

The influence of the VAT increase on consumer prices¹

Master Thesis in Economics and Taxation

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Abstract: This thesis studies the effect of the VAT increase on consumer prices in the Netherlands. The main question is whether the current period of economic downturn has led to a delayed pass through of the VAT increase into consumer prices. The first part consists of a theoretical study on the effects of a VAT change; the second part is an empirical investigation of the 2001 and 2012 VAT increases in the Netherlands. I estimate the impact of the VAT increase by performing a difference in difference analysis. I find that both VAT increases have been fully shifted into consumer prices. I assess the results to different robustness check, including a common correlated effects estimation (Pesaran: 2006) and a difference in difference analysis using another control group. The robust checks yield the same results. The 2001 VAT increase is fully passed forward in the month of implementation. The results of the robustness analysis provide some evidence for a delayed pass through of the October 2012 VAT increase.

Key words: Value Added Tax (VAT) increase; inflation; recession

JEL classification: E31, H22

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Chapter 1: Introduction

On October 1, 2012 the Dutch standard Value Added Tax (VAT) rate has been changed from 19% to 21%. Companies would like to shift the burden of this VAT increase into consumer prices. They can do this by raising consumer prices, which will lead to a higher inflation. However, from economic theory it is known that the degree to which changes in VAT rates can be shifted to consumer prices depends on several factors, such as competition in the market and the elasticity of demand and supply (Taxud: 2011). Among these factors is the influence of the business cycle (Blundell 2009), which might be particularly relevant for the Dutch situation in 2012. Due to the weakness of consumer expenditures in 2012, suppliers may have decided to shift only a small part of the increase in the VAT rate into consumer prices. The purpose of this thesis is to quantify the effect of last year's policy change of consumer prices.

Understanding the inflationary effect of the raise in Dutch VAT-rate is also of interest for policy makers. According to Carare and Danniger (2008) many advanced economies have experienced eroding of direct tax bases as labor and capital have become more mobile. Therefore many governments are considering a shift towards indirect taxation. Raising income from VAT is a policy of many governments throughout the euro zone. For those governments it is important to know the macroeconomics implications of such a shift. Therefore the research question I want to address is:

What is the influence of a VAT increase on consumer prices?

The first part of this thesis consists of a theoretical framework from economic literature. Chapter 2 pays attention to the economic incidence of a VAT increase. I will describe mechanisms that affect the degree to which changes in the VAT rate are passed forward to consumers. A number of papers have already studied the question of commodity tax shifting (e.g. Katz & Rosen: 1985 and Carbonnier: 2005). Furthermore, in chapter 3, I will pay attention to papers that empirically investigate the effect of an increase in the VAT rate. I expect these papers to provide me some information on consumer and producer behavior. Besides, these papers will provide me ideas about how to measure the VAT effects and the variables I should include as control variables.

After providing a theoretical framework, in the second part of my thesis an empirical investigation on the effect of the VAT increase on consumer prices will be conducted. I use data from Statistics Netherlands on the development of inflation of goods subjected to the standard VAT rate and the general VAT rate. Chapter 4 provides information on the data set, as well as some descriptive statistics. In order to investigate the aforementioned effect, I estimate inflation in VAT items relative to non-VAT items. I adopt the methodology of Carare and Danninger (2008) and estimate the inflation rate of a commodity item by a static and dynamic linear model using fixed effects.

Differences in inflation between the two groups which cannot be accounted for by standard determinants of inflation are due to the VAT increase. I elaborate on this methodology in chapter 5. In chapter 6 the results are discussed. Besides, I assess the estimated coefficients of the VAT dummies to four robustness checks. In chapter 7 I present the conclusions of this thesis and discuss the policy implications of the results.

Chapter 2: What mechanisms influence the pass through of a VAT increase in consumer prices?

2.1 Introduction

In this chapter I will describe mechanisms that affect the degree to which changes in the VAT rate are passed forward to consumers. The key question of this study is whether the VAT on commodities is completely shifted into consumer prices and paid by consumers or that part of it is paid by firms. To assess this issue, incidence analysis needs to be done. Tax incidence is the study of who bears the burden of the tax. According to Fullerton and Metcalf (2002) distinction needs to be drawn between statutory incidence and economic incidence. The statutory incidence of a tax refers to the distribution of tax payments based on a legal obligation. Economic incidence measures the changes in economic welfare in society arising from a tax. It is about who loses real income (Fullerton and Metcalf: 2002). Because of tax shifting, economic incidence often differs from statutory incidence. For example, changes in the VAT might be passed through to consumers. Producers rise consumer prices, so consumers have to bear (part of) the burden. Incidence analysis is important for several reasons (TAXUD: 2011). First, it is of interest how the economic burden influences the behavior of households and firms and what is the impact on the economy. Second, it is of interest how different groups in the population will be affected by a tax change, e.g. whether low-income households are more affected than high-income households. The main question is: Is the VAT on commodities completely shifted into their prices, or does part of the incidence fall on firms (in which case it falls on workers or capital owners, as firms do not pay taxes)? In this chapter I will describe mechanisms that affect the degree to which changes in the VAT rate are passed forward to consumers.

2.2 The role of the competition setting

One of the things that affect the pass through of an increase in the VAT rate is the competition setting. In this section I describe the situation of perfect competition and imperfect competition.

2.2.1 Perfect competition

In the situation of perfect competition both producers and consumers are price takers. The price of a good is determined by demand and supply. The increase of the VAT rate raises the consumer price. Firms will supply the same amount if the market prices are increased by the amount of the tax payment such that the firms receive the same revenues as before the increase of the VAT rate. However, as the consumer prices are higher, consumers demand less of the good. This leads to a new intersection of the supply and demand curve (TAXUD: 2011). Under perfect competition, taxes cannot be over-shifted. The tax shifting parameter (the degree to which a tax increase is shifted onto consumer prices) is always less than or equal to 100% (Carbonnier: 2006). In the figures below can be

seen that the impact of a VAT on the price depends on the elasticity of demand and supply. The elasticity shows the responsiveness of demand or supply to a change in the price of goods. The elasticity determines whether the tax shifting parameter is close to 100% or to 0%.

Figure 2.1: impact VAT increase on price

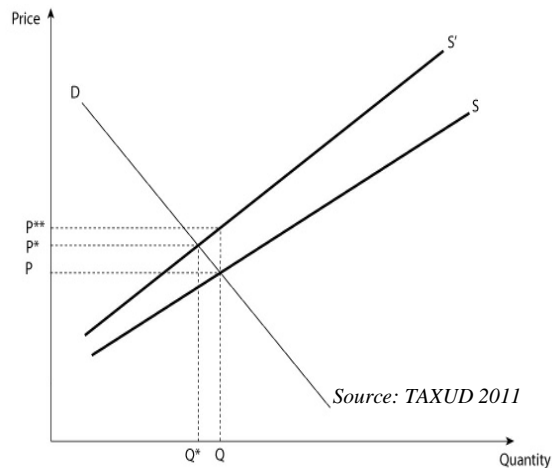
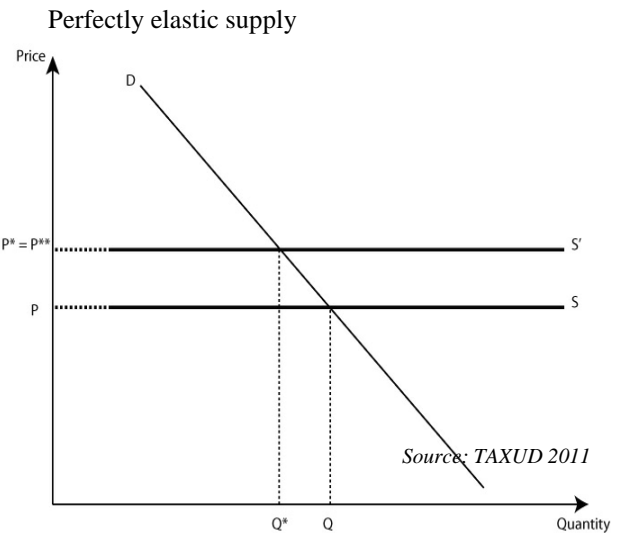


Figure 2.2: impact VAT increase on price.



From the figures can be learned that the one with the most inelastic curve has to bear the biggest part of the VAT increase. As shown in figure 1 a VAT increase raises the price of a good. The supply curve shifts to the left as producers still supply the same amount of goods. However, as goods became more expensive, consumers consume less and the amount traded decreases to Q^* . The flatter the curve, the stronger consumers respond to a tax increase and the bigger the distance between P^{**} and P^* (the part of the VAT increase that is borne by producers). In case of a downward sloping demand curve and an upward sloping supply curve (see Fig. 1) both suppliers and consumers have to bear a part of the VAT increase, as always less than the tax will be shifted into consumer prices. Figure 2 shows that when the supply curve of a taxed consumption good is completely elastic, consumers have to bear the complete burden. This is the case when marginal costs are constant. If the elasticity of demand is perfectly elastic, suppliers will not be able to pass a VAT increase forward to consumers. Therefore, it is necessary to analyze the behavior of consumers and producers with respect to a change of the VAT rate, to be sure on who bears the burden of taxation.

2.2.2 Imperfect competition

Usually, competition is not perfect but limited. In case of imperfect competition the market consists out of several firms (Stiglitz: 1997). Each of the firms is aware that its sales depend on the price it charges and other actions that it takes, such as advertising. Firms have some market power. In literature several forms of imperfect competition are studied. Bertrand and Cournot oligopolies and

monopolistic competition are most often studied. Below I will pay attention to tax shifting in these three competition settings.

Bertrand model

The Bertrand model is characterized by firms choosing the price at which goods are sold in the market. Products of the firms are homogenous. This means that firms produce goods which are perfectly equivalent from the perspective of a consumer. Furthermore, it is assumed that there are no capacity constraints. So, one firm is able to handle the complete demand for a good and production costs are linear (TAXUD: 2011). The price equilibrium is as follows: firms compete by lowering their prices until all firms set the price equal to their common marginal costs. So, in a Bertrand model prices are equal to unit costs and no firm earns economic profits. Therefore, an increase in the VAT rate would be shifted completely forward into prices, since the producer price cannot fall below marginal cost (Fullerton and Metcalf: 2002). This means that supply is perfectly elastic and that the burden of the tax increase is on consumers.

Cournot model

Most of the empirical studies done on tax incidence consider a Cournot oligopoly (e.g. Katz & Rosen: 1985, Besley: 1989, Delipalla and Keen: 1992). In a Cournot model firms are price takers but choose the level of output. In the model firms take into account the impact of their output decision on aggregate output and therefore on the price (TAXUD: 2011). The higher the aggregate output, the lower will be the market price. A lower market price means less excess profits for the firm.

According to Fullerton and Metcalf (2002) over-shifting can occur in a Cournot setting. Over-shifting occurs when the price of a good rises by more than the increase of the tax rate. This is possible because of the existence of market power and strategic behavior among firms. When a tax is shifted forward, demand for a good will decrease. Therefore, under the circumstances explained below, firms in a Cournot setting will raise the price more than the increase in tax to compensate for the revenue loss from the decreased demand.

Following TAXUD (2011) the degree of price shifting of taxes depends on (1) the demand function of households, (2) the cost function of firms, (3) the number of firms and (4) the extent of competition the firms perceives. I will briefly explain these factors below. The reader is referred to TAXUD (2011) for a more detailed discussion of these factors.

1. The demand function of households: under-shifting occurs when demand reacts more strongly to a price increase than a price decrease. The higher the original price level, the stronger the effect of the price increase. When it is the other way around, and demand reacts less strong to price increases, over-shifting becomes more likely. In that situation the demand decrease gets

smaller and smaller as the price level increases (Figure 2.3). In that case the tax causes an increase in the market power of the oligopolist, as demand is shifted to a part of the demand function that is less elastic. So, as a VAT increase leads to a higher price level, it might be profitable to over-shift the VAT increase, as the reduction of demand will be much lower compared to the situation where the price level is lower. I will pay more attention to this in section 2.3

Figure 2.3: Demand function

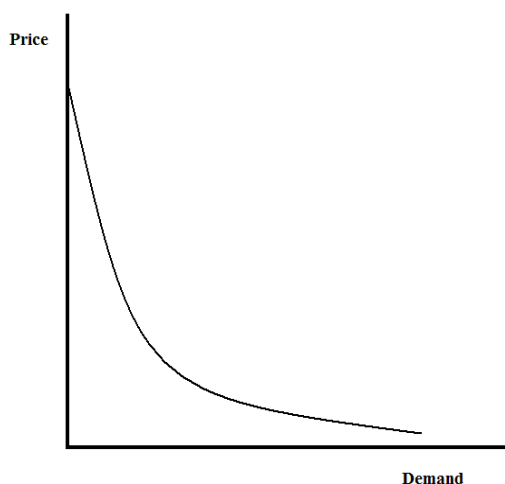
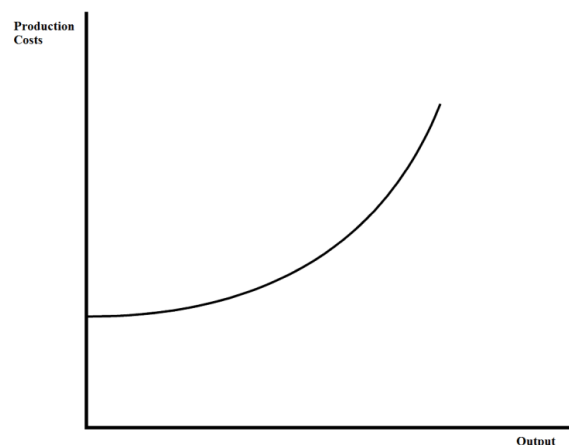


Figure 2.4: Cost function



2. The cost function of firms: the degree to which a tax increase is passed forward to consumers depends on the slope of the marginal cost function. When production costs raise more than proportionally with the level of output, under-shifting is more likely to occur. In this case, production costs will decrease more than proportionally as demand declines. The lower production costs imply a dampening effect on the price increase. (Figure 2.4)
3. The number of firms: although the number of firms in the market will not determine whether over- or under-shifting will happen, a rise in the number of firms in the market will damp the degree of over- or under-shifting. This is determined by the structure of the demand curve and the cost function. The more firms operate in a market, ceteris paribus, the more VAT shifting converges to full shifting.
4. The extent of competition a firm perceives: the higher the level of competition firms perceive, the closer firms will be following the perfect competition cost pricing rule and the smaller will be the price mark-up above marginal costs (Baker and Brechling 1992). The higher the perceived competition, the lower the extent of price shifting.

Monopolistic competition

The Cournot and Bertrand model assume that goods are identical. This is not a very realistic assumption as in most markets producers differentiate their products (e.g. different brands). Product

differentiation creates some monopoly power. Producers have to decide at which price their differentiated products are sold.

Fullerton and Metcalf (2002) find that in a situation of differentiated products an ad-valorem tax has no impact on producer price but is entirely shift forward to consumers. Besides, under the assumption of constant elasticity and linear cost result, an excise tax will be more than 100 percent forward shifted. However this situation is not very likely to happen, as it assumes perfectly elastic supply.

2.3 Asymmetric tax shifting

One of the factors that affect the degree to which a VAT-increase is shifted forward in a Cournot model is the shape of the demand function of households and the cost function of firms. According to Carbonnier (2005) asymmetric (non linear) properties of the supply and demand curve may cause asymmetric tax shifting. As mentioned in section 2.2, the shape of the curves determines whether under- or over-shifting will occur. In this section I will go more into detail about asymmetric tax shifting.

First, due to asymmetric properties in the production process, the supply curve can be asymmetric. It is harder for firms to increase their production than to decrease it. Increasing the production requires new machines and new workers. Following a decrease of the VAT rate, an increase of supply is needed to observe a decrease of prices. Producers face high marginal costs when expanding the production to meet the increase in demand that follows the lower price. These constraints on supply increases lead to smaller price decreases than price increases. According to Carbonnier (2005) labor intensive services represent a competitive market, whereas capital intensive products are representatives of an imperfectly competitive market. He found that on (1) labor intensive markets (perfect competition) firms reflect commodity tax variations more fully in consumer prices when the taxes increase than when taxes decrease. (2) For each capital intensive product (imperfect competition) it was the other way around.

With respect to (2), Carbonnier suggest that firms on an imperfectly competitive market might take into account demand reactions. He proposes demand asymmetry arguments. Due to psychological effects or to the shadow price of changing one's consumption habits, customers might react stronger to important price variations than to small ones. Imperfectly competitive markets better consider the variations of demand because of the price making power of firms. In this case price increases might be relatively weak to prevent the fall of demand. Besides, price decreases might be relatively strong to take profit of the takeoff of the demand.

2.4 Price-elasticity of consumers

As mentioned in section 2.2 the impact of a VAT on the price depends on the elasticity of demand and supply. Therefore, it is necessary to analyze the behavior of consumers with respect to a change of the VAT rate, to be sure on who bears the burden of taxation. The price elasticity depends on two components: the substitution effect and the income effect.

When the price of good X rises, close substitutes become more attractive relative to good X. The cost of close substitutes decreases in terms of good X. As the substitutes have a lower price, consumers like to purchase more substitutes. This is the so-called substitution effect. The second effect of a price increase is to reduce the consumer's purchasing power. The change in quantity purchased attributable to the change in purchasing power is the income effect of the price change (Frank: 2008).

The sum of the substitution effect and the income effect is the total effect of a price change, or for this study: a change in the VAT rate. The substitution effect will always be negative: when price goes up, quantity demanded goes down. The sign of the income effect depends on whether the good is a normal good or an inferior good. If good X is a normal good, the income effect is negative: when the price of good X goes up, the fall in purchasing power causes the quantity demanded to fall. If good X is an inferior good the effect works the other way around: in that case the income effect is positive. When the total effect, the price elasticity is zero, the demand curve is perfectly inelastic. In that case consumers have to bear the full burden of the tax increase. However, this assumption is not very realistic as it only occurs when the income effect perfectly offsets the substitution effect, or when the income effect and the substitution effect are both zero.

What is the implication of the theory mentioned above for the degree to which a VAT increase is passed through to consumers? The higher the total effect, substitution effect and income effect, of a VAT increase, the higher the price elasticity, the lower the degree to which a VAT increase can be shifted onto consumers. As the goods subjected to the general tax rate are normal goods (or even luxury goods), the income effect is negative in case of a VAT increase. Below I will pay attention to the substitution effect with respect to a change in the VAT rate.

The substitution effect: when the price of good X increases due to an increase of the general VAT rate, consumers can choose from several substitutes: (1) consume more of good Y (subject to reduced rate or exempted from VAT). Goods exempted from VAT or subjected to a reduced rate become more attractive relative to good X. This substitution effect cannot be found in all sectors, as in many sectors close substitutes are also subjected to the general tax rate. However according to ING (2012) in the Netherlands this substitution can be found in the housing sector. From empirical studies of the 2001 VAT increase they conclude that existing houses (exempted from VAT) become more attractive relative to new houses (general tax rate). (2) Consume less and enjoy more leisure. In a basic utility

function an individual derives utility from consumption and leisure. When the price of consumption increases, leisure becomes more attractive. The implication of this theory with respect to a VAT increase is that as the price of consumption gets higher, consumers will choose to refrain from consumption and save more. (3) Change the timing of consumption: According to Carare and Danniger (2008) consumers might anticipate that a part of the VAT increase will be passed on to them by a higher price. Consumers will therefore bring forward their consumption to before the date of the VAT increase. Besides, according to Barrell and Weale (2009) individuals may change the timing of their consumption in relation to the path of expected real interest rates because these affect the current price of consumption in future periods relative to the present. An anticipated rise in VAT rates will reduce the expectation of the real interest rate (nominal interest rate adjusted for expected rate of inflation) in the period immediately before the increase. Due to a reduction in the interest rate, consumption becomes cheaper. Therefore consumption will increase in the period before the VAT increase.

As both the income effect and the substitution effect are negative with respect to a VAT increase, producers will always have to bear a part of the VAT increase.

2.5 Other factors

Baker and Brechling (1992) provide three more practical considerations that might influence the extent of tax shifting. The first consideration is that firms face significant adjustment costs. This might result in firms combining the effect of a change of an indirect tax with other marginal cost changes into single price changes. In this case, adjustment might be delayed. A second reason is that producers in the short run attempt to keep their prices down by cutting profit margins, hoping that competitors will be forced to drop out of the market. According to the authors such behavior should be identified in empirical estimation by a lagged response to duty changes. The last consideration is that firms have different conjectures on the response of the other firms in the market. This could lead to different levels of tax shifting and to a delayed response.

2.6 The impact of the recession on the pass through of a VAT change

Another important component of the analysis of the pass through of a VAT increase on consumer prices is considering whether the recession may have an impact on the degree to which a VAT increase is shifted into consumer prices. According to Blundell (2009) two characteristics of recession possibly influence the impact of a VAT change. First, the growth in uncertainty and second, the increase in the number of families facing credit problems. He refers to a study from Blundell, Pistaferri and Preston (2008). They found that the recession period in the 1980's was characterized by a peak in income uncertainty. A growth in income uncertainty reduces the level of consumption.

Thus, uncertainty leads to a higher price elasticity of demand, which makes producers less able to shift a VAT change into consumer prices.

Purchasing durable goods often requires credit. Following Blundell (2009) the availability of credit is also important. He argues that the incidence of credit constraints very probably rises in recessions. Credit constraints can make the income effect more relevant because opportunities for intertemporal substitution become restricted by a lack of credit.

2.7 Conclusion

The pass through of a VAT increase on consumer prices is influenced by several mechanisms. First, the degree to which a VAT increase can be passed forward depends on the competition setting. In different markets (e.g. oligopoly) over- or under-shifting will occur. Besides, literature shows that tax shifting on prices operates differently upwards and downwards. Furthermore, the impact of a VAT change on the price level depends on the elasticity of demand. Price elasticity of demand is determined by the income effect and the substitution effect. For normal goods these effects work in the same direction. As both the income effect and the substitution effect are negative with respect to a VAT increase, producers will always have to bear a part of the VAT increase. The higher the price elasticity of demand, the lower the degree to which a VAT increase can be shifted into consumer prices. Third, some practical considerations might influence the extent of tax shifting, for example: adjustment costs and different conjectures on the response of the other firms in the market. Last, characteristics of recession, like uncertainty, might also have impact on the pass through of a VAT increase into consumer prices.

Chapter 3: Empirical evidence on the pass-through of a VAT change on consumer prices.

In the past twenty years a lot of research is done on the effects of a change in the VAT rate on inflation in other countries. In this chapter I will pay attention to these studies. I have to distinguish between two types of studies. The first group studies the effect of a change in the VAT rate on the overall price level in a country. The second type concentrates on changes of the VAT rate for specific goods. According to IHS (2011) the reason that the literature is focusing on tax changes for single goods is that the prices of the considered goods are assumed to be affected by the business cycle in the same way as a proper control good. When analyzing the impact of a VAT change on the overall price level it is more difficult to control for the business cycle. I will focus on the first type of studies, as these studies are more relevant for my thesis.

3.1 VAT increase The Netherlands 2001

Jonker, Folkertsma and Blijenberg (2004) investigate price setting behavior in the Netherlands. They also discuss the effect of the VAT increase of January 2001 on Dutch inflation. On January 1, 2001 the Dutch general VAT rate was increased from 17.5% to 19%. They find that the 1.5 percent point increase in the VAT was almost completely passed through into consumer prices. The authors had to deal with the problem that in January prices usually fall due to the winter sales. However, in 1999 and 2000 they observe an about 1% lower price in January than in December. In 2001 prices went up with 0.3% from December to January, this suggests a 1.3% higher price increase than in 1999 and 2001. However, following IHS (2001) the result of Jonker et al. (2004) should be treated with care, as the authors controlled for the economic environment in a very simple way. They only compare monthly price changes from December to January in the year of reform, with the price changes in the two years preceding the reform. Besides it should be kept in mind that the increase in the VAT rate came along with a decrease of income tax rates.

3.2 VAT increase Germany 2007

3.2.1 Deutsche Bundesbank

The Deutsche Bundesbank (2008) investigates the price and volume effects of the VAT increase in Germany on January 1, 2007. German standard VAT rates were raised from 16% to 19%. The motives behind this three percent points increase were raising tax revenues because of the extremely tight situation of public finance and reducing the heavy burden of social security contributions on labor. Using intervention analysis the Deutsche Bundesbank estimates the impact of the VAT increase on the monthly rate of the Harmonized Index of Consumer Prices (HICP). The authors refer to Valadkhani (2005) for an explanation of their methodology. Intervention analysis can be used to

assess the impact of a certain event on the time series of interest. Dummy variables are used to evaluate the effects of an unusual event. There are the pulse function and the step function. A pulse function indicates that the intervention only occurs in the single time index t_0 whereas a step function shows that the intervention continues to exist starting with the time index t_0 (Tsay 2008). According to Valadkhani (2005) it is widely believed that an intervention, such as a sales tax (or value added tax) increase only has a temporary impact on inflation. Therefore the impact of a VAT change on prices can be measured by a dummy variable, taking the value of zero everywhere, except in the quarter the VAT change took place. However it is also possible that the effect of the introduction may persist before or after the VAT change. To capture these effects pulse dummy variables can be added in the four quarters before and the four quarters after the change. As this study focuses on whether the VAT increase led to a delayed shift into consumer prices I will use this technique to identify the pattern of the pass through of the VAT increase. I refer to chapter 5 for a broader explanation.

The Deutsche Bundesbank conducts the analysis for the monthly rate of change of the overall HICP and for its main subcomponents. The calculations are based on data of the past 17 years. The model should capture systematic underlying time patterns in the data. To separate the VAT-related price movements, the Bundesbank controls for additional government measures, seasonal effects, the medium-term price trend, effects due to crude oil, the exchange rate and special price developments at the import and producer level. They find that the higher tax rates have been largely passed through to prices. The pass-through of a higher VAT was effected solely by a higher frequency of price increases. However, only a small percentage of companies raised their prices at the exact date and by the full amount of the tax increase. Only a small part of the additional price increases precisely matched the pure VAT effect, the most of them were much larger. Besides, the Deutsche Bundesbank finds anticipatory effects in both private consumption and housing construction. The VAT increase had a dampening effect on the pick-up in domestic economic activity.

3.2.2 Carare & Danninger

Carare and Danninger (2008) also investigate the influence of the VAT increase of January 1, 2007 on inflation in Germany. They trace inflation of any commodity item over time and relative to items that are not subjected to the VAT increase, by including VAT dummies that take value 1 for goods subjected to the VAT increase in a certain period. Inflation is estimated during the announcement period, the implementation and the post-implementation. The authors control for the euro area wide inflation effects, time trend and commodity-specific items. As I will largely adopt this approach, I will elaborate on this methodology in chapter 5.

Carare and Danninger conclude that increases in core inflation in 2007 were smaller than expected. Contrary to the Deutsche Bundesbank they do not find empirical evidence for a delayed price increase during 2007. The authors focus on inflation smoothing. Besides they explore whether the

development of inflation of goods subject to the VAT increase differs from the development of inflation of those goods that were not. They find that the inflationary profile of a tax hike is likely affected by the length of the announcement period. Price adjustment in advance of a VAT increase can help to smooth the inflation. Two reasons for this inflation smoothing are provided. First, not all firms adjust their prices every period, because gathering information and changing prices is costly. An announcement period might lead firms to make larger price increases, since this minimizes the chances that prices are misaligned in the period after the VAT increase. Second, during the announcement consumers might anticipate price increases and shift consumption to the period before the tax increase. Firms may be able to take advantage from this intertemporal consumption shifting by increasing the price before the VAT hike. They also find that price increases were stronger among durable goods and in markets with imperfect competition. According to the authors, the inflation smoothing effect may also explain why there were little further increases among VAT items in the aftermath of the VAT increase.

3.3 VAT increase/decrease France 1995 and 2000

Carbonnier (2005) studies the economic impact of French commodity tax reforms in 1995 and 2000. In 1995 the French general VAT rate was increased by two percent points, followed by a decrease of this rate with one percent point in 2000. He uses difference-in-differences regressions on the prices of selected goods around both the VAT increase in 1995 and the VAT decrease in 2000. The purpose of the study is to estimate tax shifting parameters. To estimate the parameters, regressions of the relative price variations are implemented on the relative tax variations. ($x = 1 + \tau_t / p_t * (p_{t+1} - p_t / \tau_{t+1} - \tau_t)$). The parameter is the ratio between the effective after-tax prices following the reform and the after-tax prices if the pre-tax prices do not follow the reform. If the tax is completely shifted into consumer prices, $x = 100\%$. $x = 0\%$ if the after-tax prices do not change following the reform.

To make this comparison Carbonnier uses monthly data on labor intensive services at one hand and manufactured products at the other hand, as he assumes that labor is more flexible and therefore labor intensive services may be represented by a perfect competition model, whereas manufactured products have high fixed costs and may be better represented by an oligopoly model. He chooses books as a control index, as these goods have not been affected by any of the VAT reforms. Besides, regressions are controlled with variables providing information about the production costs. In addition to the main control variables, Carbonnier also controls café and restaurants consumptions with before tax prices of alcoholic drinks. He stresses the usefulness of these additional controls.

Carbonnier finds that on a competitive market, the tax shifting parameter is higher upwards than downwards. This might be due to the fact that the existence of fixed adjustment costs may prevent firms from decreasing their prices after small VAT decreases. In more collusive markets (oligopoly)

the tax shifting parameter is lower upwards than downwards. A potential explanation could be that demand reactions might be stronger after important price variations than after tenuous ones.

3.4 Temporary VAT cut United Kingdom 2008

Chirakijja et al. (2009) analyze the impact of the 2008 VAT cut stimulus policy on inflation. On November 24, 2008 UK government announced a decrease of the standard VAT rate from 17.5% to 15% from December 1, 2008 to December 31, 2009. The reason was that the economic situation was rapidly worsening and the government wanted to stimulate consumer expenses. They adopt the methodology of Carare and Danniger (2008). They evaluate whether the inflation dynamics of the items subject to the standard VAT rate is different from that of the non-VAT items across the VAT cut, having controlled for time trends and seasonal effects. The authors find that about 75% of the VAT decrease was passed through into consumer prices. They expected a different effect between durables and non-durables as consumers may bring forward purchases of non-perishable (or storable) goods to be consumed later. However, they do not find evidence for this effect.

3.5 VAT changes in Switzerland 1995, 1999 and 2001

Kaufmann (2008) investigates price-setting behavior of firms in Switzerland. He also studies the effect of changes in VAT rates. He finds that tax changes affected the frequency of price increases. However, he finds that in all three cases, the size of the price increase was slightly lower than in the two adjoining quarters. The author provides two potential explanations for his findings. First, since price increases due to a tax increase can be justified in a transparent way, they will not harm the relationship between retailer/producers and customer. Second, the tax changes were relatively small compared to the average size of a price increase. Besides he finds that prices are not adjusted in anticipation of VAT rate changes. They are adjusted in the quarter in which the VAT rate change takes effect. He suggests therefore that there must be forces that prevent firms from raising their prices in anticipation of the VAT increase, as most models imply that firms optimize their prices when they obtain information about future events. Two reasons: first, price changes related to the increase of realized cost are easier to communicate to consumers. Second, in a competitive market, individually taken price increases could lead to a loss in market share.

3.6 Conclusion & summary

From these empirical studies I can conclude that VAT changes lead to a higher frequency of price increases. In most cases a VAT change will be largely passed through into consumer prices. It is not sure whether there are different effects between durables and non-durables. Furthermore, the inflationary profile a VAT increase might be affected by the length of the announcement period.

Considering the papers above, I would expect that a big part of the Dutch VAT increase has been passed through into consumer price. Besides, it could be interesting to investigate whether the earlier announcement of the VAT increase (May 2012) has led to inflation smoothing.

Summary:

Author(s)	Country	Results
Jonker et al. (2004)	Netherlands	1.5 percent point VAT increase (2001) was almost completely passed through into consumer prices.
Deutsche Bundesbank (2008)	Germany	The higher tax rates have been largely passed through to prices. The pass-through of a higher VAT was affected solely by a higher frequency of price increases.
Carare & Danniger (2008)	Germany	Inflationary profile of a tax hike is likely affected by the length of the announcement period. Price increases were stronger among durable goods and in markets with imperfect competition. Inflation smoothing effect may also explain why there were little further increases among VAT items in the aftermath of the VAT increase.
Carbonnier (2005)	France	On a competitive market, the tax shifting parameter is higher upwards than downwards. In more collusive markets (oligopoly) the tax shifting parameter is lower upwards than downwards.
Chirakijja et al. (2009)	United Kingdom	About 75% of the VAT decrease was passed through into consumer prices. No different effect between durables and non-durables.
Kaufmann (2008)	Switzerland	Tax changes affect the frequency of price increases. Prices are not adjusted in anticipation of VAT rate changes. They are adjusted in the quarter in which the VAT rate change takes effect.

Chapter 4: Data and descriptive statistics

Data

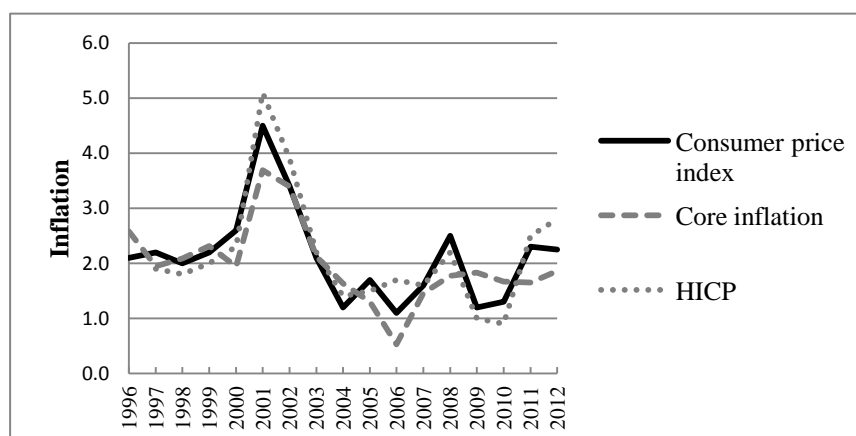
This chapter provides information on the data used and the process of gathering data. Furthermore it includes descriptive statistics.

A large number of indicators has been proposed to measure inflation. For expository purposes, I will show five different indicators that are commonly used in economic analysis.

1. Consumer price index (CPI): CPI is the most common used measure for inflation. The index measures the cost of purchasing a basket of goods and services expressed relative to a base year in the past.
2. Derived consumer price index: excludes the effect of taxes. This measure is derived technically from the CPI by the Statistics Netherlands (CBS). As the size of the tax is only estimated roughly this measure will not be used in this thesis.
3. Core inflation: Some goods, like vegetables and fruits, face volatile price movements. This measure excludes the effect of food and energy because these products can have price shocks that deviate from the overall inflation trend.
4. Deflator consumption: measures the price level of household spending.
5. HICP: Harmonized Index Consumer Prices: this index is used for international comparisons within the EU.

In this thesis, I will use the consumer price index as a measure for inflation in the Netherlands, as the CPI is the most commonly used measure. As shown in the table below, in most of the years, core inflation is not very different from the consumer price index. Differences between these two measures have to do with the development of food and/or energy prices. For example in 2001 the Netherlands had to deal with a food crisis. I will control for this higher food prices by adding a dummy variable. The table also shows differences between the CPI and the HICP. This is because the HICP does not

Figure 4.1: Inflation measures



include consumption taxes, while the CPI does. Therefore, the HICP is not a useful measure to study the effect of a VAT increase on consumer prices. However, I use the HICP as measure for euro area inflation, to control for euro area wide inflation trends.

The CPI data used in this study is collected from Statistics Netherlands (CBS). This database provides monthly data on the annual rate of change of inflation for each commodity item from January 1997 to March 2013. Therefore it is possible to analyze the period 1997-2013 and take into account both the VAT change of January 2001 and October 2012. I will use two digit level data. This allows me to differentiate between commodity items subjected and not subjected to the VAT increase. At a two digit level Statistic Netherlands provides 90 commodity items. However, a few items will be dropped from the analysis. I drop education and health, as these items only have a small weight in the CPI. Besides, I will leave out municipal taxes, insurances and fees as these groups consist of a special kind of goods which are quite different from the other goods in the study. After this selection there are 74 commodity items left, which I will include in my analysis based on their individual weights in aggregate CPI. By using weighted inflation rates the analysis will not be distorted by inflation trends of goods with only a small weight in the total CPI. The weights of the different commodity items are collected from Statistics Netherlands.

The data is divided into two sets of goods. The first set is subjected to the standard tax rate and therefore subjected to the VAT increase. The other goods are subjected to the reduced rate. In Appendix 1 a table that lists all 74 commodity items can be found. It also shows whether they are subjected to the VAT increase. The goods in italic are also subjected to excises.

The data on the Euro area inflation is collected from Eurostat. Like Statistics Netherlands Eurostat uses COICOP² to classify the commodity items. However Eurostat does not contain data on the following commodity items. For these items I will therefore be unable to control for Euro area inflation:

- cp0412: garage rent
- cp0521: curtains, blinds etc.
- cp0522: bed clothes

Stata will drop these commodity items from the analysis, as data on euro area inflation is not available. However, this will not significantly influence the results as these commodity items all have a very low weight in the total CPI (together 1%). Furthermore, Eurostat combines some commodity items in one group:

- cp0321: shoes and cp0322: repair of footwear

² Classification of Individual Consumption According to Purpose

- cp0531: major household appliances and cp0532: small household appliances
- cp0712: motorcycles and cp0713: bicycles
- cp0921: articles for outdoor recreation and cp0922: articles for indoor recreation
- cp0394: pets and related products and cp0935: veterinary and other services for pets
- cp0961: holidays in the Netherlands and cp0962: holidays abroad
- cp1212: electric appliances for personal care and cp1213: other products for personal care

I choose to use the inflation of the combined commodity item as Euro area inflation for both commodity items. For example, in 1997m1 Euro area inflation is 1.6% for the combined groups: shoes and repair of footwear. I will use 1.6% as HICP_EA for both shoes and repair of footwear.

Descriptive statistics

The graphs below show the development of inflation in the year preceding the VAT increase and the months after the VAT increase. The figures show the intuitive effect of the increase of the VAT rate. With respect to the VAT increase of January 2001 Figure 4.2 shows an increase in inflation in January 2001. However, inflation among goods subjected to the reduced rate increases even more. At first sight, the 2001 VAT increase does not seem to have had much influence on consumer prices. However one should be aware that in 2001 prices of food and gas rose, which made inflation run up among goods subjected to the reduced rate. Especially among fruit and vegetables inflation was extremely high in 2001. I therefore control for the food crisis and the time trend in my model. Note that the evolution of inflation is the same for both groups, which makes the goods subjected to the reduced rate to be a good control group.

Figure 4.3 shows that inflation among the goods subjected to the standard rate increased quite a lot in October 2012. Inflation increased till January 2013 implying that the VAT increase of October 2012 led to a delayed pass through into consumer prices. The inflation among reduced VAT rate items is as

Figure 4.2: Inflation in the Netherlands 2001

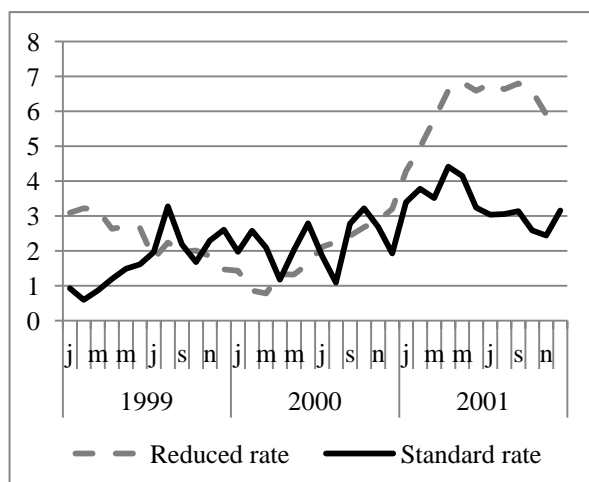
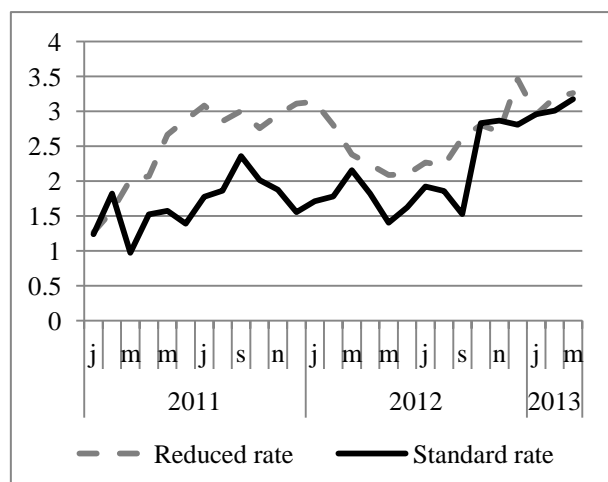


Figure 4.3 Inflation in the Netherlands 2012



high as inflation among standard VAT rate items. However, the increase of inflation is higher for goods subjected to the VAT increase, as the level of inflation was higher for goods subjected to the reduced rate in the months preceding the VAT increase.

The table below shows the main characteristics of the variables used in this study. A more detailed table on the CPI can be found in Appendix 2. This table also distinguishes between goods subjected to the standard rate and goods subjected to the reduced rate.

	Observations	Mean	St. deviation	Minimum	Maximum
Inflation	13550	1.456133	4.967915	-36.4	26.5
GDP	13672	1.877267	2.301215	-5	5.8
Interest rate	13673	4.082286	.9430269	2	5.58
Unemployment	13673	4.126571	.9147208	2.5	6.25
Inflation EA	13631	1.391409	3.377982	-23.66842	23.79474

Inflation is affected by several macro-economic factors. I use these factors as control variables in my model. The most important factor that influences inflation is the business cycle. Indicators for the business cycle are GDP and unemployment. The graphs show the relationship between these variables and inflation. Contrary to expectations from economic theory the graph shows a negative relation between GDP and CPI. In times of high GDP growth, inflation is relatively high. A potential explanation for this relation could be that inflation reacts delayed to GDP growth. Therefore I include a time lag for GDP in my model.

Figure 4.4: Unemployment and Inflation

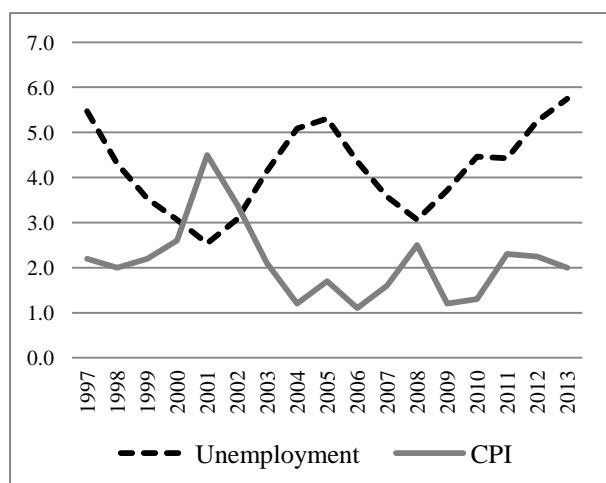
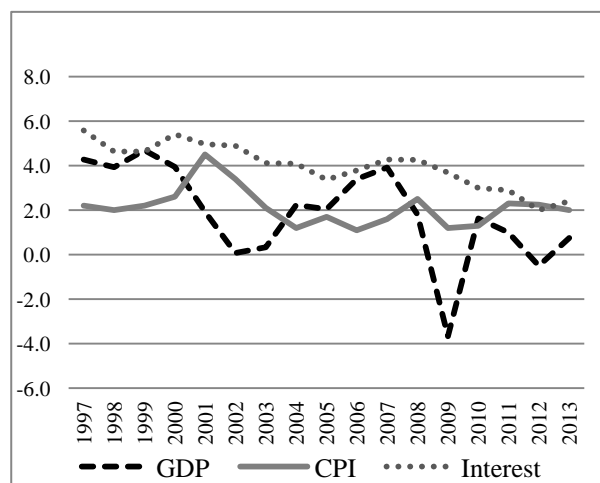


Figure 4.5: GDP, Interest and Inflation



As shown in Appendix 2 and in Figures 4.6 and 4.7 inflation shows a different trend for goods subjected to the reduced rate than for goods subjected to the standard rate. This trend can also be seen in euro area inflation. The graphs below demonstrate that both in the euro area and in the Netherlands inflation differs on average with 1-2 percent point between goods subjected to the standard rate and

goods subjected to the reduced rate. Besides, the graph shows that inflation trends are quite the same for both the euro area inflation and the Dutch inflation. This implies that the euro area inflation variable picks up this permanent difference between the two groups. The graphs show a different pattern at some points in the time.

In 2001 inflation rates were quite different between the Netherlands and the euro area among both normal goods and luxury goods. According to Statistics Netherlands (2002) the high inflation in 2001 was due to increasing food prices and the pass through of higher rents and energy costs into consumer prices. The difference between Dutch CPI and euro area inflation is bigger for goods subjected to the standard rate. The graph provides support for the hypothesis that the VAT increase has been shifted forward into consumer prices.

In 2004 Dutch CPI among goods subjected to the reduced rate differs two percent point from euro area wide inflation. Dutch inflation was very low in 2004. According to Statistics Netherlands (2005) this was mainly due to decreasing food prices due to the price war in the supermarkets.

Furthermore, the graph provides some information on the 2012 VAT increase in the Netherlands. In October 2012 and in the months after the VAT increase the Dutch inflation rate for goods subjected to the standard VAT rate is increasing, whereas euro area inflation is decreasing. This indicates that inflation among goods subjected to the standard rate rose due to the VAT increase.

Figure 4.6: Inflation goods subjected to reduced rate

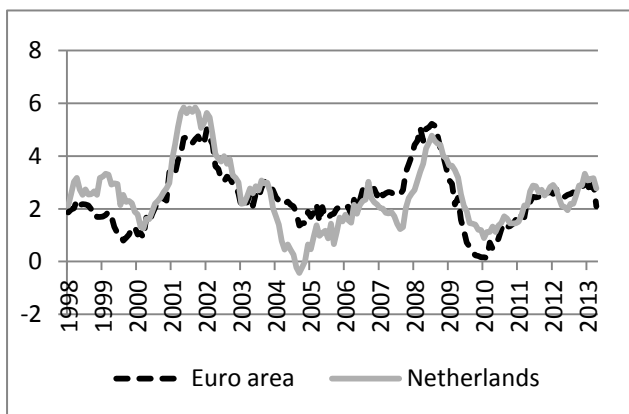
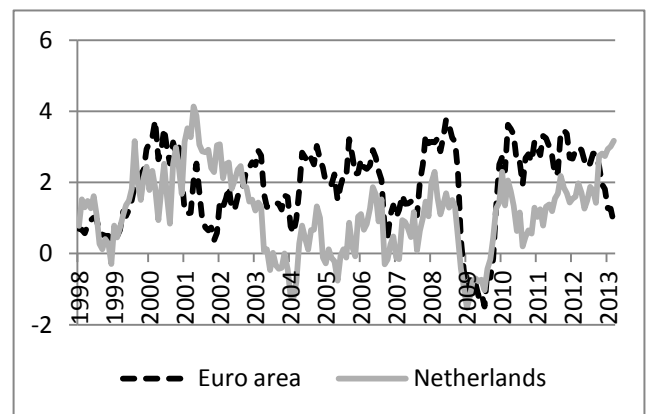


Figure 4.7 Inflation goods subjected to general rate



Chapter 5: Methodology

In this chapter I will elaborate on the method I used to identify the influence of a VAT increase on consumer prices. In order to investigate the aforementioned effect, I estimate inflation in VAT items relative to non-items. I adopt the methodology of Carare and Danninger (2008) and estimate the inflation rate of a commodity item by a static linear model using fixed effects. Differences in inflation between the two groups which cannot be accounted to standard determinants of inflation are due to the VAT increase. The equation for the weighted³ inflation rate (P_{it}) for any commodity item in the Dutch CPI is:

$$(5.1) P_{it} = \alpha + \beta_1 VAT2001_{it} + \beta_2 VAT2012_{it} + \beta_3 \delta_1 EA_{it} + \beta_4 \delta_2 EA_{it} + \beta_5 \delta_1 Z_{it} + \beta_6 \delta_2 Z_{it} + \varepsilon_{it}$$

Where $VAT2001_{it}$ stands for the 2001 VAT dummies, $VAT2012_{it}$ stands for the 2012 VAT dummies, EA_{it} for the euro area wide inflation trends and Z_{it} for the control variables. The effect of the control variables is split between the two different groups by the dummy variables δ_1 and δ_2 . These dummies take value 1 respectively for the goods subjected to the standard rate and goods subjected to the reduced rate. By introducing VAT dummies, inflation rates are allowed to vary between items liable and not liable to the VAT increase. In this way the effect of the VAT increase on consumer prices can be estimated. To estimate the inflation trend for commodity items subjected to the VAT increase I create a dummy for each month in the year after the VAT increase. In this way I will be able to identify the pattern of the pass through of a VAT increase into consumer prices. The dummy variables take value 1 for all commodity items subjected to the standard tax rate (and thus subjected to the VAT increase) and take value 0 for all items subjected to the reduced rate. If the dummy variables have a positive and significant effect, this implies that the inflation increased more strongly among goods that are subjected to the standard VAT rate. Equations (5.2) and (5.3) enable me to calculate the expected coefficient of the VAT dummies in case of a full pass through. Consumer price consists of producer price (Q) and VAT (1+ τ): see Eq. (5.2). Thus, the change of inflation consists of the change of the consumer price and the change of the VAT. Multiplying Eq. (5.3) by 100% gives the percentage impact of the VAT increase on inflation. The impact of the VAT increase on inflation is therefore: $\frac{d\tau}{(1+\tau)} * 100\%$ (assuming Q to be constant).

$$(5.2) P = Q (1 + \tau)$$

$$(5.3) \tilde{P} = \tilde{Q} + (\widetilde{1 + \tau}) \rightarrow \frac{d(1+\tau)}{(1+\tau)} = \frac{d\tau}{(1+\tau)}$$

³ As stated in the previous chapter I use weighted inflation rates in my analysis. This is achieved by including the weights of the different commodity items as a variable in my dataset and use the pweight function in Stata to weigh the items. Stata provides four weight keywords to weigh the data. pweight is the keyword that can be used for sampling weights and is therefore the most useful weight for this study.

This leads to hypothesis 1: When the VAT increase is shifted fully into consumer prices, the dummy variables have a coefficient of 1.68 in 2012 and 1.28 in 2001.

Besides, I will explore whether the earlier announcement of the VAT increase has led consumers to bring forward their purchases to before the VAT increase, by creating announcement dummies for the months preceding the VAT increase. If these dummy variables have a positive and significant effect, consumers anticipated on the VAT increase.

I use the following control variables in my model:

EA_{it} is a variable that is used to control for the regional trend. The specification of the variable includes euro area inflation for each commodity item separately and thus measures the price effect rising from the euro area. The inflation rates were computed for the euro area, excluding the Netherlands. The inflation of the Netherlands was filtered from the euro area inflation by using the following formula, where w_1 stands for the weight of the Netherlands in the euro area inflation and w_2 stands for the aggregate country weights of the other euro area countries in euro area inflation:

$$(5.4) \quad P_{EA-NL} = \frac{P_{EA} - w_1 P_{NL}}{w_2}$$

Z_{it} stands for the variables that control for the business cycle. I control for the GDP and the interest rate. In another specification I control for unemployment. I split the effect of the control variables on aggregate inflation in (1) the effect on inflation of the goods subjected to the standard VAT rate and (2) the effect on the inflation of goods subjected to the reduced VAT rate. This is achieved by creating an interaction between the dummies for the commodity items and the variables that represent the business cycle (for example $GDP_{standard} = Dum_{standard} * GDP$).

Furthermore, dummy variables are added for the years 2001, 2012 and 2013. The year 2001 was a special year. According to Statistics Netherlands (2002) inflation rose for several reasons. The dotcom bubble collapsed and food prices increased rapidly due to poor harvests and the foot and mouth disease⁴. Besides, gas prices increased. It is also argued that producers and retailers might have raised their price anticipating the introduction of the euro on January 1, 2002. Dum_{2001} is added to control for the effect of these events that apply to all commodity items. $Dum_{Food2001}$ is added to pick up the effect of the small food crisis in 2001. The dummy variable takes value 1 for product 1-3, 6 & 7. Dum_{2012} and Dum_{2013} might pick up some business cycle effects that are not covered by the other variables that control for the business cycle.

⁴ Food and mouth disease is an infectious viral disease that affects cloven-hoofed animals, such as cows and sheep. As the disease can be easily transmitted a lot of cattle was killed in an attempt to halt the disease. This led to enormous cost for the agricultural sector.

To control for seasonal and time specific effects monthly time dummies are introduced. Besides, some goods are subjected to excises. I will therefore add a dummy `Dum_EXC` that takes value 1 for the excise goods in the year of a change of the excises.

Second, inflation (P_{it}) will be measured as a dynamic panel with lagged inflation P_{it-1} . By including this lags I control for the dynamics of the process:

$$(5.5) P_{it} = \alpha + P_{it-1} + \beta_1 VAT2001_{it} + \beta_2 VAT2012_{it} + \beta_3 \delta_1 EA_{it} + \beta_4 \delta_2 EA_{it} + \beta_5 \delta_1 Z_{it} + \beta_6 \delta_2 Z_{it} + \varepsilon_{it}$$

Including lagged inflation changes the intuition of the coefficient of the other variables. After including a lag the coefficients represent the short term effects of the VAT increase on inflation.

Furthermore, to obtain consistent estimations, it is important to obtain standard errors that are robust to disturbances being heteroskedastic and autocorrelated. This is achieved by using the option `cluster()` in Stata. This option specifies that the standard errors allow for intragroup correlation, relaxing the usual requirement that the observations are independent.

Chapter 6: Results and robustness analysis

6.1 Results

Table 6.1 shows the core results of the estimation of inflation. All models include VAT dummies that measure the influence of the VAT increase on consumer prices, variables that control for the time trend, euro area inflation and monthly time dummies that control for seasonal effects. Besides, fixed effects are used in all models. The standard errors are robust to heteroskedasticity and clustered into a group subjected to the standard VAT rate and a group subjected to the reduced VAT rate. The purpose of the clustering is to account for the difference in the variance of goods subjected to the reduced rate and to the standard rate; standard errors might be clustered within the groups.

I used five different specifications to estimate inflation. The two main differences between the specifications are: (1) the inclusion of year dummies (in specification 4 and 5) and (2) including lagged inflation (specification 1, 2 and 4). In my view the specifications that include year dummies are the most useful specifications, as these dummies might pick up some time trend that is not controlled for by the other control variables. Euro area inflation has a positive and very significant effect on inflation in the Netherlands. The coefficients of this variable are robust throughout the different specifications. GDP influences inflation negative, interest positive. However, these control variables are not all significant. This provides support for including year dummies that pick up the other effects of the time trend on inflation. Furthermore, in specification (2) I added lagged GDP to control for the time trend as inflation may react delayed to GDP growth. However this lagged GDP does not influence inflation significantly and the coefficients of the VAT dummies change only very slightly. The dummy for the 2001 food crisis is positive and significant. Inflation is 1.7 percent point higher among fruit, vegetables, meat, fish and bread because of poor harvests and the mouth and foot disease.⁵

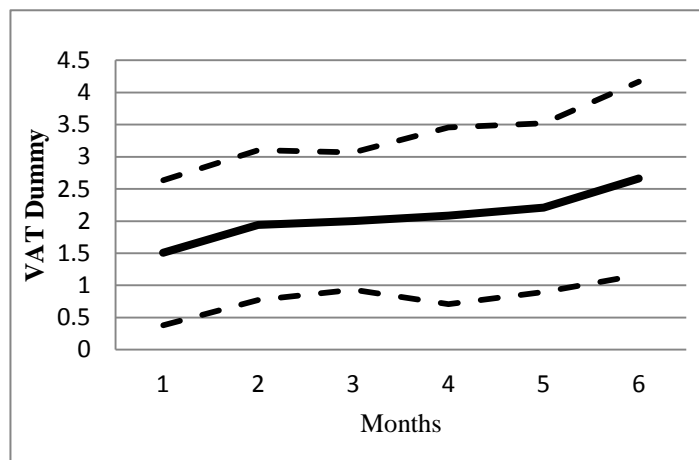
The VAT dummies are most relevant to assess my research question. They measure whether inflation increased more strongly among items subjected to the VAT increase.

The VAT_2012 dummies all show a positive and significant effect throughout all specifications. In October 2012 the coefficient of the dummy is between 1.5 and 1.9 in the different specifications. This implies that in the month of implementation inflation is 1.5-1.9 percent point higher for commodity items subjected to the VAT increase than for commodity items not subjected to the VAT increase. As stated in Chapter 5, I expected the coefficient to be 1.7 in case of a full pass through of the VAT increase into consumer prices. This would apply for each month in the year after the VAT increase, as

⁵ Besides, I estimated inflation controlling for (1) unemployment and (2) wages (as a measure for the business cycle). However, the results of these estimations do not influence the conclusions, as the coefficients of the VAT dummies do not change significantly. I did not include the results in this thesis.

the inflation measures a year on year price change. None of the coefficients of the VAT dummies differs significantly from 1.7. This provides support for the hypothesis that the VAT increase was shifted fully into consumer prices. Besides, the coefficients are increasing over the months; this might provide evidence that the VAT increase led to a delayed pass through into consumer prices. However, the coefficients in specification 4 and 5 do not differ significantly between the different months. The graph below illustrates the influence of the VAT increase on consumer prices. It shows the estimates of the VAT dummy (specification 4-5) in the months after the VAT increase. The dotted lines mark the upper bound and the lower bound of the confidence interval.

Figure 6.1: Effect of the October 2012 VAT increase



In March 2013, the coefficient of the VAT dummy lies quite high: between 2.6 and 3.2. Inflation for commodity items subjected to the tax increase is thus 2.6-3.2 percent point higher than inflation among commodity items not subjected to the VAT increase. This implies that the VAT increase might have been overshifted into consumer prices. Over-shifting might be due to the fact that producers face significant adjustment costs, as argued by Baker & Brechling (1992). This costs result in firms combining the effect of a change of an indirect tax with other marginal cost changes into single price changes. This leads to a delayed but higher pass through into consumer prices. However, one should be aware that although the coefficient of the VAT dummy is quite high, it does not differ significantly from 1.7 (full pass through). Besides, according to Statistics Netherlands the high inflation in March is partly due to the increase of excises on tobacco in January.⁶ Till March a lot of stock was available at old prices. The largest part of the excise increase was shifted into consumer prices in March. Therefore part of the VAT effect in March may consist of the higher excises.

⁶ <http://www.cbs.nl/NR/rdonlyres/6567C573-5A44-43EF-88EE-E9EF9AA6652B/0/pb13n024.pdf>

The VAT_2001 dummies also show that inflation is higher among goods subjected to the standard VAT rate. However, the effect of the 2001 VAT increase is not that clear as the effect of the 2012 VAT increase. First, the dummy variables are not significant throughout all specifications. Besides, there is a big difference between specifications 1-3 at one hand and specification 4-5 on the other hand. This is due to the fact that several factors caused high inflation in 2001. Although the evolution of inflation is the same for both groups, these factors make it very difficult to control for the differences between the treatment group and the control group. Retailers shifted higher rents and energy prices into consumer prices, besides they might have increased their prices anticipating the introduction of the euro (Statistics Netherlands 2002). These circumstances apply for all commodity items. However, it is not sure whether it influences both groups equally. The year dummy picks up this effect and is positive and significant in both specification 4 and 5. Therefore I consider these specifications to be the most useful specifications. Following specification 4-5 inflation was 1.1 percent point higher among goods subjected to the VAT increase in January 2001. As stated in Chapter 5, I expected the coefficient to be 1.3 in case of a full pass through of the VAT increase into consumer prices. Although the effect of the VAT increase is not constant, the coefficients of the VAT dummies do not differ significantly from this 1.3. So, considering the results of specification 4-5 the VAT increase of 2001 has been fully shifted into consumer prices. However, the coefficients of the VAT dummies are a lot higher throughout specifications 1-3. The coefficient of the VAT dummy is 2.5 and differs significantly from the value in case of a full pass through (1.3). The results of specification 1-3 indicate that the VAT increase has been overshifted into consumer prices.

Figure 6.2: effect of the 2001 VAT increase (spec. 1-3)

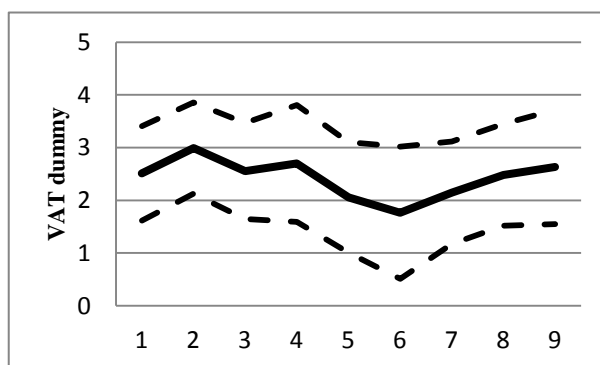
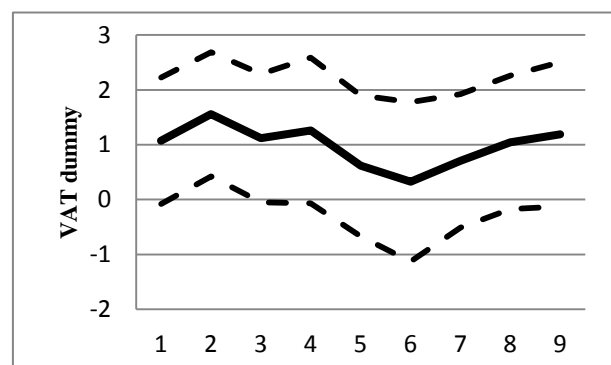


Figure 6.3: effect of 2001 VAT increase (spec. 4-5)



To summarize, one should be very careful when drawing conclusions regarding the 2001 VAT increase. The coefficients are varied between the five specifications, which makes it difficult to determine the precise effect of the VAT increase. I will therefore assess the coefficients to robustness in section 6.2.

One of the hypotheses was that the current period of economic downturn and lower consumer expenditures has led suppliers to only shift part of the VAT increase into consumer prices. The results do not confirm this hypothesis, as the coefficients of the VAT dummies show that the VAT increase was shifted fully into consumer prices. Comparing these results to the results for 2001 I do not find evidence that business-cycle effects influenced the pass-through of the VAT-increase in 2012. Timing and the extent of the pass-through are roughly similar in both years.

In addition I explored the hypothesis whether the VAT increase led to price increased anticipating the VAT increases in January 2001 and October 2012. The anticipation dummies that measure the difference in inflation rates between luxury goods and basic goods in the period preceding the VAT increase do not offer support for an anticipation effect (I did not include the results in the table).

Table 6.1: Determinants of Dutch inflation: differences between goods subjected and not subjected to the VAT increase (sample January 1997-March 2013)

	(1)	(2)	(3)	(4)	(5)
Constant	-0.21 (0.17)	-0.12 (0.18)	-0.30 (-0.19)**	-0.09 (0.16)	-0.21 (0.19)
Lagged Inflation (CPI-1)	0.11 (0.06)*	0.10 (0.06)		0.11 (0.06)*	
VAT DUMMIES:					
Dum_VAT2012_1	1.35 (0.56)**	1.39 (0.55)**	1.45 (0.54)***	1.51 (0.57)***	1.50 (0.57)***
Dum_VAT2012_2	1.73 (0.58)***	1.78 (0.58)***	1.89 (0.54)***	1.89 (0.60)***	1.93 (0.59)***
Dum_VAT2012_3	1.86 (0.51)***	1.90 (0.51)***	1.95 (0.50)***	2.02 (0.53)***	2.00 (0.54)***
Dum_VAT2012_4	2.28 (0.62)***	2.33 (0.61)***	2.48 (0.59)***	2.10 (0.68)***	2.15 (0.67)***
Dum_VAT2012_5	2.37 (0.60)***	2.42 (0.59)***	2.54 (0.57)***	2.19 (0.66)***	2.20 (0.66)***
Dum_VAT2012_6	2.83 (0.70)***	2.89 (0.70)***	3.00 (0.67)***	2.66 (0.75)***	2.66 (0.75)***
Dum_VAT2001_1	2.70 (0.42)***	2.68 (0.42)***	2.51 (0.45)***	1.32 (0.52)**	1.07 (0.58)*
Dum_VAT2001_2	3.07 (0.45)***	3.06 (0.45)***	2.99 (0.43)***	1.70 (0.58)***	1.55 (0.57)***
Dum_VAT2001_3	2.61 (0.47)***	2.61 (0.47)***	2.56 (0.46)***	1.24 (0.60)**	1.11 (0.58)*
Dum_VAT2001_4	2.75 (0.55)***	2.78 (0.54)***	2.70 (0.56)***	1.38 (0.64)**	1.25 (0.67)*
Dum_VAT2001_5	1.95 (0.51)***	1.99 (0.51)***	2.05 (0.53)***	0.58 (0.64)	0.61 (0.64)
Dum_VAT2001_6	1.64 (0.60)***	1.67 (0.60)***	1.76 (0.63)***	0.27 (0.72)	0.32 (0.73)
Dum_VAT2001_7	2.11 (0.47)***	2.19 (0.47)***	2.14 (0.49)***	0.73 (0.62)	0.70 (0.61)
Dum_VAT2001_8	2.34 (0.45)***	2.42 (0.45)***	2.48 (0.48)***	0.97 (0.60)	1.04 (0.61)*
Dum_VAT2001_9	2.40 (0.50)***	2.44 (0.50)***	2.63 (0.54)***	1.02 (0.64)	1.19 (0.66)
Dum_VAT2001_10	1.75 (0.58)***	1.83 (0.57)***	1.89 (0.61)***	0.36 (0.70)	0.44 (0.71)
Dum_VAT2001_11	1.98 (0.44)***	2.03 (0.44)***	2.13 (0.47)***	0.60 (0.59)	0.68 (0.60)

Dum_VAT2001_12	2.65 (0.40)***	2.68 (0.41)***	2.73 (0.42)***	1.26 (0.56)*	1.28 (0.57)**
CONTROL VARIABLES:					
Inflation euro area (standard rate)	0.91 (0.16)***	0.91 (0.16)***	0.93 (0.15)***	0.92 (0.16)***	0.93 (0.16)***
Inflation euro area (reduced rate)	0.88 (0.02)***	0.89 (0.02)***	0.89 (0.02)***	0.89 (0.02)***	0.89 (0.02)***
GDP*Dum_standard_rate	-0.05 (0.06)	-0.05 (0.06)	-0.12 (0.06)**	-0.06 (0.06)	-0.12 (0.10)**
GDP*Dum_reduced_rate	-0.10 (0.06)*	-0.08 (0.05)	-0.15 (0.07)**	-0.07 (0.05)	-0.12 (0.14)*
Interest*Dum_standard_rate	0.10 (0.10)	0.03 (0.11)	0.25 (0.10)**	0.09 (0.10)	0.25 (0.10)**
Interest*Dum_reduced_rate	0.12 (0.11)	0.04 (0.12)	0.26 (0.13)**	-0.01 (0.12)	0.13 (0.14)
GDP*Dum_standard_rate (-1)		0 (omitted)			
GDP*Dum_reduced_rate (-1)		0.06 (0.03)*			
Dum_Food2001	2.83 (0.56)***	2.85 (0.55)***	2.83 (0.55)***	1.64 (0.70)*	1.59 (0.71)
Dum_2001				1.39 (0.36)**	1.45 (0.37)**
Dum_2012				-0.19 (0.34)	-0.05 (0.21)
Dum_2013				0.15 (1.71)	0.31 (0.34)*
Estimation	fe	fe	fe	fe	fe
Observations	11851	11781	11851	11851	13507
Number of groups	70	70	70	70	70

Standard errors in parentheses *significant at 10% level **significant at 5% level *** significant at 1% level

6.2 Robustness analysis

In this section I assess the robustness of the estimates of the VAT dummy variables. The four robustness checks are described in the following subsections. The first robustness check (§ 6.2.1) examines whether splitting the sample into different periods yields the same coefficients for the dummy variables as the base regression. The second robustness check (§ 6.2.2) performs a time-series analysis for goods subjected to the VAT increase. The third robustness check (§ 6.2.3) assesses the reliability of the control group by performing another difference in difference analysis using Belgium as a control group. The fourth and final robustness check (§ 6.2.4) implements the methodology of Pesaran (2006). This analysis examines whether allowing for heterogeneous responses to aggregate shocks leads to different coefficients.

6.2.1 Splitting the sample into different periods

I check the robustness of the coefficients of the VAT dummies by splitting the sample over time. By splitting the panel I am able to focus on the period around the VAT increase. I split the sample in the following periods: (1) 2000-2002 and (2) 2011-2013. For both periods I estimate both a static (specification 1 & 4) and a dynamic panel (specification 2, 3 & 5)

The results are presented in table 6.2 below. For the period 2000-2002 the results are quite different between the different specifications. Inflation turns out to be quite persistent. Besides, including lagged inflation leads to lower coefficients of the VAT dummies. This is what I would expect. Including a time lag changes the intuition of the coefficients: they measure a short term trend. Using the short term coefficients the long term effects can be easily derived. As after a while inflation gets back to its normal pattern, the long term effect can be measured as:

$$P^{\wedge} = \frac{\beta}{(1 - \alpha)} VAT$$

From this equation follows that the higher inflation persistence (α) is, the larger is the long run effect.

Table 6.2 shows that the VAT increase of January 2001 has been fully passed through into consumer prices. Again, the coefficients of the VAT2001 dummies are quite high, indicating that some over-shifting might have occurred. However, the coefficients do not differ significantly from 1.28 (the coefficient in case of full pass through). The October 2012 VAT increase has also been shifted fully into consumer prices. The VAT dummy is quite high in the first months of 2013 which might be an indication of over-shifting. But again the coefficients are not significantly different from 1.7.

To summarize, splitting the panel over time does not yield different results. Again I find evidence that the VAT increases is shifted fully into consumer prices, both in 2001 and 2012.

Table 6.2: Results when splitting the panel into different periods

	(1)	(2)	(3)	(4)	(5)
Sampling period	2000-2002	2000-2002	2000-2002	2011-2013	2011-2013
Constant	1.91 (0.91)**	0.05 (0.80)	-0.46 (0.84)	0.00 (-0.01)	0.19 (0.42)
Lagged Inflation (CPI-1)		0.45 (0.14)***	0.53 (0.15)***		0.16 (0.13)
<u>VAT DUMMIES:</u>					
Dum_VAT2012_1				1.59 (0.57)***	1.49 (0.58)**
Dum_VAT2012_2				1.86 (0.61)***	1.77 (0.61)***
Dum_VAT2012_3				1.62 (0.60)***	1.71 (0.62)***
Dum_VAT2012_4				2.20 (0.64)***	2.05 (0.65)***
Dum_VAT2012_5				2.10 (0.66)***	2.09 (0.65)***
Dum_VAT2012_6				2.70 (0.80)***	2.75 (0.81)***
Dum_VAT2001_1	2.39 (0.58)***	2.15 (0.67)***	2.09 (0.67)***		
Dum_VAT2001_2	2.94 (0.75)***	2.13 (0.73)***	1.97 (0.75)**		
Dum_VAT2001_3	2.60 (0.55)***	1.71 (0.55)***	1.55 (0.58)**		

Dum_VAT2001_4	2.82 (0.43)***	1.84 (0.55)***	1.67 (0.57)***		
Dum_VAT2001_5	1.86 (0.47)***	0.48 (0.60)	0.22 (0.63)		
Dum_VAT2001_6	1.47 (0.64)**	0.01 (0.73)	-0.25 (0.77)		
Dum_VAT2001_7	1.92 (0.54)***	0.82 (0.58)	0.62 (0.61)		
Dum_VAT2001_8	2.08 (0.48)***	0.78 (0.61)	0.54 (0.65)		
Dum_VAT2001_9	2.04 (0.44)***	0.74 (0.60)	0.49 (0.64)		
Dum_VAT2001_10	1.41 (0.45)***	0.44 (0.52)	0.26 (0.54)		
Dum_VAT2001_11	1.55 (0.39)***	1.04 (0.43)**	0.94 (0.43)**		
Dum_VAT2001_12	2.34 (0.52)***	2.04 (3.87)***	1.99 (0.52)***		
<u>CONTROL VARIABLES:</u>					
Inflation euro area (standard rate)	1.02 (0.23)***	0.98 (0.23)***	1.05 (0.21)***	0.81 (0.16)***	0.79 (0.17)***
Inflation euro area (reduced rate)	0.94 (0.08)***	0.94 (0.08)***	0.94 (0.08)***	0.66 (0.10)***	0.67 (0.10)***
GDP*Dum_standard_rate	-0.16 (0.10)	0.02 (0.10)	0.05 (0.10)	-0.12 (0.10)	-0.01 (0.10)
GDP*Dum_reduced_rate	-0.02 (0.10)	0.16 (0.09)*	0.21 (0.09)**	-0.07 (0.14)	0.05 (0.20)
Interest*Dum_standard_rate	-0.26 (0.36)	-0.08 (0.35)	-0.04 (0.35)	0.74 (0.68)	0.28 (0.72)
Interest*Dum_reduced_rate	-0.14 (0.20)	-0.20 (0.19)	-0.14 (0.17)	0.11 (0.65)	-0.33 (0.67)
Dum_Food2001	2.26 (0.72)***	1.81 (0.74)**			
Estimation	FE	FE	FE	FE	FE
Observations	3329	3261	3261	1834	1766
Number of groups	70	70	70	68	68

6.2.2 Time-series analysis goods subjected to standard VAT rate

The second robustness check is a simple time series analysis that investigates the evolution of inflation of goods subjected to the standard VAT rate over time. The interpretation of the VAT dummies in this model is different from the interpretation of the results from table 6.1. As stated in Chapter 5, in the base (panel) regression the coefficients of the dummy variables measure the average difference in inflation between the group coded with value 1 (goods subjected to VAT increase) and the group coded with 0 (goods not subjected to the VAT increase) in the months after the VAT increase. When controlling in the right way for the influence of the business cycle on the two different groups the dummy variables measure the exact effect of the VAT increase on inflation. In a time series analysis the coefficients of the dummy variable measure the higher inflation in the months after

the VAT increase with respect to the months prior to the VAT increase. This simple analysis will not give the exact treatment effect as there may always have been a different value for the group subjected to the reduced VAT rate even before the policy intervention took place. Besides, part of the higher inflation might be due to an effect that also affects the group not subjected to the VAT increase. However time series analysis is a useful and easy measure of inflation growth as controlling for a different trend in a control group is not needed.

Table 6.3 shows the results of the model analyzing inflation among goods subjected to the VAT increase. Including lagged inflation does not lead to different results. Again, in this specification the coefficients of the dummy variables are quite similar to the baseline results (slightly higher for 2001 and slightly lower for 2012).

	(1)	(2)
Constant	-0.45 (0.20)**	-0.57 (-0.44)*
Lagged Inflation (CPI-1)	-0.01 (0.01)	
<i>VAT DUMMIES:</i>		
Dum_VAT2012_1	1.52 (0.56)***	1.50 (0.55)***
Dum_VAT2012_2	1.98 (0.58)***	1.94 (0.58)***
Dum_VAT2012_3	2.06 (0.55)***	2.05 (0.55)***
Dum_VAT2012_4	2.36 (0.60)***	2.33 (0.60)***
Dum_VAT2012_5	2.47 (0.60)***	2.50 (0.60)***
Dum_VAT2012_6	2.91 (0.75)***	2.94 (0.75)***
Dum_VAT2001_1	2.40 (0.46)***	2.43 (0.46)***
Dum_VAT2001_2	2.98 (0.51)***	3.03 (0.51)***
Dum_VAT2001_3	2.54 (0.51)***	2.59 (0.51)***
Dum_VAT2001_4	2.81 (0.56)***	2.75 (0.56)***
Dum_VAT2001_5	2.11 (0.58)***	2.05 (0.57)***
Dum_VAT2001_6	1.82 (0.69)***	1.77 (0.69)**
Dum_VAT2001_7	2.09 (0.57)***	2.01 (0.57)***
Dum_VAT2001_8	2.44 (0.56)***	2.35 (0.56)***
Dum_VAT2001_9	2.76 (0.58)***	2.68 (0.57)***
Dum_VAT2001_10	2.11 (0.66)***	1.97 (0.66)***
Dum_VAT2001_11	2.27 (0.50)***	2.24 (0.51)***

Dum_VAT2001_12	2.92 (0.47)***	2.88 (0.47)***
CONTROL VARIABLES:		
Inflation euro area	0.89 (0.02)***	0.89 (0.02)***
GDP	-0.12 (0.03)***	-0.12 (0.02)***
Interest	0.18 (0.06)**	0.26 (0.05)***
GDP(-1)	0.05 (0.03)***	
Estimation	FE	FE
Observations	7294	7294

6.2.3 Using Belgium as control group

As discussed in section 6.1 the VAT dummies might also pick up some other effects, due to the fact that goods subjected to the reduced rate are not the perfect control group. I therefore assess the robustness of the estimates of the VAT dummies using Belgium as a control group. I estimate inflation among VAT items relative to inflation among these items in Belgium. I chose Belgium because like Holland this is a small country with an open economy. The panel is split in the period 2000-2002 and 2011-2013. The graphs below show that inflation trends among goods subjected to the standard rate are the same in Belgium and the Netherlands. Inflation differs between the countries in the months after the VAT increase. I therefore consider Belgium to be a good control group.

Figure 6.4: Inflation Belgium & the Netherlands 2001

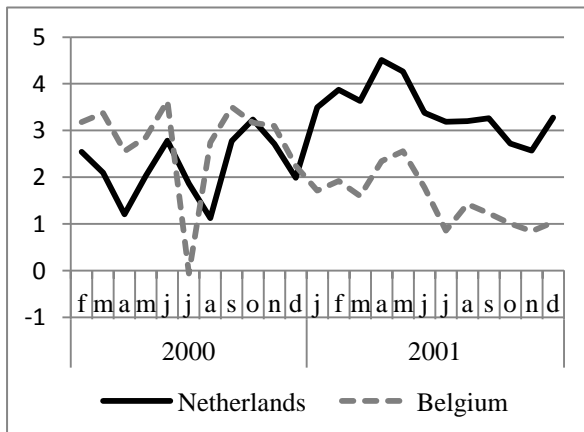


Figure 6.5 Inflation Belgium & the Netherlands 2012

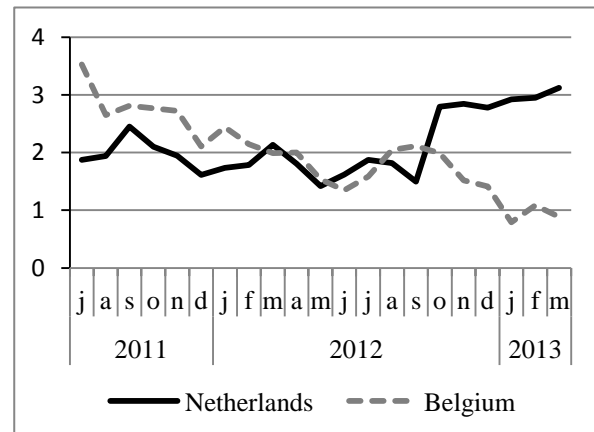


Table 6.4 presents the results of this regression. The VAT_2012 dummies show a positive and significant effect on inflation. The coefficients are slightly increasing in the months after October 2012, starting from 1.15 in October. In all months the coefficient of the dummy is lower than 1.7 (the value in case of full shifting). This might indicate that retailers did not fully shift the VAT increase into consumer prices. However, one should be careful when drawing this conclusion, as the coefficients do not differ significantly from 1.7.

The VAT_2001 dummies also show a positive and significant effect of the VAT increase on inflation. The coefficients are a bit higher than the coefficients of the VAT_2012 dummies, which might indicate that retailers were more cautious to shift the VAT increase into consumer prices in 2012 than they were in 2001. In January 2001 the coefficient is 1.2 and it increases to around 2 in May (coefficient in case of full pass through: 1.3). Although the January 2001 VAT increase seems to be overshifted into consumer prices, one should be aware that none of the coefficients differs significantly from 1.3.

Table 6.4: difference in difference analysis goods subjected to standard rate Holland-Belgium

VAT increase October 2012		VAT increase January 2001	
	(1)		(2)
Constant	0.97 (0.61)	Constant	1.83 (0.88)**
Dum_VAT2012_1	1.15 (0.63)*	Dum_VAT2001_1	1.20 (0.51)**
Dum_VAT2012_2	1.20 (0.47)**	Dum_VAT2001_2	1.57 (0.36)***
Dum_VAT2012_3	1.13 (0.45)**	Dum_VAT2001_3	1.34 (0.67)*
Dum_VAT2012_4	1.28 (0.73)*	Dum_VAT2001_4	2.22 (0.51)***
Dum_VAT2012_5	1.31 (0.75)*	Dum_VAT2001_5	1.97 (0.40)***
Dum_VAT2012_6	1.47 (1.12)	Dum_VAT2001_6	1.09 (0.83)
GDP Holland	-0.11 (0.15)	GDP Holland	-0.12 (0.35)
GDP Belgium	0.34 (0.37)	GDP Belgium	0.28 (0.64)
Interest Holland	0.74 (0.61)		
Interest Belgium	0.93 (0.86)		

6.2.4 Common Correlated Effects (CCE-estimator)

As a fourth robustness check I estimate inflation using the Common Correlated Effects (CCE) Estimator. By including cross-section averages of the dependent and the independent variables as additional variables, the CCE estimator accounts for the presence of unobserved common factors. It allows the different commodity items to have heterogeneous responses to aggregate shocks (Chirinko & Wilson: 2011).

$$(4) \quad P_{it} = \alpha + \beta_1 VAT2001_{it} + \beta_2 VAT2012_{it} + \beta_3 \delta_1 EA_{it} + \beta_4 \delta_2 EA_{it} + \beta_5 \delta_1 Z_{it} + \beta_6 \delta_2 Z_{it} + \varepsilon_{it} + \gamma_i (\bar{P}_t - \beta_1 \overline{VAT2001}_t + \beta_2 \overline{VAT2012}_t + \beta_3 \delta_1 \overline{EA}_t + \beta_4 \delta_2 \overline{EA}_t + \beta_5 \delta_1 \overline{Z}_t + \beta_6 \delta_2 \overline{Z}_t)$$

The term in parentheses consist of the difference between the dependent and the independent variables en thus stands for the unexplained part of the dependent variable. The bar above the variables denotes the cross-section average. According to Pesaran (2006) this unexplained part of the dependent variable consists of three components: (1) the residual, (2) (product) fixed effects and (3) the common shock. Assuming that the cross-section average of components 1 and 2 is zero yields the conclusion that the term in parentheses is the common shock. γ_i measures the responses of the different commodity items to the common shock.

As the CCE model is nonlinear in parameters, implementation is quite complicated. I follow the approach of Chirinko and Wilson (2011) to estimate the model. The model is estimated following a three step process.

- Step 1: Estimate the linear, unrestricted CCE estimator to obtain consistent estimates of the β 's. This is achieved by interacting product dummies with each of the CSA terms and including all interactions in the model.
- Step 2: Use the initial values for the β 's obtained in step 1 for the β 's that pre-multiply the CSA terms in the term in parentheses (second line). Obtain new estimates of the β 's from the first line and use them as β 's on the second line. Iterate until the β 's on the first and the second lines converge. During this process γ_i 's are estimated at each iteration. At the point that β 's converges, the model yields consistent and efficient estimates of γ_i 's.
- Step 3: Use the γ_i 's to estimate the resulting linear model to obtain consistent and efficient estimates of β 's.

Estimating inflation by implementing the CCE estimator yields the results presented in table 6.5. The VAT dummies are positive and significant (except for October 2012), implying that even when controlling for heterogeneous responses to aggregate shocks the VAT increase has influenced consumer prices, both in 2001 and 2012. The VAT increase of 2012 had led to a delayed pass through into consumer prices. The coefficients of the first three months provide evidence for under-shifting (0.7-0.9). However, after four months (January 2013) the VAT increase has been shifted fully into consumer prices (1.9). The coefficients of the VAT2001 dummies show that the January 2001 VAT increase has been shifted fully into consumer prices. Contrary to 2012, the response was not delayed in 2001: producers and retailers shifted the full 2001 VAT increase into consumer prices in the month of implementation. Comparing these two patterns provide evidence for the hypotheses that the current economic situation has led retailers to be more cautious to shift the 2012 VAT increase into consumer prices.

Table 6.5: Differences between goods subjected and goods not subjected to the VAT increase. CCE-estimator

Dum_VAT2012_1	0.72 (0.48)	InflationEA	0.80 (0.01)***
Dum_VAT2012_2	0.85 (0.48)*	GDP	-0.28 (0.01)***
Dum_VAT2012_3	0.87 (0.48)*	Interest	0.23 (0.04)***
Dum_VAT2012_4	1.86 (0.57)***	Dum_Food2001	1.19 (0.58)**
Dum_VAT2012_5	1.58 (0.57)***	Dum_2001	-0.77 (0.25)***
Dum_VAT2012_6	1.77 (0.57)***	Dum_2012	-0.02 (0.14)
Dum_VAT2001_1	1.26 (0.53)**	Dum_2013	-0.90 (0.35)**
Dum_VAT2001_2	1.24 (0.53)**		
Dum_VAT2001_3	1.31 (0.53)**		
Dum_VAT2001_4	1.20 (0.54)**		
Dum_VAT2001_5	1.15 (0.53)**		
Dum_VAT2001_6	1.08 (0.53)**		
Dum_VAT2001_7	1.21 (0.53)**		
Dum_VAT2001_8	1.27 (0.53)**		
Dum_VAT2001_9	1.33 (0.54)**		
Dum_VAT2001_10	1.15 (0.53)***		
Dum_VAT2001_11	1.33 (0.53)**		
Dum_VAT2001_12	1.33 (0.53)**		

6.3 Conclusions

To summarize, I find that both the VAT increase of October 2012 and the VAT increase of January 2001 have been shifted fully into consumer prices. In about four months the VAT changes have been fully passed through. I did not find strong business cycle effects. I did however find some evidence for menu effects in 2012. More detailed conclusions on both VAT increases are provided below.

VAT increase October 2012

The results of the base specifications show that consumer prices increased more strongly among goods subjected to the VAT increase (after controlling for the time trend and euro area inflation trends). The VAT dummies have a positive and significant effect throughout all specifications. Besides, the coefficients do not differ significantly from 1.7, implying that the 2 percent point VAT

increase has been shifted fully into consumer prices. The coefficients are increasing from 1.5 in October to 2.6 in March. This provides evidence for a delayed pass through.

I assessed the estimates of the VAT2012 dummies to different robustness checks. From this robustness checks I can conclude that the VAT2012 dummies are quite robust to different specifications. Splitting the panel over time and time-series analysis yields the same results.

However, the results of the third and the fourth robustness check indicate that the VAT dummies might pick up more than just the effect of the VAT increase. Performing a difference in difference analysis (using Belgium as a control group) results in lower coefficients of the VAT dummies: 1.2 in October, increasing to 1.5 in March. Although these coefficients do not significantly differ from 1.7, they might indicate that some retailers did not fully shift the VAT increase into consumer prices. The fourth robustness check (the CCE-estimator) also provides lower estimated coefficients in the first three months after the VAT increase. The results provide thus strong evidence that retailers and producers responded delayed to the VAT increase.

From the results of the robustness checks could be concluded that the VAT2012 dummies in the base specification also pick up some other effects. The effects of the VAT increase could therefore be over-estimated. However from all specifications follows that in the VAT increase has been shifted fully into consumer prices in the fourth month after implementation.

VAT increase January 2001

The results also provide evidence that the 2001 VAT increase has been shifted fully into consumer prices. However the effect is not that clear as the effect of the October 2012 VAT increase. All base specifications show that the VAT increase has been fully passed through into consumer prices, as none of the coefficients is significantly lower than 1.3. However there is a big difference between the results of specification 1-3 at one hand and specification 4-5 at the other hand. Following specification 1-3 implies that producers/retailers have combined the rise of the indirect taxes with other marginal cost increases, as the coefficients of the VAT2001 dummies are high (around 2.5). Specifications 4-5 show low coefficients.

The results of the robustness checks are neither consistent. The results of the first and second robustness checks show estimated coefficients of the VAT2001 dummies similar to the estimates in specifications 1-3. Robustness check 3 yields slightly lower outcomes. The coefficients of the VAT dummies estimated by the fourth robustness check all lay around 1.3, which corresponds to a full pass through. An important finding is that none of the robustness checks provides evidence for a delayed pass through of the 2001 VAT increase. Producers and retailers seem to have increased their prices in the month of implementation.

In my view, for 2001, the results of the CCE estimator are the most useful results. As stated above, a lot happened in 2001, which makes it difficult to control for the time trend in a right way as all commodity items are affected in a different way. The CCE estimator allows for commodity specific coefficients. Therefore the VAT dummies are estimated more precise.

To summarize, I find evidence that the 2001 VAT increase has been fully shifted into consumer prices in the month of implementation.

Comparing 2012 & 2001

The aim of this thesis is to investigate whether the current period of economic downturn has led suppliers to only shift part of the VAT increase into consumer prices. Considering the estimates of the VAT dummies I do not find evidence for this hypothesis. However, when comparing the estimates of the VAT2012 dummies to the estimates of the VAT2001 dummies, I find some evidence for a delayed pass through of the October 2012 VAT increase. However it is not clear whether this effect is due to timing or to the business cycle. The 2012 VAT increase was implemented in October. As suppliers normally change their prices in January, they might have waited until January 2013 to shift the VAT increase into consumer prices.

6.4 Relation to earlier studies and caveats

A number of earlier papers have already studied the effect of a VAT increase on consumer prices. Carbonnier (2007) focused on asymmetric price responses to VAT changes, Carare and Danninger (2008) on the announcement effects of a VAT hike. However, no study focused on the impact of a recession on consumer prices. I adopted the methodology of Carare and Danninger (2008) and used VAT dummies to measure the effect of the VAT increase on consumer prices. In addition to earlier studies, I did include separate VAT dummies for each month after the implementation to identify the exact pattern of the pass through of the VAT increase.

The results of my thesis are in line with earlier research. In accordance with papers that studied the VAT changes in the Netherlands (2001), Germany (2007) and United Kingdom (2008) I found that a VAT increase is shifted into consumer prices. In line with Kaufmann (2008) I found that prices are not adjusted in anticipation of VAT rate changes. They are adjusted in the quarter in which the VAT rate change takes effect. Carare and Danninger (2008) however, did find evidence for price adjustments in the announcement period. They conclude that the inflationary profile of a large VAT change is likely affected by the length of the announcement period. This explains why they found an anticipation effect for Germany, while I did not find evidence for price adjustment in advance of the VAT increase in the Netherlands.

I add one caveat to the results of this thesis. The VAT dummies are quite high, especially in the results of the base specifications and the first two robustness checks. As stated in chapter 2, a VAT increase cannot be overshifted in the situation of perfect competition. This indicates that the VAT dummies might pick up some other effects than the VAT increase. This might be due to the fact that the development of inflation is not exactly the same for the treatment group and the control group. Besides, inflation was decreasing till October 2012, which might result in VAT dummies that pick up more than just the VAT effect. The results of the third and the fourth robustness confirm that the estimates of the VAT dummies in the base specifications might be too high. Therefore one should be very careful drawing the conclusion that the 2001 and the 2012 VAT increase have been overshifted into consumer prices.

Figure 6.6: estimates VAT dummies VAT increase October 2012

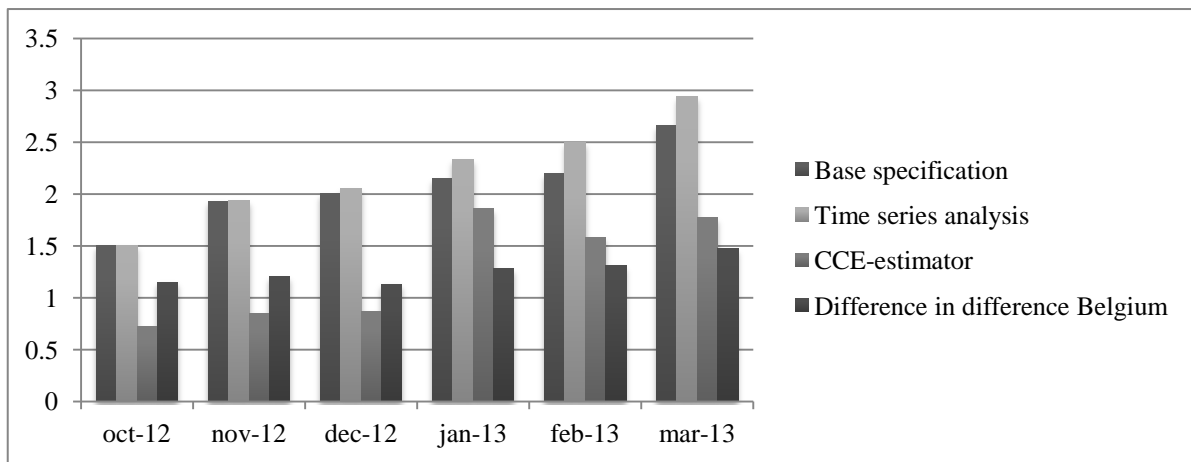
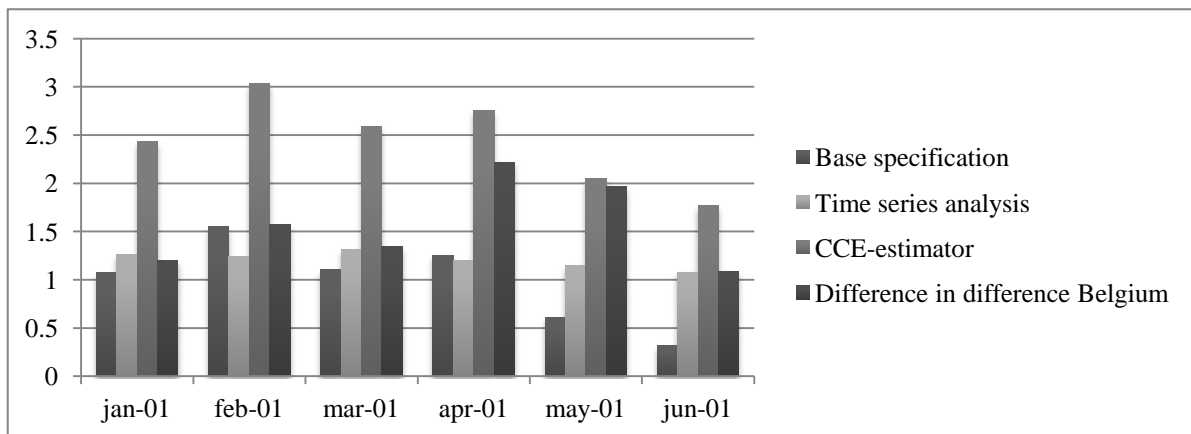


Figure 6.7: estimates VAT dummies VAT increase January 2001



Chapter 7: Conclusions

Economic theory suggests that the pass through of a VAT increase on consumer prices is influenced by several mechanisms. First, the degree to which a VAT increase can be passed forward depends on the competition setting. In different markets (e.g. oligopoly) over- or under-shifting will occur. Besides, literature shows that tax shifting on prices operates differently upwards and downwards. Furthermore, the impact of a VAT change on the price level depends on the elasticity of demand. Price elasticity of demand is determined by the income effect and the substitution effect. For normal goods these effects work in the same direction. As both the income effect and the substitution effect are negative with respect to a VAT increase, producers will always have to bear a part of the VAT increase. The higher the price elasticity of demand, the lower the degree to which a VAT increase can be shifted into consumer prices. Third, some practical considerations might influence the extent of tax shifting, for example: adjustment costs and different conjectures on the response of the other firms in the market. Last, characteristics of recession, like uncertainty, might also have impact on the pass through of a VAT increase into consumer prices. Previous empirical studies on VAT changes in other countries show that the VAT changes have been largely passed into consumer prices. Most papers find that the VAT increase is shifted into consumer prices soon after the VAT increase, leading to only little further increases in the aftermath of the VAT change. Furthermore, the studies provide some evidence that price increases are stronger among goods with imperfect competition.

Using data from Statistics Netherlands and Eurostat I analyzed the effect of the 2001 and 2012 VAT increase on consumer prices. For 2012, the results of the base specifications provide evidence that the VAT increase has been shifted fully into consumer prices. I assessed the estimates of the VAT2012 dummies to four robustness checks. From this robustness checks I conclude that the VAT2012 dummies are quite robust to different specifications. However, from the results of the robustness checks could be concluded that the VAT2012 dummies in the base specification also pick up some other effects, as the coefficients are quite high. The effects of the VAT increase could therefore be over-estimated. The robustness checks yield lower coefficients, but also provide evidence that after four months the VAT increase is fully shifted into consumer prices. Summarizing: from all specifications follows that the 2012 VAT increase has been shifted fully into consumer prices in the fourth month after implementation. For 2001 the results also provide evidence for a full pass through of the VAT increase into consumer prices. One should be careful drawing precise conclusions on the effect of the 2001 VAT increase, as the results differ between the different specifications and the result of the robustness checks are neither consistent. 2001 was a complicated year, in which a several commodity groups were hit by a crisis, in a different way. I therefore attach a lot of weight to the results of the CCE-estimator, which yield a full pass through of the VAT increase in the month of implementation.

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Appendix 1

	CPI	Commodity item	Weight	Subject to general tax rate
1	cp0111	Bread and cereals	2234	0
2	cp0112	Meat	2141	0
3	cp0113	Fish	407	0
4	cp0114	Milk, cheese and eggs	1419	0
5	cp0115	Oils and fats	216	0
6	cp0116	Fruit	818	0
7	cp0117	Vegetables and potatoes	1171	0
8	cp0118	Sugar, sweets and ice cream	877	0
9	cp0119	Food products, n.e.c.	1082	0
10	cp0121	Coffee, tea and cacao	346	0
11	cp0122	Mineral waters, soft drinks, juice	606	0
12	cp0311	Clothing materials	94	1
13	cp0312	Clothing	3799	1
14	cp0313	Other clothing and accessories	164	1
15	cp0314	Cleaning, repair and hire of clothing	91	1/0
16	cp0321	Shoes and other footwear	744	1
17	cp0322	Repair of footwear	38	0
18	cp0411	Housing rent	5994	0
19	cp0412	Garage rent	47	1
20	cp0431	Products for maintenance and repair dwellings*	958	1
21	cp0432	Services for maintenance and repair dwellings*	298	1
22	cp0442	Refuse collection	68	1
23	cp0444	Services related to dwellings n.e.c.	733	0
24	cp0511	Furniture, lighting and home decoration	1895	1
25	cp0512	Carpets and other floor coverings	410	1
26	cp0513	Repair of furniture, etc.	-	1
27	cp0521	Curtains, blinds, screens, etc.	251	1
28	cp0522	Bed clothes	150	1
29	cp0523	Household linen	63	1
30	cp0531	Major household appliances	525	1
31	cp0532	Small household appliances	176	1
32	cp0533	Repair of household appliances	26	1
33	cp0561	Non-durable household goods	606	1
34	cp0562	Household services	1017	0
35	cp0711	Motor cars	2256	1
36	cp0712	Motorcycles, scooters, mopeds	188	1
37	cp0713	Bicycles	299	1
38	cp0721	Spare parts, accessories for personal transport equipment	283	1
39	cp0722	<i>Fuels and lubricants</i>	4274	1
40	cp0723	Maintenance and repair private transport	2117	1
41	cp0724	Other services private transport	500	1
42	cp0731	Passenger transport by railway	674	0
43	cp0732	Passenger transport by road	385	0
44	cp0733	Passenger transport by air	435	0
45	cp0734	Passenger transport by waterway	78	0
46	cp0736	Other purchased transport services	153	0
47	cp0911	Audio-visual equipment	855	1
48	cp0912	Photo, film, optical equipment	103	1
49	cp0913	Information processing equipment	409	1
50	cp0914	Recording media	321	1
51	cp0915	Repair of equipment	115	1
52	cp0921	Articles for outdoor recreation	291	1

53	cp0922	Articles for indoor recreation	110	1
54	cp0931	Games, toys and hobbies	601	1
55	cp0932	Equipment for sport and camping site	246	1
56	cp0933	Gardens, plants and flowers, etc.	665	1
57	cp0934	Pets and related products	332	1
58	cp0935	Veterinary and other services for pets	154	1
59	cp0941	Recreational and sports services	1571	0
60	cp0942	Cultural services	1456	0
61	cp0951	Books	561	0
62	cp0952	Newspapers and magazines	590	0
63	cp0953	Other printed matter, stationery	342	1
64	cp0961	Holidays in the Netherlands	-	0**
65	cp0962	Holidays abroad	1564	0**
66	cp1111	Restaurants and cafes	3487	0
67	cp1112	Canteens	345	0
68	cp1211	Beauty parlours	677	0/1
69	cp1212	Electric appliances for personal care	83	1
70	cp1213	Other products for personal care	1506	1
71	cp1231	Jewellery, clocks and watches	415	1
72	cp1232	Other articles for personal use	335	1
73	cp021	<i>Alcoholic beverages</i>		1
74	cp022	<i>Tobacco</i>		1
			100,000	

* Reduced rate from March 1, 2013 onwards

** From April 1, 2012: "reisbureauregeling". General tax rate on gross profit margin

Appendix 2

		Observations	Mean	St. dev.	Minimum	Maximum
1997	General VAT rate	458	0.703275	2.568444	-10	12
	Reduced VAT rate	324	2.392593	4.882084	-18.3	26.3
1998	General VAT rate	448	1.310491	2.880794	-15.1	12.7
	Reduced VAT rate	324	2.186728	5.141609	-18.3	26.1
1999	General VAT rate	431	1.476798	3.206254	-16.6	16.5
	Reduced VAT rate	322	2.749068	4.94238	-13.8	26.5
2000	General VAT rate	429	1.877389	3.983597	-8.5	23.3
	Reduced VAT rate	324	2.324383	3.226351	-18.1	12
2001	General VAT rate	444	4.617342	3.589317	-10.0	14.9
	Reduced VAT rate	324	5.561728	2.887362	-4.8	16
2002	General VAT rate	444	3.596171	3.326127	-6.6	12.3
	Reduced VAT rate	323	4.115789	3.406702	-7.1	23.9
2003	General VAT rate	444	1.944369	3.404703	-10.9	10.3
	Reduced VAT rate	323	2.66935	2.897582	-13.4	11.3
2004	General VAT rate	444	.4092342	5.212377	-12	21.3
	Reduced VAT rate	323	-.5560372	4.845929	-20.1	6.6
2005	General VAT rate	444	.6065315	3.833172	-12.4	18.8
	Reduced VAT rate	321	1.064798	3.394818	-7.7	15.4
2006	General VAT rate	444	1.020946	3.545198	-9.1	14
	Reduced VAT rate	324	1.692593	4.871965	-32.4	26.1
2007	General VAT rate	444	1.248874	3.391541	-8.4	25.1
	Reduced VAT rate	324	1.688889	2.985455	-9.5	13.2
2008	General VAT rate	443	1.874718	3.598308	-17	15.1
	Reduced VAT rate	324	4.084877	5.581481	-21.6	25.4
2009	General VAT rate	444	1.837162	4.314173	-16.7	15.8
	Reduced VAT rate	312	2.095192	3.721815	-19.1	16.7
2010	General VAT rate	443	1.416253	3.196768	-5.6	17.5
	Reduced VAT rate	312	.8163462	3.762912	-13.4	16.1
2011	General VAT rate	432	1.884028	2.918109	-4.7	12.1
	Reduced VAT rate	312	2.846474	4.270416	-7.8	21.6
2012	General VAT rate	430	2.345581	2.860073	-7.3	13.6
	Reduced VAT rate	312	2.546154	3.544451	-10.2	18.9
2013	General VAT rate	108	3.187037	3.343458	-3.9	15.5
	Reduced VAT rate	78	2.998718	3.59247	-8.8	18.5