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Cross-border Shopping and the Environment

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Cross-border Shopping and the Environment

The case of petrol cross-border shopping[1]

by

Mads J.N.G. Hansen[2]

Primary draft

Abstract

In this paper the price sensibility in cross-border shopping will be investigated. Especially, the prices of petrol, and other goods which are typical in the Danish-German cross-border shopping like wine, beer, and cigarettes will be examined. The analysis is based on surveys collected at the frontier between Denmark and Germany.

Keywords: cross-border shopping, petrol and other vehicle fuels, and pseudo panel data analysis.

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1. Introduction

The purpose of this paper is to discuss some of the consequences of commodity taxation on the cross-border shopping in the border region of Denmark and Germany. In doing this the primary aim of this study is to quantify the amount of cross-border shopping.

The incentive behind the cross-border shopping is the differences in the price levels. These differences is caused by variations in competition conditions and asymmetric commodity taxes especially excise duties. The differences in the price levels can be seen as the benefit in relation to the cross-border shopping for the private persons. On the other hand, the cost according to the cross-border shopping for the private persons are the transportation cost and the time used for the cross-border shopping.

This paper is organized as follows. In section 2 some remarks concerning the commodity taxation will be made. Then empirical evidence of former surveys are given in the next section. The main section of this paper is section 4 in which an econometric analysis concerning the problem of cross-border shopping is given: first a formal model is presented, and then estimated. Finally, this section is closed by stipulating needs for further investigations. The paper is completed by a few concluding remarks in section 5.

2. Some remarks concerning commodity taxation

A question often asked is to what extent a small open economy can impose commodity taxes[3] that differ from those levied abroad. While this is not a relevant question to ask in a closed economy context, it is highly more relevant in an open economy in which not only commodities, but also consumers are mobile in the sense that they can make direct purchase abroad.

[3] In most studies of commodity taxes and international trade two principles for indirect taxation are considered. According to the destination principle goods are taxed in the country where they are purchased by the consumer. According to the origin principle goods are taxed in the country in which they are produced.

It is well-known that in a closed economy a general consumption tax is a disturbing way of taxing labour, while excise taxes are either Pigovian taxes, or they distort the allocation by driving wedges between the marginal rates of substitution and the marginal rates of transformation for consumer goods (Frenkel et al. (1991)). The small open economy of conventional international trade theory has free mobility of commodities across its borders, but the consumer buys the goods at the home country. For this economy the world market rate of substitution is diverted by taxing a particular good, unless it is done to correct a consumption externality. Hence the basic nature of this distortion is the same in the open as well as in the closed economy.

Because all goods can be traded when consumers are travellering the interesting distinctions are between transportables and non-transportables and between general and country-specific goods.

General goods are goods that are available in many countries even though they may not be transportable in contrary to a country-specific good. Country-specific goods can in principle be taxed differently in different countries, since no perfect substitute is available in other countries by definition. But in practice the scope for charging different prices may be rather limited if there are fairly close substitutes in other countries. Another question is to what extent it is feasible and acceptable to tax country-specific goods. For instance, it seems that the enjoyment of the natural assets of a country can only be taxed in a very imperfect way via complementary goods.

Not all consumption goods can be transported to and sold in other countries. This obviously applies to many services. Yet they may be sold to foreigners, but only if the foreign consumers demand them in the country and buy them there. In some cases, the whole point is to consume abroad, for instance to visit other countries. In other cases, the good is available in any country (a hair cut, an appointment at the dentist's, a restaurant meal), but the consumers may travel to take advantage of price differences, or at least take advantage of them when travelling. If a general good is non-transportable, the price obtained by producers in the domestic market is determined by the given consumer price minus the tax. Domestic producers will have to accept

this price even if it is lower than the producer price abroad, since the good cannot be sold abroad. The scope for taxation is then limited by the producers' willingness to supply the good at the resulting prices.

The scope for commodity taxation depends on consumer transaction costs for cross-border trade and the existence of country-specific commodities that have to be bought and consumed locally. Consumer transaction cost will be different for different countries. For example, for Iceland it is easy to enforce commodity taxes that are higher than in the neighbouring countries. On the other hand, for a country located as Denmark it is easier to enforce commodity taxes that are higher than in neighbouring countries comparing to for instance the case of Luxembourg. Empirical studies of this phenomenon are presented in Bygvrå (1997, 1994, 1992, 1990), Bygvrå and Hansen (1987), Bygvrå et al. (1999), Bygvrå et al. (1987), and Fits Gerald (1989). An overview of Danish-German cross-border shopping evidence is shown in table 1 in section 3.

From ***a private point of view*** it is worthwhile to incur a certain cost in order to shrink the tax bill since . The consumers do not privately distinguish between paying a domestic and a foreign tax even though it is the last mentioned that is part of the social cost by shopping abroad. On the other hand, while there is an incentive to shrink the domestic tax bill there is an asymmetric balance between the private savings and the national tax pay.

Cross-border shopping results in an increase in the amount of transportation and therefore it inflects in an unnecessary burden on the ***environment***.

From ***a social point of view*** there are other problems. The general problem with collecting taxes in an open economy is that the scope for escaping taxes widens as the tax bases become internationally mobile. The taxpayers can transfer their economic activities and their assets to other countries and even migrate themselves. If there are no impediments by such mobility, the scope for domestic taxation is strictly constrained by the opportunities that the taxpayers face abroad. No domestic tax rate can be sustained that makes opportunities less favourable at home

than abroad. However, if escaping the domestic tax is costly, a higher domestic tax level becomes sustainable. From a tax-collection point of view it is good news. The bad news are that social cost is incurred.

Also, from a social point of view there is no offsetting gain, and the scope for taxation is constrained by the concern for social costs. This is an outcome between the polar cases in which mobility across borders is prohibitively costly or entirely free. Paradoxically, no cost associated with mobility is actually incurred in either case but opportunities for collection taxes are poles apart. Also, it has become common knowledge in the political sphere that an asymmetric excise tax on goods will result in social costs that are larger than the expected gains.

In several studies of commodity taxes and cross-border shopping the focus has been on commodity tax competition, tax harmonization (or "approximation" in Commission language), and tax coordination. This is expanded in three main approaches: the first is an absolute equalisation at a common tax rate, the second is an approximation within a common band, and the last is a case of complete tax competition. In general, the two former approaches are termed tax harmonization. The tax approximation approach encompassing both the tax equalization and the tax competition approach as an extreme case. The first scholars to give much attention to the tax approximation by taking advantage of geographical market were Kanbur and Keen (1993), and Haufler (1998). These articles characterized non-cooperative commodity taxation emphasizing asymmetries between two countries in a mutual tax competition. Kanbur and Keen focus on differences in the populations densities, while Haufler investigates the implications of different preferences for public goods. Kenbur and Keen formulated an analytical model of origin-based commodity tax competition between two governments lying on a linear market, in which each country sets its tax rate with a view to maximizing its tax revenue taking account of cross-border shopping. They examined how the tax approximation with minimum standard rates affect the equilibrium tax rates and revenues of two competing governments.

An article which investigate non-cooperative commodity taxation between a series of countries

with various geographical extent is written by Ohsawa (1999), and Ohsawa (1998). Oshawa confirms the result of Kenbour and Keen. In the two-country model the government in the small country sets a low tax rate and obtain more per capital revenue than the government in the bigger country. He proved that in the case of identical country sizes any tax approximation establishes U-shaped tax-rate structure, a M-shaped demand, and per capita revenue structures. Finally, Ohsawa concludes that the size and the position of the countries plays a central role in tax approximation. In the article by Nielsen (1998), he like Ohsawa investigated non-cooperative commodity taxation between countries with different areas, but only within a two-country concept. The two country setup has the advance of the possibility of inclusion of the costs of transportation for goods from the place of production to the market and the inclusion of border inspection. The conclusion in the article is that both a drop in transportation costs and the abolishment of border control intensify commodity tax competition and thereby lowers tax rates as well as revenues.

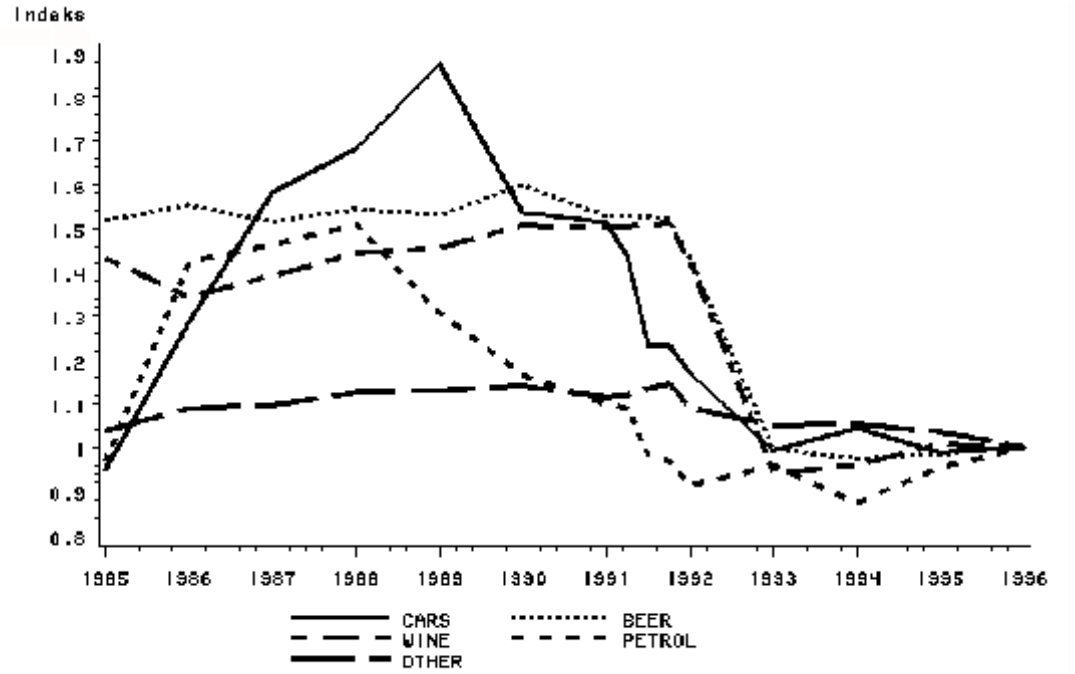
Articles which further investigate the non-cooperative commodity taxation between a series of countries with various geographical extent of countries are written by Kanbur and Keen (1993), and Edwards and Keen (1996). Christiansen (1994) studied optimum commodity taxation from the point of view of national self-interest of a small country which has no effect on other countries reaction functions, when consumers engage in cross-border shopping. This study showed that the most important consideration in optimal taxation was not the total demand but rather the domestic demand.

3. Empirical evidence

In 1985 about 2.5 million Danish cars cross the German border 91% of the drivers and fellow passengers made a purchase in Germany. In the spring of 1986 the Danish Government induced a package of higher excise duties. There were small increases for the traditionally heavily taxed commodities such as beer, wine, and cigarettes, while the petrol duty raised dramatically. Simultaneous, the German price index for vehicle fuel decreased highly. The index of comparative

dollar price level of final expenditure on GDP for petrol consequently increased by 56%. The effect was significant. For the period 1985 to 1989 the number of Danish cars increased by 98% and a larger proportion of border-crosses were making purchases in Germany and trips with the only purpose of making shopping trips had become more common, making combinations with other missions proportionately less important. The indexes for petrol, beer, wine, cigarettes, and cars are illustrated in figure 1. In 1990, the Danish Government reduced the incentive for cross-border shopping by reducing the excise on petrol significant, although the Danish price remained higher than the German price. The number of Danish cars crossing the border starts the scaling down to the initial value in 1985. In the year 1991 the German Government increased excise duty on petrol in order to receiving for the German reunification. By the end of 1991 petrol only momentarily were part of the cross-border shopping.

Figure 1: *Price-indexes for the period 1985-1996*



Source: OECD (1995, 1992, and 1987), Statistics Denmark (1997, 1990, and 1987), and Statistisches Bundesamt (1997, 1990, and 1988).

The conclusion of the former work is that the Danish cross-border shopping in Germany involves mainly commodities bearing excise duty such as beer, wine, and cigarettes. In the period when petrol was much cheaper in Germany this product was included in cross-border shopping.

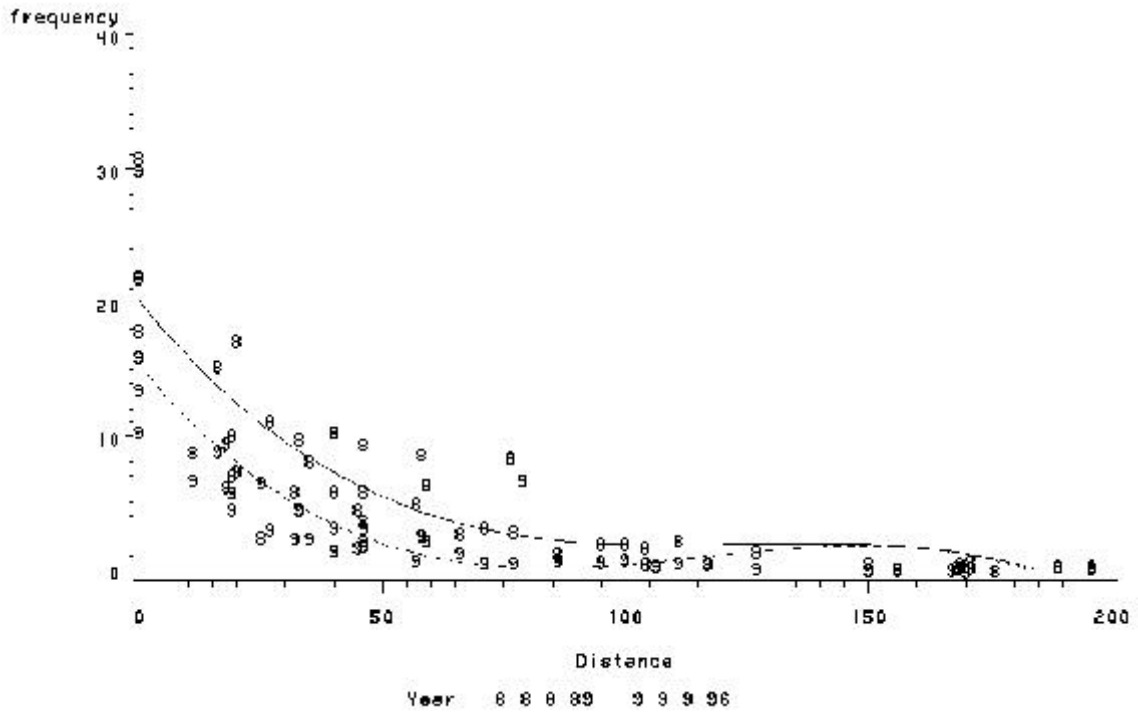
Another conclusion is that after completing the Single European Market the much lower rate of the German VAT (15 percent) comparing to the Danish VAT (25 percent) causes not price differentials to be large enough to override the general barrier of the border. Also, this is consistent with the findings of Fitz Gerald (1995), and Gordon and Nielsen (1997). This means that there is no real incentive for the Danish Government to lower the Danish VAT from its current level of 25 percent.

Although the main research in this paper is based on interviews it has been necessary to use

official statistics for the amount of the cross-border traffic to calculate the total amount of goods purchased and money spent. Unfortunately, during the process of opening up the internal borders of the EU, there have been changes in the way in which the number of vehicles (counted by machines) is divided in nationalities. This has had some consequences for the comparability of the various investigations. In fact, for many European borders no statistics exist at all.

The total number of Danish cars is only a part of the analysis. The impact of transportation done in connection with cross-border shopping has changed during the period with altering excise duties in Denmark and Germany. Figure 2 illustrates the spatial distribution of the total numbers of cars crossing the border for the years 1989 and 1996 and a regression line for the frequency depending on the distance to the neighbouring country. The spatial distribution of the frequency to the neighbouring country has undertaken significant alterations.

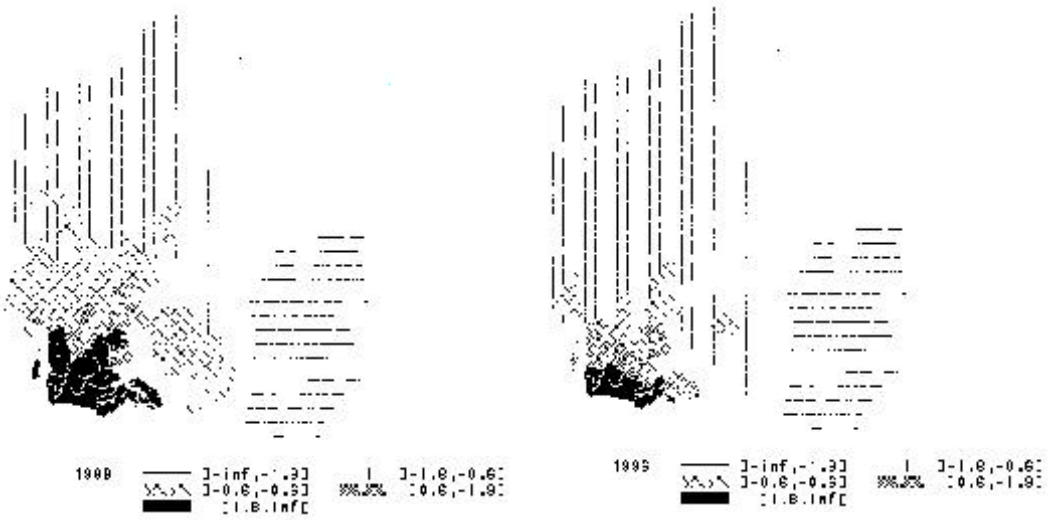
Figure 2: *The Frequency of trips to Germany depending on distance.*



Source: Byggrå (1996, and 1989).

The difference in frequency change measured by the deviation of the regression lines in figure 2 for the inhabitants near the border is 4 trips per year between 1989 and 1996. For the inhabitants living about 100 km. the average frequency of cross-border trips is 1 trip per year between 1989 and 1996 and less for the inhabitants living additionally away. Compared with the rest of Denmark and Germany the Danish part of the border region is sparsely populated. Even an expressive change in the frequency for near border living have only marginal effect in the total number of vehicles crossing the border. Contradictory, only changes in the frequency of cross-border shopping for the inhabitants living further away from the border will have significant effect on the total numbers of vehicles who cross the border. This is shown by the increasing difference between the two lines in figure 2 which is illustrated though the total number of cars crossing the border. The spatial change in the frequency is shown in figure 3, too. The significant variation in frequency is related to the southern part of Jutland and the island of Fun.

Figure 3: *The spatial distribution of trip frequency in logarithms for 1989 and 1996.*



Source: Bygvrå (1996, and 1989).

The data used to analyse the cross-border shopping consist of a series of surveys of cross-border shopping across the Danish-German border. Most of the surveys were carried out in a

"neutral" month such as May but some cover the Christmas period and other the summer holidays. The 1991 survey covered the whole year. Table 1 reports the time and the sample size of each survey. Also, the table gives references to the detailed accounts published. A contemplate article containing the Danish-German cross-border shopping surveys from 1977 to 1996 is Bygvrå (1998).

Table 1: *Times of surveys and numbers of respondents*

Date		*Danes in cars*	*Main references*
October	*1985*	*461*	*Bygvrå and Hansen (1987), Bygvrå et al. (1987)*
December	*1985*	*524*	
May	*1986*	*706*	
May	*1989*	*737*	*Bygvrå (1990)*
1 quarter	*1991*	*602*	*Bygvrå (1994, and 1992)*
2 quarter	*1991*	*691*	
3 quarter	*1991*	*774*	
4 quarter	*1991*	*586*	
November	*1996*	*1026*	*Bygvrå (1997)*

Source: This table is a reproduction of Table 1 (Bygvrå, 1998, p.151)

The surveys were made using questionnaires to Danes and Germans returning to their own country after a trip into the neighbouring country. Respondents were asked about their trip and about some background information. The surveys contain only respondents that actually made a trip to the neighbouring country.

After the data has been going though the econometrics analysis of the cross-border shopping will be given in the following section.

4. Econometric analysis

The purpose of this section is firstly to present an econometric model which will be used to

examine the relationships between the amount of cross-border shopping and the potential determinating factors. Next, we present some important result from the estimations. Finally, some few considerations regarding the need for further investigation is made.

4.1. A cross-border shopping model

The account of the total number of trips from Germany to Denmark is based on the surveys discussed above and the official statistics and it is derived according to the following equation:

$$f_{it} = \frac{n_{it}\, s_t}{n_{.t}\, i_{it}}$$

where f_{it} is the number of trips from region *i* to Germany at time *t*

n_{it} is the number of respondents in region *i* at time *t*

$n_{.t}$ is the total numbers of respondent at time *t*

s_t is the total numbers of Danish cars entering from Germany to Denmark at time *t*

i_{it} is the size of the population in region *i* at time *t*

Consider a consumer who consumes the goods basket *(Q)*. The consumer has the opportunity to purchase at home or abroad. If buying abroad the consumer incurs a transportation cost *(T)*. A simple assumption is that the relatively prices of the basket *(Q)* purchased at home and abroad does not alters the relatively demand of the goods under consideration, but it has an income effect.

The amount purchased abroad ($Q_{i,Ger,t}$) is the average amount the residences in region *i* have purchased from the neighbouring country. Also, the value of goods purchased abroad is the average value for the consumers in municipality *j*[4].

[4] The population of the home country consist of 279 Danish municipalities. These 279 Danish municipalities are reduced to 49 regions by using homogeneous clusters of municipalities and not by

A single representative consumers purchases of goods abroad in Germany ($Q_{i,Ger,t}$) can be derived by taking the average of goods purchased by the consumers belonging to region *i* at time *t*:

$$Q_{i,Ger,t} = 1/n_{j\in i}\left[\sum_{j\in i} Q_{j,Ger,t}\right]$$

$$Y_{i,Ger,t} = P_{Ger,t} E_t Q_{i,Ger,t} = 1/n_{j\in i}\left[\sum_{j\in i} P_{Ger,t} E_t Q_{j,Ger,t}\right] \qquad j = 1,\ldots,279 \quad i = 1,\ldots,49$$

where $Q_{i,Ger,t}$ is the consumers in region *i* purchases of goods in Germany at time *t*

n is the number of consumers in region *i*

$Y_{i,Ger,t}$ is the fixed expenditures of goods purchases in Germany in Danish currency at time *t*

$P_{Ger,t}$ is the fixed foreign consumer price index at time *t*

E_t is the fixed exchange rate of the currency at time *t*

At the same time, a single representative consumers purchases of goods at home in Denmark ($Q_{i,Den,t}$) can be derived by taking the average of goods purchased by the consumers belonging to region *i* at time *t*:

$$Q_{i,Den,t} = 1/n_{j\in i}\left[\sum_{j\in i} Q_{j,Den,t}\right]$$

$$Y_{i,Den,t} = P_{Den,t} Q_{i,Den,t} = 1/n_{j\in i}\left[\sum_{j\in i} P_{Den,t} Q_{j,Den,t}\right] \qquad j = 1,\ldots,279 \quad i = 1,\ldots,49$$

where $Q_{i,Den,t}$ is the consumers purchases of goods in Denmark at time *t*

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administrative regions according to the Danish local authorities system. The regions in the neighbourhood to the border is identical to the division in the municipalities. For the regions further away they consist of an accumulation of rural municipalities indexed by the distance to the border or they are urban municipalities.

n is the number of consumers in region *i*

$Y_{i,Den,t}$ is the fixed domestic expenditures of goods purchased at time *t*

$P_{Den,t}$ is the fixed domestic consumer price index at time *t*

The population of each region is considered as a single representative consumer shopping at home and abroad. The advantage of considering each region as a single representative consumer is that it is not necessary to comparing cross-border shoppers to non-cross-border shoppers.

The total expenditures ($Y_{i,t}$) is divided into domestic expenditures ($Y_{i,Den,t}$), foreign expenditures ($Y_{i,Ger,t}$), and transportation costs ($T_{i,t}$) which are necessary to incur in order to do cross-border shopping it is . Therefore, the model is as follows:

$$Y_{i,t} = P_{i,Den,t} Q_{i,Den,t} + P_{i,Ger,t} E_t Q_{i,Ger,t} + T_{i,t}$$

$$Y_{i,t} + G_{i,t} = P_{i,Den,t} (Q_{i,Den,t} + Q_{i,Ger,t}) + T_{i,t}$$

$$\text{where } G_{i,t} = (P_{i,Den,t} - P_{i,Ger,t} E_t) Q_{i,Ger,t}$$

$$G_{i,t} = \left(\frac{P_{i,Den,t}}{P_{i,Ger,t} E_t} - 1 \right) P_{i,Ger,t} E_t Q_{i,Ger,t}$$

where $G_{i,t}$ is the gross gain by carrying out cross-border shopping from region *i* at time *t*, Here $G_{i,t}$ is denoted as the gross gain since the cost of transportation is excluded in the calculation of the gain.

After simple manipulation of the model above the model can be divided into two factors: the well known Comparative Price Level or CPL ($P_{i,Den,t}$ /($P_{i,Ger,t}$ E_t)), and the value of the amount of goods purchased abroad in fixed domestic currency (E_t).

The first factor in the model is the lower price existing abroad in relation to the price domestically. The product is then the amount availably for other purpose, including transportation

cost in order to carry out cross-border shopping. If the gross gain, obtained by purchasing a basket containing the typically cross-border goods, exceed the transportation cost the agent will carry out cross-border shopping.

Now, let the amount of trips from region *i* to the neighbouring country at time *t* be determined according to the following function:

$$f_{it} = f_i(G_{i,t}, T_{i,t}, a_{i,t})$$

The annual frequency of cross-border trips depends on the yearly gross gain, ($G_{i,t}$), yearly transportation cost due to cross-border shopping ($T_{i,t}$), and a vector of exogenous variables, ($a_{i,t}$), like Duty-free allowances.

Now, the linear econometric model are as follows:

$$f_{i,t} = a_i + b_i^T G_{i,t} + b_i^T T_{i,t} + e_{i,t}$$

where the expression gross gain ($G_{i,t}$) can be divided into two factors: firstly, the price gain resulting from cross-border shopping in petrol, and secondly, the gain from all other goods in the cross-border basket. After a logarithm transformation of all the variables, the equation results are:

$$f_{i,t} = a_i + b_i^{p^o} \left(\frac{P^o_{i,Den,t}}{P^o_{i,Ger,t} E_t} - 1 \right) + b_i^{p^p} \left(\frac{P^p_{i,Den,t}}{P^p_{i,Ger,t} E_t} - 1 \right)$$
$$+ b_i^{v^o} \left(P^o_{i,Ger,t} E_t Q^o_{i,Ger,t} \right) + b_i^{v^p} \left(P^p_{i,Ger,t} E_t Q^p_{i,Ger,t} \right) + b_i^T T + e_{i,t}$$

Now let:

$$\tilde{p}^{n}_{i,t} = \left(\frac{P^{n}_{i,Den,t}}{P^{n}_{i,Ger,t} E_t} - 1 \right) \qquad n = o, p$$

$$\tilde{V}^{n}_{i,t} = \left(P^{n}_{i,Ger,t} E_t Q^{n}_{i,Ger,t} \right) \qquad n = o, p$$

which can be written as:

$$f_{i,t} = a_i + b_i^{p^o} \tilde{P}^{o}_{i,t} + b_i^{p^p} p^{p}_{it} + b_i^{v^o} \tilde{V}^{o}_{i,t} + b_i^{v^p} \tilde{V}^{p}_{i,t} + b_i^{T} T_t + e_{i,t}$$

In section 4.2 the model will be estimated by using covariance analysis since the data can be considered as a pseudo panel data set. Pseudo panel data estimation is among others used by Blundell et al. (1993), Blundell et al. (1992), and a summary is given by Baltagi (1995). The pseudo panel data set contains 392 observations. The average observation in the pseudo panel data set is 14.8 observations from the initial surveys. The timeseries dimension is hierarchic in the sense that the timeseries are divided in two sub-periods. Firstly, the period where petrol is included in the cross-border shopping basket and secondly, the period where petrol is excluded from the basket according to the official statistics.

4.2. Results of cross-border shopping estimation

In this section the results of the estimation are shown and discussed. The trip frequency in the cross-border shopping is presented in the following table.

Table 2: *Trip frequency in the cross-border shopping model where the dependent variable is the logarithm of the annual trip frequency.*

	Covariance analysis	
	Before 1993:	*After 1993:*
Intercept	-	-
Log (CPL - 1)	*-0.18*	*0.38**
	(0.133)	*(0.225)*
Log (value of cross-border shopping)	*0.13***	*0.02*
	(0.061)	*(0.100)*
Log (relative price on petrol)	*0.38****	*-0.09*
	(0.07)	*(0.169)*
Log (value of petrol cross-border shopping)	*0.03*	*0*
	(0.026)	*(0.04)*
Number of observations	*369*	
R^2	*0.92*	

Note: Here, the intercepts are not shown but they are shown in figure 4. In brackets the standard errors are shown. If the estimated parameters are significant different from zero, at a 10% level it is shown with *, at a 5% level it is shown with **, and at a 1% level it is shown with ***. The transportation cost and the value of petrol cross-border shopping are excluded from the covariance analysis, since the parameter estimates are insignificant.

Source: Bygvrå (1996, and 1989)

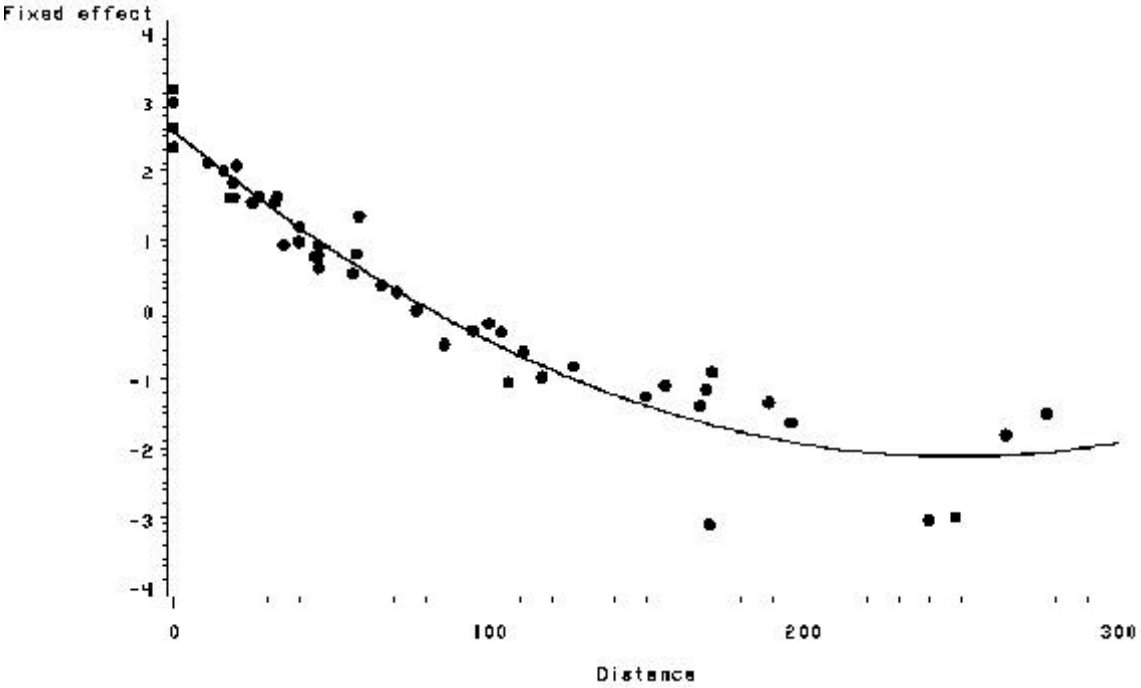
Table 2 presents the estimation results for the rate of trips to the neighbouring country. According to the covariance analysis the hypothesis of intercept of the form α_{ip} is rejected whereas the hypothesis on the intercept of the regions is accepted. The hypothesis of a common slope in periods with different relatively petrol prices are rejected. In this analysis an individual slope for the regions can not be accepted. In the period before the establishment of the Single European Market in1993 the sign of the comparative price levels of final consumption is negative but insignificantly different from zero why we are unable to make a conclusion on this parameter. Simultaneous with the increased excise duty on beer, wine, and cigarettes, the Danish Government maintained the Duty-free allowances for adult Danes on a one-day trip across the

border that have been enforced during the period with Danish membership of the EU. All other things equal, a restriction on the duty-free allowance have to bound the sensibility in the frequence of trip to the border determined by the price differences. This have consequences for the fixed effect. The fixed effect integrate some cross border shopping induced by the prise difference. Another explanation is that the behaviour in cross-border shopping react on lagged prises. The data in the surveys does however not contains suitable data that allow us to develop a model with this specification. After 1993 the parameter estimates become significant and positive.

Regarding the value of the cross-border purchase in domestic currency there is some evidence for a switch in the size of the parameter estimate. Before 1993 the sign is positive and significantly. After the establishment of the Single European Market the sign is again positive but it does not fulfill the hypothesis that it is different from zero. During the period with the Danish membership of the EU the Danes frequencies to cross-border shopping are reduced.

An increase in the comparative price gross gain for petrol with 10 % increases the number of cars crossing the border with 3.8 %. After the establishment of the Single European Market the petrol has not figured in the cross-border shopping basket. The value parameters estimates are not significantly different from zero in neither of the two periods.

Figure 4: *Plot of the intercepts estimated by the covariance analysis and the distance for the cross-border shopping model where the dependent variable is the logarithm of annual trip frequency.*



Source: Bygvrå (1996, and 1989).

Figure 4 illustrates the relation between the slopes from the covariance analysis and the distance to the German-Danish border. It appears that the neighbours living next to the border carry out cross-border shopping more often than people living farther away from the border.

The findings of the covariance analysis is that the frequency elasticities of prices and real values are homogenous according to the regions. This is identical with homogenous elasticities with distance to Germany. Consequently, the cost of transportation elasticity is homogenous.

4.3. Further investigation

Further analysis would be to compare the revenue elasticities of changes in the domestic petrol prices (see COWI (1998), and Bjørner (1997)) and to estimate the cross-border shopping revenue elasticities.

In order to measure the environmental consequences from cross-border shopping the elasticity of domestic transportation (no frontier crossing) and cross-frontier transportation related to changes in petrol prices have to be investigated.

5. Conclusion remarks

The conclusion of this analysis is that the so-called trigger goods in cross-border shopping have identical elasticities in the price gross gain for petrol and also for the other typical cross-border shopping commodities which are included in the cross-border shopping basket. The second result is that the elasticities are identical for the 49 Danish regions used in this study. There exist apparently no latent cross-border shopping point of departure area. A consequence of this is that the elasticity of the cost of transportation related to cross-border shopping does not increase with an increasing distance can not be found.

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