p. 132). Normal goods are discussed previously and have the characteristic that when price decreases or when income increases more will be demanded by consumers. Normal goods follows a basic principle in economics called Law of Demand meaning that when price of a good decreases then demand for that good will increase and vice versa. Necessary goods however are not affected in the same way by price and income changes. If income increases then demand for a necessary good does not increase as much since the consumer can switch to purchasing a more expensive good such as a normal good. A luxury good is a good where when income increases the demand for those goods increases more than in proportion to the increase in income. Luxury brands or fancy cars usually are more attractive to consumers when income increases since it can be seen as high status to purchase that specific good. A Giffen good is a specific type of good that seemingly defies the Law of Demand meaning that when price for that good increase then so does the observed demand. This effect however holds only for the uncompensated demand curve and when measuring price increases the substitution effect is still negative for Giffen goods. Due to these different types of goods it is important to include income in the demand function to describe what drives demand for that good. The demand function is seen below in equation 1.1, and explains that demand for a specific good X is a

function of price elasticity for good x, cross-price elasticity for good y and income elasticity I. Any empirical assessment of demand needs to reflect at least these elements, and usually several others beside these, assuming that preferences do not change during the range of data under the analysis.

$$X = f(P_x, P_y, I)$$

Equation 1.1 Demand function for good X

**2.2 Elasticity**

Elasticity is a basic economic concept and explains how a change in one variable leads to a change in another variable, for example how changes in price affects demand of that good (Perloff, J. 2014, p. 50). Elasticities are useful when determining how consumers will react to changes in price and it is an important tool for companies as well as governments when calculating revenue changes due to price changes such as increased taxes or factor prices. The most commonly used elasticity is called price elasticity of demand and calculates changes in demand given a certain change in price and can be formulated as such:

$$\epsilon = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta p}{p}} = \frac{\partial Q}{\partial p} \frac{p}{Q}$$

Equation 1.2 price elasticity of demand

Source: Perloff, J. 2014, p. 50

Equation 1.2 above explains how a 1% increase in price will either increase or decrease demand by a certain percentage. Price elasticity of demand is usually negative and therefore proves the Law of Demand, meaning that an increase in price will cause demand to decrease (Perloff, J. 2014, p. 51). When a good is called elastic it means that the price elasticity of demand is less than -1 ( $\epsilon < -1$ ). This means that when price increases with 1%, the quantity demanded will decrease with more than 1%, meaning it is more sensitive to price changes. If price elasticity of demand is between 0 and -1 ( $0 > \epsilon > -1$ ) then the good is called inelastic, meaning it does not respond as violently to price changes as does elastic goods. Some goods with fairly low numbers of elasticity, such as -0,21, show that consumers are not sensitive to price changes, which might be explained by what type of good they demand. Goods such as

petroleum, gas, power and water usually have low elasticities due to the fact that many people view these as necessities.

Advantages of elasticity of demand are that information regarding prices and consumption can easily be found through statistical databases meaning that the results will be highly statistically significant. A disadvantage of using elasticity is that there might be reasons other than price that will affect demand such as policies by the government to decrease the usage of tobacco and these policies are first of all usually difficult to calculate and also not including this in the calculation might create a skewed result (Nguyen, L., Pekurinen, M. & Rosenqvist, G. 2012).

### **2.2.1 Long run versus short run**

It is usually common for long-run elasticity and short-run elasticity to differ which of course leads to differences in how consumers react to price changes. Perloff (2014, p. 57) discusses two approaches that could explain what causes the two time perspectives to differ – storage opportunities and substitution. The most relevant term for this thesis is the substitution aspect and how it might affect long-run elasticity, which will be calculated further on. It is very common that the short-run elasticity is smaller than the long run due to the time frame. Switching between goods or breaking out of a habit takes time and this is usually the reason that short-run elasticities are smaller. However, if the consumer has other alternatives, substitute goods, to chose between then the short-run elasticity and the long-run elasticity might differ more since the consumer can simply chose to purchase the substitute good instead without a time consuming period where they would have to conform to a new habit. In the short run it might be easy for consumers to substitute between snus and cigarettes due to the tax increase, however in the long run the tax increase might increase demand for cheaper, illegal products. Price increases of such magnitude that is discussed in this thesis could give rise to an increase in a shadow market with more illegal products being imported, which could be shown in the price elasticity of the product. However, due to an obvious difficulty when trying to quantify these effects the current thesis will focus only on the presumed short run effects and ignores these further issues in the empirical analysis.

## 2.3 Tax

Tax is one of the most cost-efficient methods to reduce consumption of a certain good and has since long been applied to goods such as gasoline, tobacco or alcohol due to its damaging effects to health and the environment. A tax increases price of the good meaning that the consumer cannot purchase as much of the good as previously with a fixed income meaning that demand for that good will decrease, which can also be explained by the term normal good that was discussed previously. Due to the above statement a tax on a normal good should therefore decrease demand of the good it is imposed on.

There are different types of taxes, but the two most common ones are called excise tax or ad valorem tax, and secondly value-added tax (VAT) or specific tax (Perloff, J. 2014, p. 61). An ad valorem tax is a certain percentage of the price that the government keeps, meaning that companies often compensates for this tax that they have to pay by increasing the original price and making it more expensive for the consumers. This in turn causes prices to increase and quantity supplied to decrease (Perloff, J. 2014, p. 62). VAT is a fixed amount that is applied at every sold unit of that good, for example x SEK per liter of gas.

### 2.3.1 Taxes and elasticity

When a tax is applied in a market it causes a shift of the supply curve upwards as companies does not want to supply as much as they previously did to a lower price since a certain amount is to be paid to the government as revenue. This usually causes the price that consumer pay to increase meaning they are less willing to buy the product. However, it is rare that the entire cost of the tax falls on the consumers and it is more common that the consumers and the producers share the cost (Perloff, J. 2014, p. 63). The amount that the consumers and the producers have to pay can be calculated with the help of elasticities (Perloff, J. 2014, p. 63). Deriving the equation to show how price is affected by the tax is shown by Perloff (2014) as such:

Equilibrium condition where price is affected by the tax:

$$D(p(\tau)) = S(p(\tau) + \tau)$$

*Equation 2.1 equilibrium condition*

Differentiating price with respect to tax,  $\tau$ :

$$\frac{\partial p}{\partial \tau} = \frac{\frac{\partial S}{\partial p}}{\frac{\partial S}{\partial p} - \frac{\partial D}{\partial p}}$$

*Equation 2.2 changes in price caused by changes in tax*

Law of Demand states that  $\frac{\partial Q}{\partial p} < 0$  due to decreases in quantity demanded caused by increased price. However, supply is usually upward sloping meaning that  $\frac{\partial S}{\partial p} > 0$  since quantity supplied increases as price is increasing (Perloff, J. 2014, p. 63).

Explaining equation 2.2 in terms of elasticities:

$$\frac{\partial p}{\partial \tau} = \frac{\left(\frac{\partial S}{\partial p} \frac{p}{Q}\right)}{\left(\frac{\partial S}{\partial p} \frac{p}{Q}\right) - \left(\frac{\partial D}{\partial p} \frac{p}{Q}\right)} = \frac{\eta}{\eta - \epsilon}$$

*Equation 2.3 dividing tax among consumer and producers in terms of elasticities*

The price increase that falls on the consumers is therefore determined by the ratio of the supply elasticity,  $\eta$  and the difference between the supply and demand elasticity. The amount of the tax that falls on the producers is therefore  $1 - \frac{\partial p}{\partial \tau}$ , and the two ratios together equals 1 which is the amount of the entire tax imposed. These calculations explain how to decide how much of the tax the consumer and the producer will pay when the issue is regarding a specific (VAT) tax.

Taxes are supposed to capture all goods with a certain characteristic on the market, such as snus, gasoline or alcoholic beverages, but it is however difficult for the tax to be applied to all the goods circulating the market. Tax is therefore only applied to the legal part of the market and cannot capture some of the goods traded on the so-called black market. This means that when taxes increase price on a certain good at the market there might be a shift towards cheaper goods that are not available at the legal market meaning that they are not taxed as high as the other goods. This might lead to lower tax revenue for the government if they do not try to capture the tax in any other way.

### **3. Method and Material**

*In this section I will describe what method that has been used when performing the analysis of the research question. The different models that the calculations have been based on will be explained and analyzed and the data collection process is explained with the variables chosen displayed.*

#### **3.1 Research method**

The research method used in this thesis is a quantitative data collection of information regarding prices and quantity sold of snus in Sweden during 1996-2012. To obtain the results a quantitative research method will be used with time series data since it is of importance to measure effects over a certain period of time. This specific type of data suits this research well since time series data considers how past events have influenced previous events due to the fact that all information has to be ordered after a chronological order of time, meaning that it is easier in the results to explain how previous data might have affected the current situation (Wooldridge, J. 2013, p. 8). A simple linear regression model discussed in the next section will be the base for the calculations performed. The model will consist of a dependent variable, which is the variable that is of interest in this thesis since it is the variable being affected by other variables, and whose effects it is interesting to measure (Graziano, A. & Raulin, M. 2007, p. 61). The variable that is being manipulated to give the results of the dependent variable is called the independent variable (Graziano, A. & Raulin, M. 2007, p. 61). Other variables that are included in the study but that is not being manipulated by the researcher but that still might affect the dependent variable are called extraneous variables (Graziano, A. & Raulin, M. 2007, p. 61). The variables being used in this thesis are explained in the next section.

Models in scientific research are used to display something complex and unseen to represent a larger piece of reality. In previous research there have been a couple of models of measuring demand for tobacco that have been reoccurring. The most common and most used one has been one that Becker, G. & Murphy, K. (1988) discusses in their article “A theory of rational addiction” where they discuss demand of addictive goods. After this there has been alternatives to this model explaining other behaviors that could show how demand is affected by prices on tobacco. I will shortly describe the three most commonly used models in

previous research by Audrey Laporte (1996) – the static model, the myopic model and the rational addiction model.

### 3.1.1 The Static model

The static model describes demand as a function that is not dependent on addiction, meaning that previous consumption and future knowledge about prices are not included (Laporte, A. 2006). The model looks as such:

$$C_t = A + \beta_1 P_t + \beta_2 P R_t + \beta_3 Y_t + \varepsilon_t$$

$C_t$  describes demand for the good being investigated, in this case it would be demand for snus,  $A$  is a constant,  $P_t$  is price for snus during time period  $t$  (year, month, week),  $P R_t$  gives price for other good during time period  $t$ ,  $Y_t$  shows disposable income during time period since this affects how much of the goods the consumer can purchase and the final term,  $\varepsilon_t$  is an error term for the time period being investigated. This model captures both the short-run effect and the long-run effect the price change will have on demand, and it therefore gives the total effect (Laporte, A. 2006).

### 3.1.2 The Myopic model

The myopic model describes demand as a function that includes previous consumption, which should therefore affect current and future consumption (Laporte, A. 2006). This is usually the case for highly addictive goods and given the situation this is a very appropriate model to use. The model looks as such:

$$C_t = A + \gamma_1 C_{t-1} + \beta_1 P_t + \beta_2 P R_t + \beta_3 Y_t + \varepsilon_t$$

$C_t$  is still the demand for the good (snus),  $A$  is a constant,  $P_t$  is price for the good being investigated,  $P R_t$  is price for another good and  $Y_t$  is disposable income for that period. The additions in this model are the new terms  $\gamma_1$  which is the addictive coefficient and if it is positive it shows that higher past consumption leads to higher current consumption. The second new term is  $C_{t-1}$ , which takes into consideration previous consumption of the good. There is no total effect being shown in the model, however the short-run elasticity can be

found in the coefficient  $\beta_1$  while the long-run coefficient is given by the equation  $\frac{\beta_1}{1-\beta_1}$ . This equation proves that short-run elasticities tend to be smaller than that in the long run due to an adjustment process that the consumer has to go through when adjusting to the new prices and the new consumption (Laporte, A. 2006).

### 3.1.3 The Rational Addiction Model

The final model takes the myopic model one step further and includes not only the addictive aspect but also the rational aspect of the consumer and points to that the consumer also makes rational decisions regarding their consumption based on future prices of the good (Laporte, A. 2006). Due to this the rational addiction model looks as such:

$$C_t = A + \gamma_1 C_{t-1} + \gamma_2 C_{t+1} + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 P_{t+1} + \beta_4 Y_t + \varepsilon_t$$

The two new additional terms in this model are  $\gamma_2 C_{t+1}$ , which refers to future consumption of the good and also  $\beta_2 P_{t-1}$  where the consumer takes into consideration future prices and decides consumption thereafter. The  $\gamma_1$  is still positive since it is still an addictive good that will affect future consumption and since the individual is rational regarding costs and decisions it means that  $\gamma_2$  is also positive (Laporte, A. 2006).

The model that this thesis will be based on will be the rational addiction model since time series data includes previous reactions to price changes and gives the long-term elasticity for the product. Consumption patterns visible in the data also reflect the rational aspect since when price is increased during a year consumers might reconsider their purchases for future years. This is also reflected in the final result due to the time series data collected. When given the results the model will be discussed more closely by comparing the coefficients for the different variables.

The variables that will be used in this model are those that might affect the demand for snus throughout the years. The dependent variable is the consumption of snus and therefore quantity demanded. The independent variables are then the mean price of snus, the mean price of the substitute good cigarettes and also the mean disposable income of households in Sweden. Besides this there will be an error term for the variables in the model that will be given when performing the regression. The model will also contain a dummy variable that

will consider the prohibition of smoking in bars that were implemented 2005 that could have increased demand for snus the following years.

Variable type	Explanation of variable	Name
Dependent variable	Demand for snus	$C_{snus}$
Independent variable	Price of snus	$PS$
Independent variable	Price of cigarettes	$PC$
Dummy variable	Smoking prohibition 2005	$DV$
Independent variable	Disposable income	$DINC$

Chart 3.1 Variables used in method

### 3.1.5 Issues regarding method

When calculating price elasticity of demand and regression there are some aspects to be aware of. Mainly there are three dangers with this test that has to be tested in order for the test to be valid and prove statistical significance.

The first is called autocorrelation and it aims to when errors from one period is also observed in the next period, meaning that the first influenced the other (Wooldridge, J. 2013, p. 341). This is usually common in time series data since if for example interest rates are high in the first period then they will probably be high during the period following that. To test if the sample shows autocorrelation it is relevant to perform a Durbin-Watson test to be able to exclude this possibility. If  $d = 2$  then the sample does not show any autocorrelation, so an answer more closely to 2 would be the most optimal. If  $d$  is closer to 0 then the test shows positive autocorrelation meaning that they are closely related to each other. If  $d$  is closer to 4 on the other hand it shows negative autocorrelation, meaning they are not correlated in any significant way, which does not provide a statistically significant answer.

The second is called heteroskedasticity, which refers to when the variance in the error terms for the dependent variable is not constant, so when the independent variable is increasing then the unexplained variance in the dependent variable is either increasing or decreasing (Wooldridge, J. 2013, pp. 49-50). If the error term  $\epsilon$  possesses this characteristic then it means that the regression will not be relevant for the smaller variance in the variable and the result

will not be statistically significant. To exclude that heteroskedasticity is present and will not affect the calculations the Breusch-Pagan test can be performed. It proves if the error term shows a constant or non-constant variance.

The third is called multicollinearity and it occurs when two independent variables exhibits a high correlation (a high  $R^2$  but not equal 1, meaning perfect correlation). This might be an issue in the model since it might be difficult to prove what affects the changes in the dependent variable if it is too difficult to decide which independent variable that is causing the changes. To solve this issue it is usually clever to only use one of the variables meaning that the other one has to be excluded. This might on the other hand lead to issues with the credibility of the model since we are now excluding one variable that might affect price and quantity demanded (Wooldridge, J. 2013, pp. 91-92). One way to test for multicollinearity is by using a test called VIF (variance inflation factor) where it can be tested if there is too high correlation between two variables and if one has to be removed (Wooldridge, J. 2013, p. 94). It is of course wisest to remove the one that is less relevant for the issue being researched.

### **3.2 Motivation for method**

The most commonly used method when measuring effects of an increase or decrease in price on quantity is price elasticity of demand. Depending on what variables are included in the calculations the elasticity will explain how changes in price will change demand for the good. This method is also very useful since data is easy to receive from statistical databases and especially with time series data it is easy to see development from year to year. Since all data collected was in nominal prices it was important to adjust all data to current prices meaning that they had to be adjusted for inflation from 1996-2012. This data was also easily retrieved meaning that this method is well adjusted for this thesis.

### **3.3 Data collection**

The data for this research has been collected through Svenska Statistiska Centralbyrån (SCB), Eurostat and through interim reports from Swedish Match AB. In order to receive significant results it was important to adjust all prices to current level of inflation, meaning that all numbers had to be recalculated by using consumer price index information gathered from Eurostat (Eurostat, 2014). Eurostat provided consumer price index from 1996-2012 for all

categories of goods, which was used for disposable income, as well as consumer price index for tobacco goods and alcohol beverages and this was used to calculate prices for cigarettes, snus and the sale data from Swedish Match. Information regarding disposable income was found through SCB's webpage and is displayed annually through the years 1991-2012 with total disposable income, mean disposable income and number of participants in study. For the regression I only used mean disposable income for the total population from 1996-2012 and adjusted it for inflation. Price of cigarettes and price of snus was provided by the department of transfer prices at SCB and are displayed in mean prices annually from 1980-2012. These were also adjusted for inflation and the prices are displayed in the regression from 1996-2012. Demand for snus has been derived through sale statistics from annual reports at Swedish Match AB. Sale data from Swedish Match is reported in millions of SEK, which does not provide a reliable variable to use in the method. It was noted in the first regression that when using sale data in SEK the coefficient for price of snus was positive indicating that when price increases then so does demand which would defy Law of Demand and state that snus is not a normal good. This is probably due to the fact that since price of snus has increased then so has total revenue for Swedish Match, even though they have sold fewer portions of snus. Due to this I decided to perform the regression on the dependent variable of number of doses sold instead. To retrieve this variable I divided the sale data for each year by the mean price retrieved by SCB for that year. This gave a more credible view of how sales for Swedish Match has been affected by the increasing prices. A dummy variable has been used to illustrate how the prohibition of smoking in bars could have affected demand for snus. The prohibition was implemented during 2005, which means that data prior to this will be given the number 0 and data after this will be given the number 1.

### **3.3.1 Swedish Match AB and the Swedish market**

Swedish Match is the largest actor on the Swedish Market for snus and moist snuff and their products are sold in Sweden, Norway and the US (Swedish Match 2014a). The specific type of snus that they sell is only sold in Sweden in the entire European Union due to the regulations that EU has put on snus (Swedish Match 2014a). Swedish Match originates from the company Svenska Tändsticks AB created by Ivar Kreuger and currently sells both snus, moist snuff, cigarettes, cigars, matches and lighters. With their background and government aid during the financial crisis in the beginning of the 1930's they have maintained a strong position on the Swedish market. Due to Swedish Match's high market share in Sweden they

can be seen as representative for the Swedish demand for snus. During 2013 they had 95% of the full price segment market and during the same period they had 71% of the entire market (Swedish Match 2014a). Figure 3.1 provides a depiction of how sales data for Swedish Match has developed quarterly since 1996. The data is given in millions of SEK and shows increases for sale of snus while sale of their other products such as cigarettes, matches, lighters and cigars have had both highs and lows throughout the years.

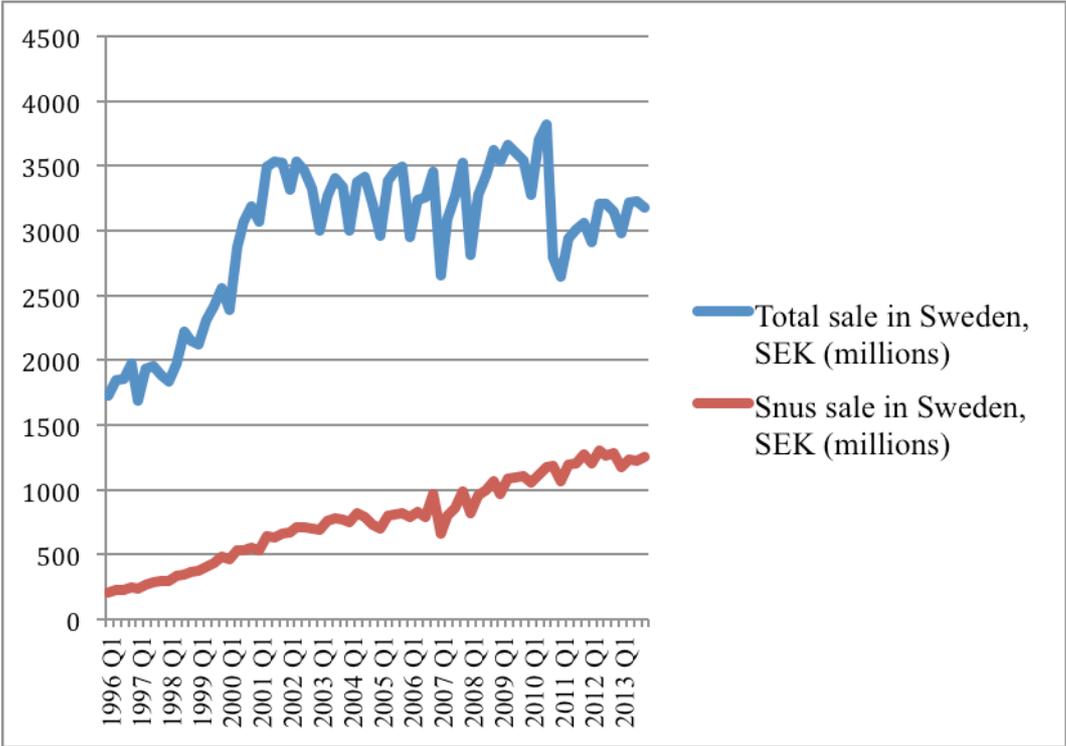


Figure 3.1 Swedish Match sale data

Source: Own depiction of data collected from Swedish Match’s interim reports 1996-2013 (Swedish Match, 2014b)

**3.4 Ethical aspects of research**

There are two ethical aspects to be aware of when writing this thesis about this subject. First of all it is stated in the beginning that there are fewer negative health aspects with snus compared with cigarettes but the comparison is slightly ambiguous: at first glance snus seems like the healthier alternative, however when considering there are still many occasions where snus has proven to be a health risk. The primary positive aspect about snus is that it is not harmful for the surrounding in the same way that passive smoking affects others. Also there have been fewer incidences of death reported from snus compared to cigarettes, which proves

that it is a better alternative. However, this thesis does not intend to promote snus, it simply gives an attempt to explaining that tax reforms might be more suitable for other products or areas that in the long run could provide more positive health aspects. The second aspect concerns Sweden and the ban on their snus in the European Union. The Swedish government has been fighting for Sweden's right to sell their domestically produced snus abroad but are not allowed to. Increasing price on the products sold in Sweden could mean that the consumers will import more illegal products from abroad boasting international production and making it more difficult for Swedish Match to compete with their products.

### 3.5 Econometric estimation method

The estimations of the rational addiction model in equation 3.1 will be performed in the statistical program Gretl and I will use a regression to see how the independent variables affect the dependent variable and what information the coefficients provide about the correlation. The results will be analyzed by comparing how the coefficients differ between the variables to see what variables affect more or less with the specific interest in how price of snus is affecting its demand.

The demand equation for the log-log estimation used for the analysis looks like such:

$$\text{Log}(C) = \beta_0 + \beta_1 \text{Log}(PS) + \beta_2 \text{Log}(PC) + \beta_3 \text{Log}(DINC) + \mu$$

*Equation 3.1 log-log specification for elasticity*

## 4. Results

*The results from the research will be presented in the section below and I will discuss how I used the above-mentioned method to reach the results and how different factors might have affected the results such as the issues discussed above.*

### 4.1 Results from method

The results from the method were provided from the statistical program Gretl and the chart below shows how the variables are interacting with each other. Chart 4.1 shows the regression

when the variables are adjusted for inflation where the indices were gathered from Eurostat (2014) where the base year is set to 2005 and prices are calculated in the monetary value of 2012 as well as calculated in a logarithmic form, which means that the results can be interpreted as elasticities directly.

	<b>Coefficient</b>	<b>Std. error</b>	<b>T-ratio</b>	<b>P-value</b>	<b>Significance</b>
<b>Constant</b>	-51.3519	7.63509	-6.726	2.12e-05	***
<b>Log (PS)</b>	-0.536159	0.222936	-2.405	0.0332	**
<b>Log (PC)</b>	-1.42481	0.506568	-2.813	0.0157	**
<b>Log (DINC)</b>	5.14612	0.588001	8.752	1.48e-06	***
<b>Dummy</b>	-0.240261	0.0900230	-2.669	0.0205	**

*Chart 4.1 estimation results from Gretl*

<b>OLS, using observations 1996-2012</b>	T = 17
<b>Dependent variable</b>	Log (C)
<b>R-squared</b>	0.862348
<b>Adjusted R-squared</b>	0.816465
<b>Durbin-Watson</b>	1.834378
<b>Breusch-Pagan test for heteroskedasticity</b>	P-value = 0.242154
<b>Null hypothesis: heteroskedasticity not present</b>	

*Chart 4.2 estimation results from Gretl*

What is interesting in the two charts above are the coefficients for the different variables since they show the price elasticity of demand for each of them. The coefficient for  $PS$  shows -0.536, which is the price elasticity for this variable. Since all of the data has been recomputed into logarithms it is possible to interpret these coefficients as percentages that means that -0.536 can be explained as when price of snus increases by 1% then demand for snus will fall with 0.536%. The coefficient for  $PC$  illustrating cross-price elasticity of demand is a bit more interesting on the other hand since if price of cigarettes increases by 1% then demand for snus will fall by 1.425%. This is a bit surprising and this coefficient should be viewed with some caution since there is a chance that the two variables  $PS$  and  $PC$  are slightly correlated and some of the effect of the coefficient for price of snus falls on the coefficient for price of

cigarettes. However, the coefficient for  $P^S$  should still be viewed as relevant despite this and to prove this I performed a regression where I removed the data for the variable  $P^C$ .

	<b>Coefficient</b>	<b>Std. error</b>	<b>T-ratio</b>	<b>P-value</b>	<b>Significance</b>
<b>Constant</b>	-56.4217	6.10656	-9.240	4.47e-07	***
<b>Log (PS)</b>	-0.478747	0.268704	-1.782	0.0982	*
<b>Log (DINC)</b>	5.08826	0.554609	9.174	4.84e-07	***
<b>Dummy</b>	-0.294406	0.109097	-2.699	0.0182	**

*Chart 4.3 estimation results from Gretl where Log (PC) has been excluded from the model*

Chart 4.3 above shows that the coefficient for  $P^S$  has not changed much meaning that  $P^C$  in the previous regression did not affect it enough for it to be excluded. Due to this chart 4.2 is only present to provide an explanation for the coefficient for  $P^C$  and should not be considered further on in the research.

The coefficient at 5.146 for disposable income shows the income elasticity and states that when income increases with 1% the demand for snus also increases by 5.146%, which proves that the theory that snus is a normal good is accurate. The p-values describe if it is possible to discard the null hypothesis and a lower p-value indicates that the null hypothesis should be discarded (Körner, S & Wahlgren, L. 2006, p. 208). The null hypothesis for this thesis states that the price does not affect demand in any way, neither negative nor positive. Most commonly p-values above 5% indicate that the null hypothesis cannot be discarded and the research is not reliable. To prevent this other variables could be tested or a larger sample might be needed (Körner, S & Wahlgren, L. 2006, p. 208). The p-values for the results all indicate that the null hypothesis can be discarded. Hence, we conclude that there is a correlation between price and demand. P-values closer to 0% provide stronger indication that the null hypothesis can be discarded and the values displayed in figure 4.1 are all below 5%. The t-values all indicate that the p-values are correct and the stars on the right prove that the p-values received are significant.

The R-squared,  $R^2$ , explains how much of the variance in the dependent variable that can be explained by the independent variables, meaning that 86% of the variance in the demand for snus can be explained by these four variables. This number is relatively high which might be due to the fact that there are only four variables present and these variables are those that

affect demand mostly. Increasing the amount of independent variables and thereby showing what might affect and might not affect demand for snus might have achieved a lower number.

**4.1.1 Heteroskedasticity**

Heteroskedasticity is of potential concern here due to the fact that the variance in the error term might not be constant against the dependent variable, meaning that the results received might not be statistically significant. Therefore we test for it based on the Breusch-Pagan test, which proves that the p-value is not small enough for us to be able to exclude the possibility that we will accept a false null hypothesis and the results could therefore be insignificant. Due to this it is necessary to correct for this when performing the test, and this is done by including robust standard errors (HAC) in the estimation. The calculations in chart 4.1 has robust standard errors included and therefore the possibility of heteroskedasticity can be excluded from further analysis.

**4.1.2 Multicollinearity**

To test for multicollinearity it is most suitable to use a Variance Inflation Factor (VIF) which can be seen in chart 4.4, where each variable needs a value below 10 in order to be able to exclude the possibility of this. By performing this test in Gretl it is obvious that no variables in the model has values above 10, meaning that the chance of multicollinearity between any variables can be excluded. Many might argue that 5 is a better value when measuring multicollinearity and it can also be seen that no variables exhibits a value above 5 which further strengthens the conclusion that this can be excluded.

Variance Inflation Factors

Minimum possible value = 1.0

Values > 10.0 may indicate a collinearity problem

<b>Variable</b>	<b>VIF</b>
Log (PS)	4.636
Log (PC)	1.121
Log (DINC)	4.621
Dummy	3.264

*Chart 4.4 estimation results from Gretl, VIF test*

### **4.1.3 Autocorrelation**

The last aspect with this method was to test for autocorrelation between the variables by performing the Durbin-Watson test that tests if values in time series data affects data from year to year. The original regression in chart 4.1 gives a value of  $d = 1.834$ , which is close to 2, meaning that this can be excluded from the research as previously discussed. This points towards that the prices for each year are not solely decided on previous prices but instead on other external factors.

## **5. Analysis and Discussion**

*The results presented in the previous section will be analyzed and discussed here. I will try and explain what the results mean in the context of the area of research and how the results can be interpreted in a broader aspect. I will then discuss any limitations of this research and ethical aspects regarding it for future research.*

### **5.1 Discussion and conclusion**

This research asked two questions originally and these were (1) how will the increase in tax on snus affect its demand in Sweden and (2) what possible effects will the tax increase have on the predicted tax revenue? The results from the previous section showed that when price of snus increases by 1% demand for snus will fall as a consequence with 0.536% meaning that long-term price elasticity of demand for snus is -0.536 since the regression is performed during 17 consecutive years. As discussed earlier, it is very common that when price increases demand will eventually fall due to the fact that consumers cannot consume their optimal bundle anymore with their fixed income. In the short run consumers tend to continue purchasing and consuming a certain product despite the price increase since they cannot change their habits overnight. However, in the long run consumers have more alternatives such as the ability to stop using the product, purchasing substitute goods or importing cheaper goods from abroad from travels. The coefficient -0.536 shows that in the long run consumers tend to purchase less of snus and might instead import more illegally. This might give rise to the thought that less snus is not consumed, but instead the same amount is being consumed

with a less percentage being taxed upon. This would mean that the planned tax revenue collected from the government would not be as high as originally thought.

A different scenario might occur if consumers were to choose a substitute good instead of importing snus illegally. As mentioned previously a substitute to snus is cigarettes that due to increased taxes on both goods are equally expensive. If consumers were to choose to purchase cigarettes instead of snus since they previously chose snus due to the difference in price then the negative externalities associated with this switch could be major. Increased rates of smoking prevalence would entail health risks for those consuming it and those exposed to passive smoking. In the long run this could mean that medical costs in Sweden would increase and the government would have to plan for another reformation to be able to direct aid towards the health sector. Another approach to putting an end to smoking would be more extensive programs towards smoking prohibitions in the society, alternatives to nicotine such as gums or patches as well as carefully designed help programs for addicts. This could also bear costs that would need to be funded by the government in alternative ways such as tax increases or budget cuts. This argument supports previous research where the importance of the outline of a tobacco tax is discussed.

The intended increase in tax from the government suggests a price increase of 22% on snus, which according to Swedish Match's estimates on their portions would mean that during 2014 a dose of snus would cost 56.12 SEK. This 22% increase in price would cause an 11.8% decline in consumption. This drop in consumption would mean that Swedish Match would sell approximately 28,137,455 fewer doses in one year. This strongly supports the argument that Swedish Match might lose a major part of their market share on the Swedish market, which will open up the market for competitors that might sell cheaper and less quality products. There are some advantages and disadvantages of this scenario. More competitors on the markets equal a lower price on the products since they will be competing over the consumers. Lower prices on normal goods increases demand meaning that more snus will be bought. As long as the snus is sold on the Swedish market legally the government will be able to collect tax revenue on it and the increase in demand would mean an increase in tax revenue. However, more competitors on the market with less knowledge about the production process could indicate that the snus will have worse quality than the snus that exists today. If this brought even further health risks for consumers then the funds for the medical sector would have to increase further meaning that taxes would have to be increased to fund this.

The purpose of this thesis was to investigate how a tax increase would affect demand for snus in Sweden and how it might affect the predicted tax revenue. The discussion above answers the two questions asked in section 1 by explaining that demand for snus will fall drastically and the Swedish producers will be forced to increase prices and therefore be able to sell less. This will probably lead to increased illegal imports of similar products, which will not be taxed, and therefore the suggested tax revenue will not be as high as the government has predicted.

## **5.2 Limitations of the approach**

This study has used data from three different sources, Eurostat, SCB and Swedish Match. The data from SCB is partially gathered from their database and partially from help via e-mail from their internal costs department. The data from the internal costs department was sent in an excel file via e-mail and contained information not available on their website. In order to receive information regarding sales in Sweden I tried to contact Swedish Match to see if they had any information regarding this. It was however difficult to get a response from them and they could not provide any other sale information than that available in their interim reports. Due to this I had to gather all the information myself from the reports and unfortunately the sales from Sweden, Norway and USA were not separated. However, since Sweden is the biggest actor for Swedish Match I chose to see this as representative for Swedish demand. The sales were all reported in millions of SEK, and since I noticed that this was not appropriate for the regression performed I recalculated everything into amount of doses sold instead. Swedish Match had no information regarding this as well, but since I had available data on sales and price per dose I chose to perform my own calculation. Therefore, the data for amount of doses sold is not something that has been collected from a database but is from own calculations. Due to the above-mentioned statement it should be noted that the research done in this thesis can only provide a rough model for how the Swedish demand for snus is affected by price. A more accurate image might be given if the data collected came from the same source or if it could be proven that the sales registered only came from Sweden and if the study were performed on a specific segment of the product, such as high quality segment.

Due to the given time frame it was difficult to gather more information that would potentially be necessary to perform a more detailed, comprehensive and empirically potentially more

reliable research. In this thesis I have only used five variables with observations over 17 years. However, working with a limited time range allows us to assume that preferences, which are otherwise hard to observe, remain approximately constant. This study should therefore be viewed as an attempt to analyze limited information for regression analysis against limited information about otherwise unobserved variables that may affect the long run demand as a longer time horizon or multiple countries would be considered within one regression. The  $R^2$  for the research was at 0.862 meaning that 86% of the variance in demand for snus could be explained by these four variables, which must be considered a reasonable fit to the data. Additional variables could be added such as regional data within different counties in Sweden that could explain cultural differences, education about the risks of tobacco usage or the influence of commercial. These variables could help explain what drives demand for snus and this could in turn be of aid when determining an appropriate tax rate. However, given the overall satisfactory explanatory power of the model we cannot rule out that the estimated coefficients present a somewhat trustworthy approximation to the demand in Sweden during the observed time.

### **5.3 Future research**

This thesis could build a stable foundation for future research by comparing this result with studies done where more variables have been used over a longer period of time. This thesis discusses price and demand for 17 years in Sweden. Due to the limited time frame of 10 weeks it was not possible to gather more data that would facilitate a comparison between Sweden, Norway and Finland, and how price affects consumers in the different countries. By comparing these countries and gathering more information as independent variables it would be very interesting to see if there are any cultural differences in how we react to price changes.

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## **7. Attachments**

**7.1 Appendix 1 displaying average prices for cigarettes and snus in Sweden from 1996-2012, as well as adjusted prices for both goods**

**7.2 Appendix 2 displaying average disposable income in Sweden during 1996-2012, as well as adjusted disposable income using HICP in chart 5**

**7.3 Appendix 3 displaying sale data from Swedish Match, gathered from their interim reports (Swedish Match 2014b). Sale data adjusted using HICP in chart 5 as well as number of doses sold based on data from chart 1**

**7.4 Appendix 4 displaying the dummy variable for the introduction of the smoking prohibition in bars in 2005**

**7.5 Appendix 5 displaying HICP for all goods as well as tobacco and alcohol, gathered from Eurostat, base year for index = 2005**

## 7.1 Appendix 1

Year	Average price for one pack of "Red Prince" (SEK)	Average price for 1 can of snus, 50g (SEK)	Adjusted PC	Adjusted PS
1996	31	14.8	48.2	23
1997	38.2	17.6	50.7	23.3
1998	41	20	58.1	28.3
1999	35.2	19.8	49.1	27.6
2000	35.6	20.8	48.8	28.4
2001	36.4	20.4	50	27.9
2002	37.3	22.8	49.9	30.4
2003	38.3	23.2	50.6	30.6
2004	38.5	23.7	50.9	31.3
2005	38.8	24.4	50.6	31.9
2006	39.8	24.8	51.2	31.9
2007	45	34.1	53.8	40.7
2008	48.1	42.8	53.2	47.3
2009	49.7	43.9	53.3	47
2010	47.7	46.3	50.5	49
2011	48.3	47.8	50.6	50
2012	52.7	51.3	52.7	51.3

## 7.2 Appendix 2

Year	Average disposable income (thousands of SEK)	Adjusted disposable income	Number of participants
1996	148.3	192.7	7083266
1997	153.1	193.9	7093750
1998	159.9	202.3	7107060
1999	167.7	209.7	7120505
2000	176	217.2	7146136
2001	184	220.2	7179357
2002	190.5	224.3	7216788
2003	196.8	227.6	7257299
2004	201.2	230.6	7305013
2005	206.9	234.1	7356871
2006	212.7	237.2	7434219
2007	221.3	240.8	7513694
2008	229.6	244.6	7591566
2009	231.6	240	7673014
2010	235.3	238.8	7740539
2011	243.2	245.7	7795572
2012	251.2	251.2	7845049

### 7.3 Appendix 3

<b>Year</b>	<b>Total snus sale (millions SEK)</b>	<b>Adjusted snus sale</b>	<b>Sale in number of doses (millions)</b>
1996	900	1169.5	50.9
1997	1079	1366.6	58.5
1998	1337	1691.7	59.7
1999	1688	2111.2	76.4
2000	2071	2556	103.4
2001	2457	2940.3	105.2
2002	2788	3282.3	107.8
2003	2995	3463.4	113.1
2004	3081	3531.3	113
2005	3131	3542	111.1
2006	3363	3750.8	117.5
2007	3289	3578.2	87.8
2008	3829	4078.5	86.2
2009	4250	4403.8	93.7
2010	4522	4589.3	93.6
2011	4726	4775	95.4
2012	5049	5049	98.5

### 7.4 Appendix 4

<b>Year</b>	<b>Dummy variable (prohibition)</b>
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	1
2006	1
2007	1
2008	1
2009	1
2010	1
2011	1
2012	1

## 7.5 Appendix 5

<b>Year</b>	<b>HICP – all items</b>	<b>HICP – alcoholic beverages and tobacco</b>
1996	87.68	84.41
1997	89.96	98.87
1998	90.05	92.57
1999	91.10	94.08
2000	92.32	95.76
2001	95.21	95.51
2002	96.78	98.03
2003	98.53	99.29
2004	99.41	99.29
2005	100.72	100.47
2006	102.16	101.95
2007	104.73	109.78
2008	106.97	118.65
2009	109.96	122.41
2010	112.27	123.90
2011	112.77	125.26
2012	113.94	131.15