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Economics of Tobacco Control Paper No. 19

The Economics of Tobacco in Estonia

Anneli Taal, Raul Kiivet and Teh-Wei Hu

June 2004

Tobacco Free Initiative
World Health Organization

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Health, Nutrition and Population (HNP) Discussion Paper

ECONOMICS OF TOBACCO CONTROL PAPER NO. 19

The Economics of Tobacco in Estonia

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This report was prepared under the Estonia Health Project (World Bank Loan No. 3835), which was implemented by the Ministry of Health in Estonia between 1996 and 2000.

Abstract: This study was written in 2000 using the latest data available at the time. Where readily available, some updated information has been added during preparation for publication. Although several years have elapsed between writing and publication, the report offers sound analysis and a methodology that could be a useful example for other researchers.

The study examines prevalence of tobacco use in Estonia, expenditures by smokers, and the prevalence of prominent diseases for which tobacco use is an important risk factor. It estimates private and public direct and indirect costs associated with smoking in Estonia for 1998, looking at health care costs, fires, loss of household income, productivity losses, sickness benefits and disability, retirement and survivors' pensions. The total cost to the government in additional expenditures and lost revenues is estimated to be well over EEK 200 million greater than the tobacco tax revenues generated and reduced pension expenditures resulting from premature deaths attributable to tobacco. The second part of the paper estimates the relationship between cigarette prices (adjusted for inflation) and demand, including legal and illegal purchases by Estonians and by foreign visitors to Estonia. The price elasticity of cigarette demand is estimated at –0.34, implying that each 10% rise in the real price of cigarettes in Estonia will cause consumption to fall by about 3.4%. The analysis shows that a tobacco tax rate increase will increase tax revenue from local consumption despite substitution between legal and illegal consumption, but that revenues will be greatly affected by the extent to which visitors (mostly from Finland) continue to buy (tax paid) cigarettes in Estonia. Stricter tobacco control measures, including higher taxation of cigarettes, would lead to healthier people, the avoidance of premature death, and increased productivity, which can only improve the economic performance of the country.

Keywords: tobacco, tobacco control, smoking, cigarettes, Estonia , tobacco tax, cigarette tax, economics of tobacco, economics of tobacco control, prevalence, smoking, cessation, tobacco epidemic, burden of disease, lung cancer, tobacco policy, tax policy, price elasticity, demand for cigarettes, tobacco tax revenues, smuggling, health care costs, tobacco-attributable mortality, tobacco-attributable morbidity, fires, household income, spending on tobacco, sickness benefits, disability pensions, productivity losses, cigarette market, cigarette prices

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FOREWORD

In 1999, the World Bank published "Curbing the Epidemic: governments and the economics of tobacco control", which summarizes the trends in global tobacco use and the resulting immense and growing burden of disease and premature death. By 2000, there were already nearly 5 million deaths from tobacco each year, and this huge number is projected to grow to 10 million per year by 2030, given present trends in tobacco consumption. Already about half of these deaths are in high-income countries, but recent and continued increases in tobacco use in the developing world is causing the tobacco-related burden to shift increasingly to low- and middle-income countries. By 2030, seven of every ten tobacco-attributable deaths will be in developing countries. "Curbing the Epidemic" also summarizes the evidence on the set of policies and interventions that have proved to be effective and cost-effective in reducing tobacco use, in countries around the world.

Tax increases that raise the price of tobacco products are the most powerful policy tool to reduce tobacco use, and the single most cost-effective intervention. They are also the most effective intervention to persuade young people to quit or not to start smoking. This is because young people, like others with low incomes, tend to be highly sensitive to price increases.

Why are these proven cost effective tobacco control measures –especially tax increases– not adopted or implemented more strongly by governments? Many governments hesitate to act decisively to reduce tobacco use, because they fear that tax increases and other tobacco control measures might harm the economy, by reducing the economic benefits their country gains from growing, processing, manufacturing, exporting and taxing tobacco. The argument that "tobacco contributes revenues, jobs and incomes" is a formidable barrier to tobacco control in many countries. Are these fears supported by the facts?

In fact, these fears turn out to be largely unfounded, when the data and evidence on the economics of tobacco and tobacco control are examined. The team of about 30 internationally recognized experts in economics, epidemiology and other relevant disciplines who contributed to the analysis presented in "Curbing the Epidemic" reviewed a large body of existing evidence, and concluded strongly that in most countries, tobacco control would not lead to a net loss of jobs and could, in many circumstances actually generate new jobs. Tax increases would increase (not decrease) total tax revenues, even if cigarette smuggling increased to some extent. Furthermore, the evidence show that cigarette smuggling is caused at least as much by general corruption as by high tobacco product tax and price differentials, and the team recommended strongly that governments not forego the benefits of tobacco tax increases because they feared the possible impact on smuggling, but rather act to deter, detect and punish smuggling.

Much of the evidence presented and summarized in "Curbing the Epidemic" was from high-income countries. But the main battleground against tobacco use is now in low- and middle-incomes countries. If needless disease and millions of premature deaths are to be prevented, then it is crucial that developing counties raise tobacco taxes, introduce comprehensive bans on all advertising and promotion of tobacco products, ban smoking in public places, inform their citizens well about the harm that tobacco causes and the benefits of quitting, and provide advice and support to help people who smoke and chew tobacco, to quit.

In talking to policy-makers in developing countries, it became clear that there was a great need for country-specific analytic work, to provide a basis for policy making, within a sound economic framework. So the World Bank and the Tobacco Free Initiative of the World Health Organization (as well as some of the WHO regional offices and several other organizations, acting in partnership or independently) began to commission and support analysis of the economics of tobacco and tobacco control in many countries around the world.

The report presented in this Economic of Tobacco Discussion Paper makes a valuable contribution to our understanding of the issues and likely economic impact of tobacco control in a specific country-setting. Our hope is that the information, analysis and recommendations will prove helpful to policy makers and other researchers, and help result in stronger policies to reduce the unnecessary harm caused by tobacco use.

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PREFACE

Tobacco accounts for a considerable proportion of premature deaths in countries where cigarette smoking has been common for many decades. Smoking prevalence peaked in western countries in the 1970's and 1980's and has since declined as the public has become more aware of the harmful effects of smoking. This study on the economic consequences of smoking in Estonia was undertaken in order to provide decisionmakers in Estonia with data on the consequences of smoking for the nation, and to estimate the actual costs of smoking.

The study uses original data from Estonia – national trade and health statistics as well as household surveys and studies on health behaviour. Where data were not available for Estonia, international studies were used and adapted to the population of Estonia. Most calculations were done for the year 1998, the latest year for which smoking prevalence data were available for Estonia at the time of writing. Every effort was made to be conservative, i.e. lower estimates were used whenever possible, in order not to overestimate the economic burden.

The study was completed in the year 2000, initiated under the Estonia Health Project, funded by a loan from the World Bank. Although several years have gone by, it was still considered valuable to publish the study, to make it publicly available, because the analysis is still valid and useful, and the study is a good methodological model for other researchers. It was not possible to update the study for this publication, but it is hoped that other researchers may be inspired to do so.

Since 2000, there has been considerable change in tobacco control policies in Estonia. At the beginning of 2001, the Law on Tobacco[1] took effect, which one journalist described as containing "some of the most sweeping measures against smoking yet seen in Europe" (I. Traynor, Guardian, Jan 6, 2001). It banned smoking in all schools, hospitals, other government facilitites, stairwells, theatres and cinemas, and indoor workplaces and offices (allowing smoking only in designated ventilated smoking rooms). All public transport (except boats) was required to be smoke-free. Cafes, bars, and restaurants were required to be entirely smoke-free zones unless they offer separate rooms for smokers, which must be equipped with new air conditioners refreshing at least eight litres of air a minute. Advertising is banned in all national media and at the point of sale, product placement and tobacco brand advertising is banned, and tobacco sponsorship is restricted. It is illegal to sell cigarettes in vending machines, or in quantities of less than 20 (but still legal to distribute free cigarettes). The minimum age for buying or smoking cigarettes is 18 years, and offenders can be fined. There are public information campaigns against smoking, cessation support including a telephone help line, and training for health professionals and medical students.

[1] The law was enacted in June 2000 and became effective on January 1, 2001. It was later amended.

In recent years, progress has continued. Further steps towards compliance with EU tax levels have been taken, including changing the tax structure to a mixed (specific plus ad valorem) tax, and increasing the tax rates in July 2002, April and July 2003, and July 2004. These increases have contributed to continued increases in the total excise revenues collected on tobacco products, supported also by changes in the Penal Code that took effect in 2002 that have helped in efforts to reduce smuggling and illegal cigarette sales. A National Strategy sets targets for reducing tobacco use, and the government has drafted a new, stronger Tobacco Law that would increase the size of the warnings on tobacco product packs (among other provisions) if approved by Parliament.

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EXECUTIVE SUMMARY

Tobacco use prevalence in Estonia was at its highest in 1994 at 52% of men and 23% of women of working age (16-65 years), the year in which the real price of tobacco products was at its lowest. Subsequent tax increases have only partially neutralized the effects of inflation. Between 1994 and 1998, the number of daily smokers of working age decreased by 10% among men and by 15% among women. On average, smokers spend 7% of their income on cigarettes.

In 1998, mortality from smoking-related diseases accounted for 19% of all deaths in Estonia. The total Sick Fund costs for the treatment of smoking-related diseases was EEK 193 million, or 7% of the health care budget. Mortality, morbidity, and disability from smoking-related diseases caused a loss of productivity and a deficit of taxes to the government in the amount of EEK 404 million. This should be compared to the revenues from excise tax on tobacco products of EEK 537 million. In addition, EEK 21 million was spent on survivors' pensions to the relatives of prematurely deceased smokers, EEK 118 million on sickness benefits, and 75 million on disability pensions to smokers due to smoking-related diseases. Thus, in economic terms, smoking imposed an extraordinary burden both on individuals and the society. Even under very conservative assumption, in 1998, tobacco cost the government of Estonia over EEK 200 million, in addition to the much larger cost to society in lost productivity because of illness and premature death caused by tobacco use, and the cost to smokers themselves and their families.

Total legal sales of cigarettes have decreased since 1997, but the main reason for this is not a decrease in local legal consumption, but a fast decline in the purchases made by foreign visitors. The price elasticity of cigarette demand is –0.34 in Estonia. This means that a 10% increase in price would decrease local consumption of cigarettes by 3.4%. The analysis shows that a tax increase will increase total tax revenue from local consumption despite some substitution between legal and illegal sales. The paper also shows that a tax increase of 0.5 EEK above the level in 2000 would increase tax revenues by 26 million EEK assuming constant purchases by foreigners.

Tobacco costs the government of Estonia more in expenditures and lost revenues than it generates in tax revenues or reduced pension expenditures. The main policy implication of the study is that stronger tobacco control measures, including higher taxation of cigarettes would reduce tobacco consumption, lead to healthier people, avoid premature deaths and increase productivity, which can only improve the economic performance of the country and well being of former smokers and their families.

CHAPTER 1. INTRODUCTION

This report is divided into two parts. Part I gives a broad overview of the effects of tobacco in economic terms. Data on the prevalence of smoking in Estonia and trends by age group are presented. The economic consequences to individual smokers are analyzed and summarized. Chapters 4, 5 and 6 present the mortality and morbidity costs of smoking, based on actual health statistics, health care, and social costs.

Part II concentrates on the financial issues of taxation and pricing of cigarettes. It provides information on cigarette taxation policies in Estonia in recent years, presents the main components of the cigarette market in Estonia, and studies the changes in sales, consumption, and tax revenues. Finally, on the basis of previous data, simple demand models are estimated and some short-run forecasts are given.

Estonia differs from most other countries because, since 1996 when Svenska Tabak closed its plant in Tallinn, it has had no tobacco industry. Further, as tobacco cannot be cultivated in Estonia, there are no jobs in tobacco manufacturing in the country. Thus economically, the tobacco industry's contribution to the employment rate in Estonia is negligible and limited to local importers and the retail trade.

Throughout this report, as much as possible original data from Estonia were used for cost estimations. This applies to the national trade and health statistics as well as household surveys and studies performed on health behavior. Where data were not collected or available for Estonia, some international studies were adapted to the population of Estonia. Most of calculations were done for 1998, the latest year for which smoking prevalence data were available for Estonia, when this paper was written.

The numbers and cost data presented in the report are based on calculations and methodology presented in detail in the text. In all cost estimations, an effort was made to be conservative: lower estimates were used whenever possible, making underestimation of the real costs probable. As well, many costs arising from smoking have not been accounted for in this report, such as the costs to employers due to employees' smoking-related illness and loss of productivity, health care costs of treating premature births to smoking mothers, and costs arising from exposure to second-hand smoke (often called "passive smoking"). These and other costs are obvious results of tobacco consumption, but somewhat more difficult to measure.

Estimating the costs of smoking always involves comparing two situations: a society made up of a mix of non-smokers and smokers, and a society with no smoking. In other words, we compare a hypothetical situation without smoking with the real situation. The differences between these two reflect costs or benefits of the smoking habit.

Usually the economic costs of smoking are divided into individual costs and external costs. However, in real life it is often difficult to separate these two categories. In this study, we differentiate direct and indirect costs of smoking. Direct costs comprise the

costs of prevention, treatment, and rehabilitation for smoking-related illnesses. Indirect costs comprise the value of losses that arise as a result of smoking-related morbidity and mortality, such as lost income and productivity. Direct costs reflect the financial burden of treating illnesses paid by the society. Indirect costs are based on imputed values.

Direct costs estimated in our study include costs of hospital inpatient care, physician care, and pharmaceutical expenditure. Indirect costs estimated in the study are potential production lost due to 1) sickness absence, 2) disability, and 3) premature mortality. Income transfers due to smoking-related morbidity and mortality estimated in the study are sickness allowances, disability pensions, survivors' pensions, and changes in the amount of retirement pensions paid resulting from smoking-related mortality. Other economic consequences followed in the study are costs of health promotion, tax revenues, and losses due to smoking-related fires.

PART I – TOBACCO USE AND ASSOCIATED COSTS

CHAPTER 2. SMOKING HABITS AND PREVALENCE

Estonia has a total population of 1.4 million, of which 75% are aged 18 or over and legally entitled to purchase tobacco products.

There are two sources of information on the prevalence of smoking in Estonia in the 1990s. The more comprehensive is the Estonian Health Interview Survey (EHIS), performed by trained interviewers in 1996 on a representative sample of 5,000 people aged 15 to 79 years. The other, which follows time trends of smoking habits, is the Health Behavior Among Estonian Adult Population (HBEAP) survey, a self-administered questionnaire carried out in 1990, 1992, 1994, 1996, and 1998 on a sample of 1,500 individuals aged 16 to 64. Thus the study populations and methods differ, which explains the differences in smoking prevalence figures observed (Table 1).

Table 1. Distribution and number of smokers and non-smokers in the Estonian adult population in 1996 (EHIS) and 1998 (HBEAP)

	Daily smokers	Occasional smokers	Ex-smokers	Never smoked
Proportion 1998 (HBEAP)				
Men 16 to 64	42%	15%	23%	20%
Women 16 to 64	20%	12%	18%	50%
Proportion 1996 (EHIS)				
Men 15 to 79	48%	4%	21%	27%
Women 15 to 79	17%	4%	10%	69%
Total number 1998 (HBEAP)				
Men 16 to 64	191,798	68,499	105,032	91,332
Women 16 to 64	98,300	58,980	88,470	245,751
Total	**290,098**	**127,479**	**193,502**	**337,083**

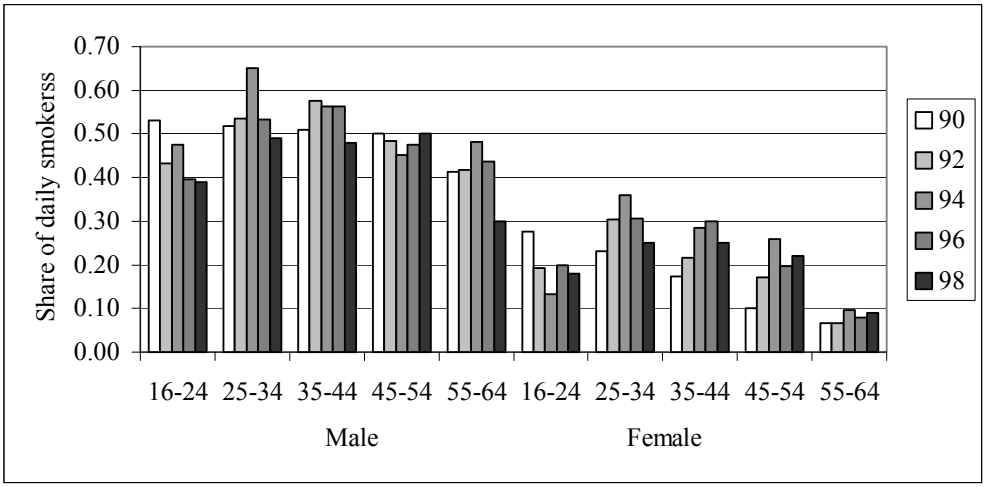
Source: EHIS and HBEAP data

According to the EHIS, 73% of males and 31% of females had ever smoked in 1996. The HBEAP survey shows that, among the adult population 16 to 64 years, 30% were daily smokers in 1998 – 42% of men and 20% of women. The highest proportion of daily smokers during the 1990s was in 1994, when 52% of men and 23% of women defined themselves as daily smokers. These prevalence rates are very high relative to most other countries; still, the positive aspect is that the majority of the population of Estonia does not smoke.

From Table 1, it can be seen that the total number of smokers in the working age group (16 to 64) can be estimated as 417,577 persons, out of which 69% are daily smokers. The subgroups “ex-smokers” and “never smoked” are the non-smoking population of Estonia, which account for 43% of males and 68% of females aged 16-64 years. All these figures refer to cigarette smokers, as 90% of those who use tobacco products in Estonia smoke only cigarettes (Statistical Office of Estonia 1999).

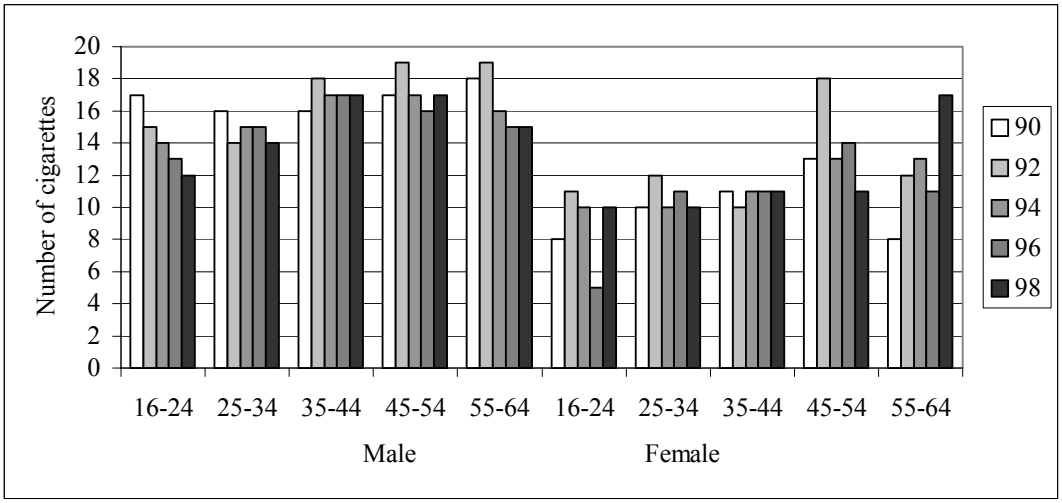
By the end of nineties smoking prevalence was slightly lower than in 1990 in most age groups among men, but higher for most age groups among women (Figure 1). The daily consumption of cigarettes by regular smokers had decreased slightly, according to the HBEAP (Figure 2). The total number of daily smokers had decreased by 10% among men and by 15% among women in the 16 to 65 age group between 1994 and 1998. This decrease of smoking can be attributed to several factors, tax increases being one of them (see chapter 8 on Pricing and Taxation of Cigarettes in Part II of this report).

Figure 1. Share of daily smokers by age and gender, 1990-1998



Source:HBEAP

Figure 2. Average daily consumption of cigarettes by smokers, 1990-1998



Source:HBEAP

CHAPTER 3. PRIVATE COSTS OF SMOKING

Calculating the costs of smoking at an individual or private level enables us to understand the behavior, attitude, and choices of smokers. There are both direct and indirect costs of smoking to the individual.

Private Direct Costs of Smoking

The main direct costs of smoking to the individual are the expense of cigarettes and medical costs due to smoking-related diseases. Costs of losses due to fires are also considered.

Expenditure on Cigarettes

To estimate the total consumption volume of cigarettes in Estonia, we applied the proportion of smokers in each of the age/gender groups (Figure 1) to the total population of Estonia, then multiplied the result by the amount of cigarettes consumed daily (Figure 2) in 1998 and by 365 smoking days. Since the HBEAP sample doesn't cover persons over 64 years, we used the EHIS 1996 figures to estimate the prevalence of smoking in the older age groups, and applied the same method to estimate their consumption.

On the basis of special surveys among schoolchildren, we also took into account the consumption of cigarettes by 15-year-old boys and girls. According to the study carried out in Tallinn in 1995, approximately 22% of 15-year-old boys and 8% of girls smoked regularly (Pärna 1999). The average daily consumption of cigarettes was 10 sticks for boys and five for girls. By multiplying these figures by the number of 15-year-old Estonian inhabitants, we calculated the volume of cigarettes consumed by girls and boys in this age group (Table 2). By applying the average price for one pack of cigarettes of EEK 9.5, in 1998, we estimated the monetary volume of the Estonian cigarette market in 1998 at EEK 743 million. (Note, however, that the exact prices in 1998 are not known, and the price of EEK 9.5 is an estimate of the average price.)

Table 2. Cigarette consumption and cost, 1998

	Cigarettes (in millions)	Packs (in millions)	Cost in EEK (millions)
Cigarette consumption by adults	1,556	77	738
Consumption by 15-year-olds	10	0.5	4.7
Estimated total consumption	1,568	78	743

Source: Authors' estimates using EHIS and HBEAP data

According to data from annual household surveys (Statistical Office of Estonia 1999), the average disposable income per capita in 1998 was EEK 2,738 per month. According to the HBEAP (National Public Health Institute 1999), the average number of cigarettes smoked daily by regular smokers in 1998 was 14. Thus, an average smoker in Estonia

spent 7% of his or her disposable income on cigarettes in 1998, or EEK 2,388 per year (Table 3).

Table 3. Share of disposable income spent on cigarettes by daily smokers, 1998

Average disposable monthly income per capita	EEK 2,738
Average number of cigarettes used daily by a regular smoker	14
Average number of packs smoked in a month per smoker	21
Average price paid per pack	EEK 9.48
Average expenditure on cigarettes per month	EEK 199
Share of disposable income spent on cigarettes	7%

Source: Authors' calculations using data from HBEAP and Statistical Office of Estonia

Individual Medical Costs from Smoking

In Estonia, the Sick Fund (National Health Insurance) covers 95% of the population. For those people covered, all hospital care, ambulance services, examinations, and treatment are completely free. A modest fee sometimes has to be paid for physician visits and outpatient medical services. The costs to patients for dentistry are considerable, but the proportion of these attributable to smoking is difficult to estimate.

In 1998, the Sick Fund covered 61% of smoking-related prescription drug costs (EEK 47 million). The remaining 39% (EEK 30 million) had to be paid by the patients themselves. Total prescription drug costs, both smoking and non-smoking related, were EEK 515 million in 1998.

Losses Due To Fires

We attempted to estimate the costs of smoking-related fires in Estonia. Unfortunately, the statistics collected on fires do not estimate the loss of and damage to property, nor do they distinguish deaths according to the cause of fires.

There were 10,758 fires registered in Estonia in 1998, in which 169 persons died. There were 213 fires classified as definitely caused by smoking, accounting for 2% of fires for which the reason was known. For 2,530 fires, the reason was unknown. Assuming that the same proportion of fires whose cause is unknown is in fact caused by smoking would add an additional 50 fires. Thus in 1998, the total number of fires due to smoking was about 263 and at least four people died in fires caused by smoking.

This figure is probably an underestimate, because in addition to the fires ignited during smoking, many fires get started from smokers' materials, such as matches and discarded unextinguished cigarettes, facts not represented in data available for Estonia. The low figure of 2% could be compared, for example, to UK fire statistics, where about 10% of all fires in dwellings and 40% of all deaths caused by fires are due to cigarettes and other smokers' materials (Fire Statistics UK 2002, Office of the Deputy Prime Minister, April 2004).

Private Indirect Costs of Smoking

The main indirect costs include loss of household income due to smoking-related premature deaths and loss of income due to absence from work.

The average loss of life for a smoker who smokes 20 cigarettes per day is about fifteen years. Thus a habitual smoker shortens his or her life span by about five minutes for each cigarette smoked (Doll et al. 1994). However, this shortening is not distributed evenly across all smokers. The age at which any smoker dies varies according to the individual, with an estimated one in two smokers dying prematurely from a smoking-related disease. Thus, while many smokers have a normal life span, others die many years prematurely.

One of the largest prospective studies of more than one million US adults has been used by the US Surgeon General to estimate that tobacco was responsible for about one-fifth of all US deaths in 1985 (Peto et al. 1992). The share of smoking-related mortality in 51 countries of the World Health Organization (WHO) European region has been estimated at 14% of all deaths (www.who.dk/hfadb). The number of smoking-related deaths in Europe increased more than tenfold between 1955 and 1995, yet smoking rates are still rising, particularly among young people (Joossens and Sasco 1998).

Mortality from Smoking in Estonia

The total number of deaths in Estonia in 1998 was 19,446. Of these, 14,018 are from diseases for which smoking is a risk factor (Table 4). Applying attributable risk fractions calculated by Peto et al 1992 to the actual national age-sex-specific mortality rates in Estonia gives 3,715 deaths caused by smoking, 19% of all deaths. Males accounted for 81% (2,998) and females for 19% (718) of these smoking-attributable deaths in Estonia in 1998.

Loss of Household Income Due To Smoking-Related Premature Deaths

In order to estimate the loss of earnings due to smoking-related premature mortality, we used the death certificate database from the Statistical Office of Estonia. From this we identified the individuals who died of a smoking-related disease before retirement age. The number of deaths was multiplied by the attributable smoking risk factors (Peto 1992), to obtain the number of individuals who died because of smoking while working (Table 4).

Table 4. Number of deaths attributable to smoking in Estonia in 1998[2]

Smoking-related disease		No. of deaths	Proportion caused by smoking	Deaths caused by smoking
Cancers				
Lung cancer	m	582	0.96	559
(C33-C34)	f	116	0.62	72
Upper aerodigestive cancer	m	178	0.76	135
(C00-C15, C32)	f	27	0.30	8
Other cancers	m	1,083	0.25	271
(C16-C31, C35-C97, D01-D09)	f	1,341	0.01	13
Non-cancer disease				
COPD	m	115	0.86	99
(J41-J44)	f	53	0.48	25
Other respiratory diseases	m	246	0.42	103
(J00-J40, J45-J99)	f	143	0.08	11
Vascular diseases[1]	m	4,259	0.43	1,831
(I00-I99)	f	5,875	0.10	588
Total		**14,018**		**3,715**

Source: Authors' estimates, data from Statistical Office of Estonia and Peto et al. 1992.
Note: [1.] Mostly coronary heart disease and stroke

The next step was to estimate the earnings loss associated with tobacco-attributable premature deaths (Table 5). Average gross earnings in 1998 were EEK 57,192 for men and EEK 41,184 for women.[3] Income tax at a rate of 26% was deducted from pre-tax gross earnings. The net income of persons not employed (9%) and those living alone (17%) (Statistical Office of Estonia 1999) was deducted. One-half of the remaining earnings was used as an estimate of the income loss borne by the household members of someone who died from smoking, on the assumption that half of personal earnings would be used for the earner's own purposes and half would be shared with other household members. Thus, the net loss for household members was EEK 15,968 for a deceased man and EEK 11,510 for a woman. As we did not take into account the exact date of death, and assuming deaths were distributed more or less evenly over the year, we used losses of one half-year of earnings to estimate the lost earnings for 1998. Thus, close relatives and household members lost EEK 6.8 million of their expected family income because of premature deaths attributed to smoking of family members in 1998.

[2] The proportion of deaths caused by smoking in a particular disease originate from a large international study by Peto et al. (1992) which used national mortality statistics reported to the WHO in 40 countries in 1985. The data were subdivided by country, sex, age, and nine major cause-of-death categories, six of which are attributed to smoking and listed in Table 4. The mortality data for Estonia in each age and sex category were multiplied by the mortality risk ratios for cigarette smokers versus non-smokers from the prospective study by the American Cancer Society on smoking and mortality among more one million US adults (Garfinkel 1985). Thus national age-sex-specific mortality rates from diseases attributable to smoking in Estonia were calculated.

[3] Data are not available on the prevalence of smokers by income group. Thus average earnings were used. To the extent that smokers are disproportionately concentrated among groups with below-average earnings, the income losses will be somewhat lower.

Table 5. Lost earnings due to smoking-related premature mortality

Cause of death	Sex	Deaths before retirement age	Proportion caused by smoking	No. of deaths caused by smoking	Lost earnings due to deaths caused by smoking (EEK)
Lung cancer	m	197	0.96	189	3,019,868
	f	15	0.62	9	107,043
Upper aerodigestive cancer	m	84	0.76	64	1,019,397
	f	3	0.30	1	10,359
Other cancers	m	294	0.25	74	1,173,648
	f	242	0.01	2	27,854
COPD	m	17	0.86	15	233,452
	f	3	0.48	1	16,574
Other respiratory diseases	m	125	0.42	53	838,320
	f	32	0.08	3	29,466
Vascular diseases[1]	m	1,011	0.43	435	6,941,769
	f	171	0.10	17	196,821
Total in 1998		**2,194**		**862**	**13,614,571**

Source: Authors' estimates, data from Statistical Office of Estonia and Peto et al. 1992.
Note: [1.] Mostly coronary heart disease and stroke

However, many premature deaths had also occurred in previous years. The average loss of life expectancy for those who die because of smoking is estimated as around 15 years (Doll 1994). For the purpose of this study, we took a conservative estimate of a five-year shorter economically active period (employment). Thereafter, the same method as described above for 1998 was applied to the actual death numbers from 1994 to 1997. Only the deaths of individuals who would have been younger than retirement age in 1998 were taken into account.

Total estimated loss of earnings to household members in 1998, due to the 3,397 premature deaths of their close relatives during the years 1994 to 1998, is EEK 52.7 million (Table 6). Thus, in addition to the emotional stress caused by premature deaths, the family members of the deceased are living under considerable economic pressure.

Table 6. Lost earnings of families in 1998 due to smoking-related premature mortality during 1994 to 1998

Year of death	1994	1995	1996	1997	1998	1994-1998
Employed persons, who died of smoking-related disease	688	650	585	697	777	3,397
Loss of earnings (million EEK)	12.1	11.4	10.2	12.2	6.8	52.7

Source: Authors' estimates

This is a definite underestimate, as lost earnings due to absence from work while being ill before dying were not taken into account. Lost earnings would also increase if the

premature deaths of those over retirement age, but still economically active, were included. Moreover, there were many people who died before 1994, but could have been still working in 1998, had they not been smokers.

Loss of Income Due To Absence from Work

Smokers are absent from work seven more days each year than non-smokers in the UK and Northern Ireland (Scott 1986), and five days in Finland (Pekurinen 1991). In Estonia, the average monthly salary in 1998 was EEK 4,100. In case of absence from work due to illness, the Sick Fund pays 60% of average salary during hospital treatment and 80% during outpatient care. Thus, if sick at home, the average person would lose EEK 27 per day from his or her normal salary.

If we apply five extra days off work to the population of daily smokers in the working age group (290,098 persons, Table 1), this totals 1.45 million days off work. During these five days the smokers lost at least 20% of their average income, totalling EEK 39 million for the whole country.

CHAPTER 4. PUBLIC COSTS OF SMOKING

The public costs of smoking, like the private costs, can also be differentiated into direct and indirect costs. Public direct costs include health care, sickness benefits, disability pensions, and health promotion. Indirect costs include the effect of avoided pension payments due to premature deaths, survivors' pensions, and loss of productivity due to illness, disability, and mortality.

The term "costs" here is not a precise economic term, but used mainly as a common expression. For example, decreasing health care costs due to decrease in smoking would not create savings, but instead, the money could be used for the treatment of other diseases and improving the health of people by other means. Similarly, having to pay less disability pensions due to decreased smoking would enable other pensions to be increased. In economic terms these can be considered either opportunity costs or transfer payments. Thus one of the economic benefits of stopping smoking would be that a considerable amount of resources could be used for alternative purposes, increasing the quality of life for many people.

Direct Public Costs

Morbidity and health care costs of smoking have been estimated in numerous studies and countries using different methodologies. The results of studies in developed countries that estimate tobacco-attributable hospital and primary medical care costs typically find that these amount to 3% to 15% of total direct health care costs, that is, from 0.25% to 1.1% of national GDP.

In this paper, we present an estimate of tobacco-attributable health care costs for Estonia using actual billing data from the Sick Fund, which pays 68% of all health care costs in Estonia. The state budget covers 10% of the ambulance services and other health care costs of the uninsured. The Sick Fund covers both hospital and outpatient costs of insured persons (95% of population) and most outpatient prescription drug costs. Out-of-pocket payments of patients account for 13.2% of costs. The patients' contribution is highest for dental care and for prescription drugs bought from pharmacies.

The existing medical statistics in Estonia are not suitable for estimating disease prevalence as they contain aggregated data only. For example, there were nine million outpatient physician visits and 282,000 hospital admissions in Estonia in 1998. Medical statistics do not identify individuals, and count each visit separately. Thus a person with a chronic disease who visits a physician often is included each time in the aggregated statistics as a separate visit.

Health Care Costs

The Sick Fund collects billing data on every medical encounter of insured persons in Estonia, and these bills identify the patient, medical service provided, and the diagnosis. In 1998, the Sick Fund paid EEK 2,530 million for medical services and EEK 360 million for prescription drugs for all of Estonia.

To estimate the number of patients who visited physicians or who had been in a hospital as a result of smoking-related diseases, we used the databases for three counties (Lääne-Virumaa, Pärnu, and Tartu), which have a combined population of 325,000, or 23% of Estonia (Table 7). The total cost of medical services for these three counties was EEK 503 million, and the cost of prescription drugs was EEK 83.4 million.

Table 7. Hospital admissions and out-patient physician visits by persons over 35 due to smoking-related diseases in Lääne-Virumaa, Pärnu, and Tartu counties, 1998

Disease	Number of persons	Percent (%) of total population	Total number of bills/visits	Number of bills/visits per capita
Lung cancer	399	0.12	1,790	4
Upper aerodigestive cancer	255	0.08	992	4
Other cancer	4,091	1.26	16,355	4
COPD	3,088	0.95	4,809	2
Other respiratory disease	37,381	11.50	65,077	2
Vascular disease[1]	44,808	13.79	137,387	3
Total	**90,022**	**27.70**	**226,410**	

Source: Sick Fund data Note: [1.] Mostly coronary heart disease and stroke

All billing data with smoking-related diagnosis were summarized for each insured person. It is obvious that billing data do not provide a correct measure of disease prevalence because many visits to a doctor and covered by the Sick Fund are not for

disease treatment, but for counselling, investigation, or follow-up. Furthermore, on many occasions the diagnosis written on the bills is not accurate, as the final correct diagnosis is not made during the initial visit. For the purposes of this study, we define this estimate as "attended prevalence," that is, an estimate of persons who have sought medical assistance for their health problems.

In the next step we restricted our analysis to the treatment costs of persons over 35 in order to exclude those who had been smoking less than 10 years. The total cost of medical treatment of persons over 35 was EEK 119 million, and of prescription drugs was EEK 34 million in the three counties studied. Twenty-seven percent of the population had been to a doctor in relation to one of the diseases listed in Table 4 of which one-half was due to cardiovascular problems. The frequency of visits (last column of Table 7) was higher for cancer patients than non-cancer patients.

Next, we calculated the average per capita cost of a treated patient for each of these diagnoses, for all patients in Estonia in age groups 35 to 69 and over 70, who sought treatment or received medicines during the study year (Table 8). The sum of bills for treatment and medication for these diagnoses paid for by the Sick Fund for the whole of Estonia was divided by the number of patients treated during the year.

Table 8. Average per capita cost of treatment and prescription medicines of insured persons over 35, selected diseases, 1998

Disease	Age	Treatment costs (EEK)	Prescription drug costs (EEK)	Total costs per capita (EEK)
Lung cancer	35-69	7,437	5,415	12,852
	over 70	5,987	2,880	8,867
Upper aerodigestive cancer	35-69	5,474	1,675	7,149
	over 70	6,340	390	6,730
Other cancer	35-69	6,331	3,267	9,598
	over 70	5,235	2,482	7,717
COPD	35-69	717	98	815
	over 70	926	108	1,034
Other respiratory	35-69	542	222	764
	over 70	804	243	1,047
Vascular disease[1]	35-69	1,754	440	2,194
	over 70	1,671	482	2,153

Source: Sick Fund data, 1998 Note: [1.] Mostly coronary heart disease and stroke

To estimate disease prevalence, we compared Sick Fund data to two other sources (Table 9). The prevalence of cancers was obtained from the Cancer Registry of Estonia and prevalence of non-cancer diseases from the EHIS, 1996. Cancer Registry data represent the number of cancer patients alive in mid-1997. EHIS data represent interviewees who had current health complaints and had been to a doctor because of these complaints during the previous year. Health problems were coded using the ICD-10 in EHIS.

Table 9. Estimate of disease prevalence, various data sources

Disease	Age	No. of patients with visits paid by Sick Fund	Cancer Registry patients (alive in 1997)	EHIS patients (current health complaints)	Best estimate
Lung cancer	35-69	1,143	619		881
	Over 70	591	281		436
Upper aerodigestive	35-69	800	490		645
Cancer	Over 70	309	168		239
Other cancer	35-69	10,617	15,938		13,278
	Over 70	7,170	10,496		8,833
Subtotal		**20,630**	**27,992**		**24,311**
COPD	35-69	8,639		5,840	7,240
	Over 70	4,787		1,362	3,075
Other respiratory	35-69	135,122		56,064	95,593
	Over 70	27,404		8,172	17,788
Vascular disease[1]	35-69	117,452		14,0160	128,806
	Over 70	77,365		32,461	54,913
Subtotal		**370,769**		**244,059**	**307,414**

Source: Sick Fund, Cancer Registry and EHIS
Note: [1.] Mostly coronary heart disease and stroke

The best estimate for the number of patients with a smoking-related disease was obtained by taking the mean of the data on patient numbers from the Sick Fund and either the Cancer Registry or the EHIS. The proportion of patients whose disease was caused by smoking was obtained by applying the risk ratios from Table 4 (Peto et al. 1992). The number of persons sick due to smoking was multiplied by the cost of treatment per patient estimated from Sick Fund payment data (last column in Table 8), to estimate smoking-related treatment costs of cancer and non-cancer diseases (Table 10).

The total cost to the Sick Fund for medical services due to smoking in 1998 was EEK 193 million, accounting for 6.5% of the total Sick Fund medical services budget. Out of that EEK 193 million, the treatment costs for men accounted for 81%, and 76% was spent on the treatment of persons under 70 years of age. Thus, similar to mortality, extra health care costs caused by smoking occur in men of working age. It is also important to note that while per capita treatment costs for cancers tend to be much higher than for non-cancer diseases, since there are far more people who suffer from COPD, other respiratory diseases and cardiovascular diseases as a result of smoking, the total treatment costs for these non-cancer diseases are more than four times the total costs for treatment for the main smoking-related cancers, and lung cancer treatment accounts for only 7% of all health care costs due to smoking.

Table 10. Treatment costs of smoking-related diseases[4]

Disease	Age	No. of persons sick due to smoking	Per capita treatment costs (EEK)	Total costs (EEK)
Lung cancer	35-69	696	12,852	8,944,863
	Over 70	292	8,867	2,590,228
Upper aerodigestive. cancer	35-69	342	7,149	2 443,886
	Over 70	88	6,730	595,134
Other cancer	35-69	1,726	9,598	16,567,492
	Over 70	574	7,717	4,430,677
Subtotal		**3,719**		**35,572,280**
COPD	35-69	3,692	815	3,009,098
	Over 70	1,230	1,034	1,271,613
Other respiratory	35-69	32,502	764	24,831,238
	Over 70	6,048	1,047	6,332,172
Vascular disease[1]	35-69	41,218	2,194	90,432,116
	Over 70	15,376	2,53	33,103,753
Subtotal		**100,065**		**158,979,991**

Source: Authors' estimates Note: [1.] Mostly coronary heart disease and stroke

Sickness Benefits

In 1998, the Sick Fund paid EEK 662 million in compensation for income lost due to inability to work. Out of this, EEK 456 million was paid in sickness benefits to people employed, but unable to work due of health problems. The rest was for maternity benefits (EEK 100 million) and benefits for the care of sick children at home (EEK 81 million).

We know that smokers use seven more days of sick leave each year in the UK than non-smokers (Scott 1986), and five more days in Finland (Pekurinen 1991). If we estimate five extra days of paid leave for every daily smoker in Estonia in the working age group (290,098 persons, Table 1), it totals 1.45 million days off work. During these days the sick population of smokers was paid at least 60% of their average income (EEK 4,100 per month) making a total amount of EEK 118 million for the whole country. Thus 25% of national sickness benefit payments were due to illnesses caused by smoking.

Disability Pensions

The total number of disability pensioners was 59,938 in 1998. Out of these, 4,604 were children. The average disability pension was EEK 863 per month, resulting in a total

[4] The proportion of patients with a disease caused by smoking was obtained by applying the mortality risk ratios from Table 4 (Peto et al. 1992), which are lower than those in other studies (Mheen and Gunning-Schepers 1996). For example, the rate of COPD is 25 times higher in smokers than in non-smokers (Barendgret et al. 1997), but we use the proportion of 0.86 for men and 0.48 for women in this study. Thus we took a very conservative approach in estimating the costs of health care treatment for diseases attributable to smoking. Furthermore, we excluded persons younger than 35 from our estimate despite the obvious fact that a certain proportion of them also get sick because of smoking.

national disability pension cost of EEK 620 million. During 1998, a total of 9,957 persons gained disability status for the first time, 6,830 of whom were of working age.

To estimate the proportion of smoking-related disability cases, we used data from the Disability Expert Commissions and the methodology described above for calculating health care costs for smoking. From the statistics of the Expert Commission, we identified persons of working age with one of the smoking-related diseases listed in Table 4. To these we applied the risk ratios for smoking and identified 7,203 disabled pensioners of working age in Estonia whose disability was attributable to a smoking-related disease. Of these, 90% were men and 65% had received their disability status because of cardiovascular disease. Thus the total costs of disability pensions attributable to smoking was EEK 75 million, accounting for 12% of all funds paid to disability pensioners in 1998.

Health Promotion

The Sick Fund allocates 0.5% of its budget to health promotion activities, most of which include an anti-smoking component. It is difficult to estimate the proportion of health promotion funds, which could have been saved in a non-smoking society. However, the EEK 14 million spent on health promotion in 1998 is a transfer cost, and not a true economic cost. In addition, there are national public health programmes with a total budget of EEK 40 million, which include anti-smoking components. In a non-smoking society, some of these national campaigns would allocate their budgets differently.

Public Indirect Costs

Indirect costs include potential changes in the payments made by the national retirement pension fund, some of the costs paid out of the taxes collected by the government (survivors' pensions), and the costs of lost productivity due to illness and premature mortality.

Changes in Amount Paid in Retirement Pensions Due To Premature Deaths from Smoking

Premature deaths of people who are receiving or would be eligible for government pensions after retirement reduce payouts from the government pension fund. The estimation of these amounts is relevant for government fiscal calculations, but does not inply that this is in any way beneficial or desirable, or that it should be a deciding factor when planning tobacco control policies.

To estimate how much payments by the national retirement pension fund differed because of premature deaths from smoking, we used the Statistical Office of Estonia death certificate database. In order not to overestimate the mortality caused by smoking,

we took into account only the deaths during the previous five years (1994 to 1998), based on the conservative assumption that smokers shorten their lives by five years at least.[5]

In addition, we identified persons who died before retirement age in each year, but who would have been receiving retirement pensions in 1998 if they were alive. Smoking attributable fractions (Table 4) were applied to the number of possible smoking-related deaths, and the number of deaths caused by smoking was summarized for each age group, by sex, and by the six smoking-related disease groups. The summarized figures are presented in Table 11. In 1998 there were 1,620 smoking-related deaths of persons of retirement age and since these deaths occurred during the course of the year so that some people who died in 1998 would have received a pensions during part of 1998, we included only one-half of the total pensions that would have been paid to these 1,620 people in 1998 when calculating the amount by which in the total sum of pensions paid was reduced because of smoking-related premature deaths during the years 1994-1998.

The average monthly retirement pension in 1998 was EEK 1,096. Thus the payout in 1998 by the pension fund was approximately EEK 100 million less, due to the 8,405 premature deaths of future pensioners during 1994 to1998. However this 100 million EEK represented only 2.2% of the total retirement pension fund payments of EEK 4.5 billion. There would have been a 2.8% larger number of pensioners than the 294,000 old age pensioners in Estonia in 1998, if these persons had not died.

Table 11. Estimated reductions in retirement pension fund payments in 1998 due to smoking-related premature mortality in 1994-1998

Year of death	1994	1995	1996	1997	1998	1994-1998
Deaths which caused savings	1,795	1,761	1,699	1,530	1,620	8,405
Savings in retirement pension (million EEK)	23.6	23.1	22.3	20.1	10.6	99.7

Source: Authors' calculations using Pension Fund and Statistical Office Death Certificate data.

Survivors' Pensions

Some of the economic problems caused by premature deaths are relieved by the so-called survivors' pension system, which helps support the spouse, children, or other family members who were completely dependent on the deceased person's income. In 1998 in Estonia there were 22,476 recipients of a state survivors' pension of EEK 637 monthly, or EEK 7,644 per recipient per year.

[5] These calculations have been done by the authors to estimate as completely as possible, the fiscal impact of smoking. WHO emphasizes that its mandate is to protect life by ensuring the attainment by all individuals of the highest possible level of health. This includes working with governments to reduce tobacco use by citizens, in order to improve health outcomes and save lives. Reduced government expenditures occurring as a result of early deaths due to the consumption of a deadly product can in no way be viewed as beneficial or desirable.

To estimate the total paid out in survivors' pensions due to smoking-related deaths, we began with the number of premature deaths caused by smoking. Most premature deaths of working age (Table 6) were of men. For example, the total number of 777 for 1998 breaks down into 745 men and 32 women. For this part of the study we counted only male deaths, since relatively few of the families of the women who died would have been eligible for a survivor's pension. From the databases of death certificates we identified men who had been married at the time of their death. For each married man, we assumed 1.4 recipients of survivors' pensions, the national average for each premature death that resulted in survivors' pensions being paid (Table 12).

Table 12. Survivors' pensions paid in 1998 due to smoking-related premature mortality of married and employed men, 1994-1998

Year of death	1994	1995	1996	1997	1998	1994-1998
Recipients of survivors' pension	729	661	518	602	287	2,797
Pension cost (million EEK)	5.6	5.1	4.0	4.6	2.2	21.4

Source: Authors' estimates using data on survivors' pensions and death certificates

Out of the total survivors' pension budget of EEK 172 million, the premature deaths of male smokers during 1994 to 1998 accounted for 12.4%. This extra cost in survivors' pensions can be compared to the reduced amounts paid in retirement pension allowances, due to smoking-related premature deaths, as estimated above. If considered in isolation, the pension fund would actually have lower annual costs, as results of smoking. In economic terms, this is not a saving, but a transfer payment, as the entire budget of the fund is spent, regardless of the number of recipients. Moreover, the effect on the pension fund should not be considered in isolation, but in the context of the other (much larger) costs incurred by the government as a result of smoking.

Loss of Productivity Due To Illness and Disability

The estimated 1.45 million working days lost due to smoking-related illnesses resulted in a total loss of earnings of EEK 198 million, including EEK 51 million of income tax, (average monthly salary EEK 4,100) and a loss of EEK 65 million to the Pension and Sick Fund in social tax.

Similarly, 90% of the 7,203 disability pensioners of working age who had retired due to smoking-related disease could have been working with an average monthly salary of EEK 4,100. Their total annual earnings would have been EEK 319 million in 1998. From this the government would have gained income tax of EEK 83 million and social tax of EEK 105 million. Thus the total loss of taxes due to illness and disability was EEK 304 million in 1998. This is by no means a transfer payment, but a true loss of tax revenues to the government and partially offsets the EEK 530 million in government revenue from the excise tax on sales of tobacco products in 1998.

Loss of Productivity Due To Mortality

Using mortality figures from the previous section, an unemployment rate of 9% and average monthly gross earnings of EEK 4,100 (EEK 4,766 for men and EEK 3,432 for women), we calculated the productivity loss due to mortality from smoking-related diseases to be EEK 44 million in 1998. As we did not take into account the exact date of death, we assumed an average loss of a half-year of earnings associated with each death in 1998 (Table 13).

Table 13. Loss of earnings due to smoking related mortality, 1994-1998

Year	1994	1995	1996	1997	1998	1994-1998
Employed persons who died of smoking-related disease	688	650	585	697	777	3,397
Loss of earnings in a year (million EEK)	39	37	33	39	22	170

Source: Authors' estimates

Many other premature deaths had occurred in previous years. On average, those who die from a smoking related illness die up to 15 years prematurely (Doll et al. 1994). For the purpose of this study we took a conservative estimate of a five-year shorter economically active period (employment). Thereafter, the same method as described above for 1998 was applied to the actual death cases during 1994 to 1997. Only the deaths of individuals who would have been younger than retirement age in 1998 were taken into account.

The total loss of earnings of EEK 170 million includes EEK 44 million in income tax. Adding the loss of social tax of EEK 56 million (that would have been paid to the Pension and Sick Fund), the total loss of tax revenue to the government was EEK 100 million due to smoking-related premature mortality.

CHAPTER 5. COSTS OF SMOKING - SUMMARY AND POLICY IMPLICATIONS

If current worldwide trends in smoking prevalence continue, smoking-related deaths and diseases will continue to rise, imposing an unacceptable burden of suffering on citizens. This will create a loss of productivity among the 35 to 64-year-old workforce, deprive families of income, and generate additional financial costs to already stretched national health budgets. In Estonia, smoking prevalence stabilized in the nineties. However, the many people who continue to smoke face high disease and mortality risks. It is important to change the prevalence trend into a steep decrease, concentrating efforts on preventing adolescents from starting to smoke and on helping existing smokers to quit. The gains in the short term will come from reduced health risks for adult smokers who quit, and

longer-term gains will come from falling youth initiation rates that will help lower future prevalence.

Higher taxes that raise real prices of tobacco products are a reliable tool for reducing smoking prevalence and youth uptake. Excise tax policy on tobacco is often strongly motivated by the fact that smoking is harmful to health and use of tobacco products should therefore be discouraged using economic incentives (as well as other measures).

Tobacco excise taxes are relatively easy to collect, and a good tax source, since higher tax rates generate greater total revenues. Historically, many countries raised tobacco taxes primarily in order to raise revenue, although the motivation of improving public health and saving lives is becoming increasingly important.

In Estonia, tobacco tax revenue is not a major part of governmental tax income: only 2.0% in 1998 and 1.8% in 2001. Thus, Estonia's economic losses due to smoking-related morbidity and mortality exceed by far the economic "revenues" (Table 14). Moreover, tax revenues from tobacco sales (EEK 537 million) are counterbalanced by taxes lost due to smoking-related mortality and morbidity (EEK 404 million) in very conservative cost calculations, where smoking is assumed to shorten life expectancy by only five years.

Table 14. Main financial consequences of smoking in Estonia in 1998

Costs due to morbidity and mortality		**Million EEK**
Direct costs	Sick Fund costs for treatment and medication	-193
Indirect costs	Loss of productivity due to morbidity	-687
	(Loss of taxes)	(-304)
	Loss of productivity due to mortality	-226
	(Loss of taxes)	(-100)
	Subtotal	**-1106**
Other economic consequences (mainly transfer payments)		**Million EEK**
Direct	Costs on health promotion	-40
	Excise tax revenue	+537
Indirect	Sickness benefits	-118
	Disability pension	-75
	Survivors' pension	-21
	Avoided retirement pensions	+100
	Subtotal	**+383**
	Total	**-723**
Total (includes loss of taxes instead of loss of productivity)		**-214**

Source: Authors' calculations

The aim of a national tobacco policy should be to decrease smoking. However, in some discussions about future taxation policies, this aim seems to be forgotten. Higher taxation is not a goal in itself for tobacco policy, but a powerful tool to decrease smoking.

Tobacco excise tax is a transferable item. In an imaginary situation, where no smoking occurred in Estonia, no tax on tobacco could be collected. But money previously spent on

cigarettes would be spent on other items such as clothes or food, items which are also taxable. Thus, a non-smoking country need not result in a decrease in tax revenue, but only a change in the structure of tax revenues.

In summary, stricter tobacco control measures, including higher taxation of cigarettes, by reducing tobacco consumption would lead to healthier people, decreased premature deaths, and increased productivity, which can only improve the economic performance of the country.

PART II – PRICING AND TAXATION POLICY ISSUES

CHAPTER 6. PRICING AND TAXATION OF CIGARETTES

Taxation of tobacco products has recently become a problem in Estonia, as it aims to join the European Union (EU). In accordance with this aim, the Estonian government is required to harmonize certain legislation, including taxation on tobacco products. The structure of tobacco taxation in Estonia will change from a specific to a combined (specific plus ad valorem) excise tax. The excise tax of the most popular cigarette brand will need to increase from 41% to 57%. Estonia has asked for a transition period of 10 years for implementing the new tobacco tax structure. However, there is concern about the likely impact of the new taxation policy.

The most common argument presented against a tax increase is the potential for the smuggling of cheaper cigarettes from other countries. The price of cigarettes in neighboring countries, especially in Russia, is considerably lower than in Estonia (Table 15). On the other hand, Finland and Sweden which are also geographically close to Estonia, have cigarette retail prices up to four times higher than in Estonia. This situation could create additional problems of cigarettes being smuggled both in and out of the country and greatly impacting legal cigarette sales.

Table 15. Price of a pack of cigarettes in Estonia, Latvia and Russia (euros), 2000

Price category	Estonia	Latvia	Russia
High	€1.09	€1.09	€0.97
Medium	€0.99	€0.81	€0.51
Most popular	€0.85	€0.77	€0.42
Low	€0.73	€0.44	€0.30
Non-filter	N/A	€0.36	€0.12

Source: Philip Morris Estonia Ltd.

In Estonia, tobacco products can be sold legally only if the excise tax has been paid in advance to the central government according to the Law on Tobacco Excise Tax. Of this tax, 96.5% supports the state budget and 3.5% goes to the extra-budgetary Estonian Cultural Fund. In addition, tobacco products, like most other products, are subject to a value-added tax of 18%. The revenue from value-added tax goes to the state budget.

The tobacco excise tax has changed over time (Table 16). With the introduction of the Estonian currency in 1992, an ad valorem excise tax was used due to high inflation rates. In 1995, it was changed to a specific (fixed) excise tax.[6]

Table 16. Tobacco excise tax per 20 cigarettes in Estonia, 1992-2000

Since	June 1992	January 1995	January 1998	January 1999	January 2000
	%	EEK	EEK	EEK	EEK
Filter cigarettes	70%	3	4.5	5	5.5
Non-filter cigarettes	70%	3	4.5	5	5.5

Source: Ministry of Finance

Table 17 shows the actual tax revenues up to 1999 and expected revenues for 2000 and 2001.[7] The expected revenue for 2000 was a clear overestimate and could only have been collected if all illegal sales were stopped.

Table 17. Tobacco tax revenues, 1993-2001

Year	Tobacco excise tax revenues (million EEK)	As percent of general government taxes	Tobacco excise tax revenues as percent of GDP
1993	21	0.27%	0.10%
1994	31	0.27%	0.11%
1995	171	1.12%	0.42%
1996	350	1.84%	0.67%
1997	502	2.10%	0.78%
1998	537	2.02%	0.73%
1999	574	Not known	not known
2000	(planned) 747	-	-
2001	(planned) 545	-	-

Source: Statistical Office of Estonia

We calculated changes in the real price of cigarettes on the basis of the Statistical Office of Estonia's annual data on cigarette purchase prices and consumer price index. In the nineties, the real price of tobacco products was at its lowest in 1994 (Figure 3). The tax increase in 1995 influenced the real price of cigarettes a little and additional tax increases

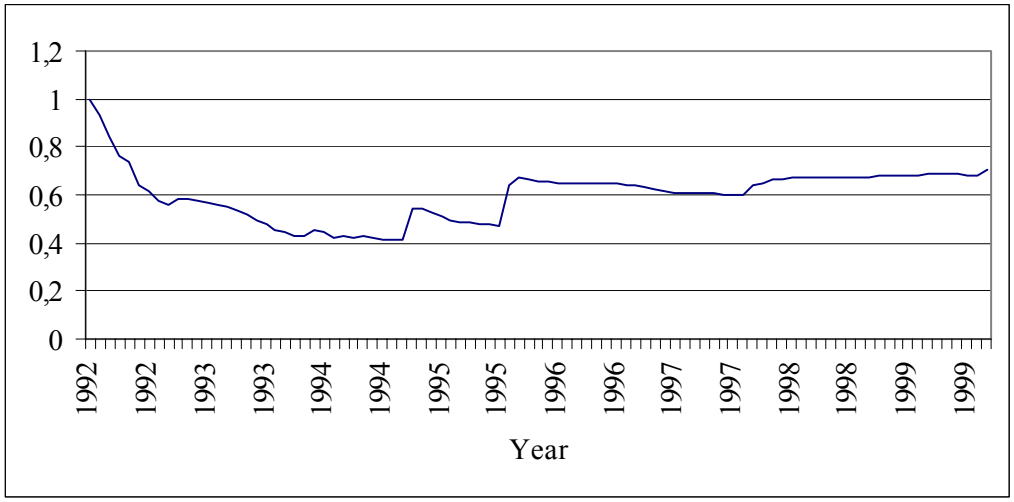
[6] It was changed to a mixed specific and ad valorem tax (as required by the EU) in 2002. Rates were changed as follows:

	July 1 2002	April 1, 2003	July 1, 2003	July 1, 2004
Specific tax per 1000 cigarettes	150	175	210	240
Ad valorem tax %	21	23	24	25

[7] Revenues increased by the following amounts (million EEK) in subsequent years: 2001 23.2, 2002 158.2, 2003 67.

in recent years have only partially neutralized the effect of inflation. The "most popular price category" of cigarettes, according to the Ministry of Finance, cost EEK 13.5 in 2000 (Table 18).

Figure 3. Real price of tobacco products in Estonia, 1992-2000 (1992=1)



Source: Statistical Office of Estonia.

Table 18. Price structure of a pack of cigarettes in 2000

Price breakdown	EEK	Percent of retail price
Cost, insurance, and freight (CIF) Tallinn	3.5	26%
Specific excise	5.5	41%
Profit margin in retail sale	2.43	18%
VAT	2.07	15%
Retail price	13.5	100%

Source: Ministry of Finance

CHAPTER 7. STRUCTURE OF CIGARETTE MARKET IN ESTONIA

Usually two different approaches are used to study the volume of consumption: sales statistics and consumption surveys. From the Ministry of Finance we obtained the statistics of excise tax labels sold, indicating the volume of legal cigarette sales. It is obvious that legal sales do not fully account for local consumption, due to the considerable movement of citizens and tourists across borders, and possible illegal purchases. Therefore, we used five additional data sources on the use of cigarettes to estimate the total national cigarette consumption:

- Household Income and Expenditure Study by Statistical Office of Estonia (monthly data, 1996-1999)
- Household Income and Expenditure Study by EMOR (monthly data, 1992 to1995)

- Health Behavior Among Estonian Adult Population (HBEAP, annual data 1990, 1992, 1994, 1996, and 1998)
- Estonian Health Interview Survey (EHIS 1996)
- Health Behavior Survey of Schoolchildren (during 1993 to1994)

The estimation process is described in Appendix 1. Results for 1995 to1999 are given in Table 19.

Table 19. Volume of cigarette sales and consumption in Estonia (no. of cigarettes)

Year	Legal sales of cigarettes (thousand sticks)	Estimated local consumption (thousand sticks)	Difference
1995	2,773,723	1,918,275	855,448
1996	2,547,507	1,737,038	810,469
1997	3,023,475	1,701,299	1,322,176
1998	2,490,136	1,568,042	922,094
1999	2,010,758	1,603,663	407,095

Source: Various surveys as noted in text, see Appendix 1 for estimation details

The last column in Table 19 shows the amount by which legal sales exceed national consumption, estimated on the basis of surveys of individuals. The only plausible explanations for this are that Estonians report smoking far fewer cigarettes when answering health behavior survey questionnaires than they in fact smoke, and/or that a considerable number of the cigarettes sold in Estonia are not consumed by Estonian citizens, but are purchased by tourists and visitors.

We know that Finns, especially, prefer to shop in Estonia, as it is cheaper and close by. Finns made approximately three million visits to Estonia in 1998. The average cigarette pack costs up to four times more in Finland than in Estonia, and every adult can legally take 10 packs of cigarettes home for private consumption. The price difference on this number of cigarettes is about the same as the cost of a ferry ticket between Tallinn (Estonia) and Helsinki (Finland).

Three main types of cigarette consumption can be distinguished in Estonia:

- Local legal consumption
- Local illegal consumption (i.e. cigarettes sold without payment of taxes)
- Purchases related to tourism and foreign visitors (legal purchases by visitors and bootlegging—cigarettes purchased tax-paid in Estonia and taken illegally to Finland or other countries).

In addition, bootlegging between Estonia and Russia occurs. This, however, is localized in the north-eastern region of Estonia and is difficult to separate from the use of illegal cigarettes.

Total legal sales and local consumption are not correlated directly. Illegal purchases of cigarettes by Estonians appear to be a fairly small part of the total market for cigarettes. Legal cigarette purchases by tourists and foreign visitors (that are not part of local consumption) are significant, and have a great impact on the level of government tax revenue. In light of this, it is useful to estimate how this part of the cigarette market will change when the price of cigarettes in Estonia increases.

If it is possible to estimate the volume of illegal consumption, it is also possible to estimate the volume of purchases made by tourists and foreign visitors (since local consumption and sales are known). Emor, a private market research company, has carried out cigarette consumption surveys among Estonians every year since 1995 (sampling around 1,500 persons each year). Every smoker interviewed is asked to show the pack of cigarettes he or she was currently using. Visually, the interviewer checked whether the cigarette pack had an Estonian (or Russian) tax label or not. The information gathered from these surveys provides data to use to estimate the share and volume of local legal and illegal consumption of cigarettes in Estonia. Subtracting estimated local legal consumption from legal sales provides an estimate of cigarette purchases by foreign visitors. Table 20 gives the estimated consumption volumes for 1995 to 1999 and some structural percentages. Trends in the cigarette market 1995-1999 are shown in Figure 4.

Table 20. Volume (in million sticks) and structure of cigarette market in Estonia

Year	Legal sales of cigarettes	Estimated local consumption	Local legal consumption	Purchases by foreign visitors	Illegal consumption	Total cigarette market volume
1995	2,774	1,918	1,439	1,335	480	3,253
1996	2,548	1,737	1,355	1,193	382	2,930
1997	3,023	1,701	1,446	1,577	255	3,279
1998	2,490	1,568	1,270	1,220	298	2,788
1999	2,011	1,604	1,187	824	417	2,428
Year	**Difference between legal sales and local consumption as % of legal sales**	**Local legal consumption as % of local consumption**	**Local legal consumption as % of legal sales**	**Purchases by foreign visitors as % of legal sales**	**Illegal consumption as % of local consumption**	**Illegal consumption as % of total cigarette market**
1995	31%	75%	52%	48%	25%	15%
1996	32%	78%	53%	47%	22%	13%
1997	44%	85%	48%	52%	15%	8%
1998	37%	81%	51%	49%	19%	11%
1999	20%	74%	59%	41%	26%	17%

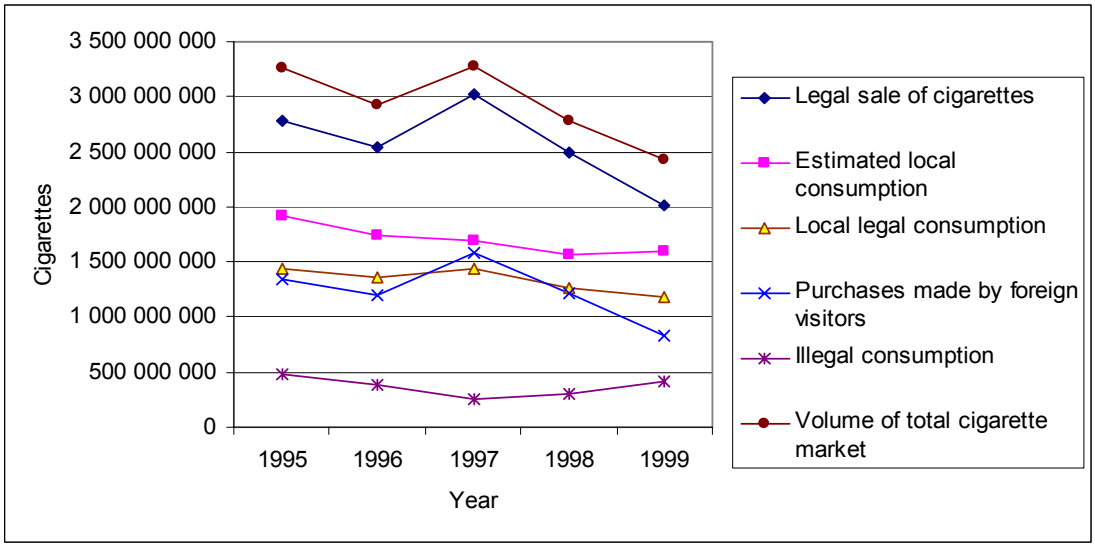
Sources: Household Surveys by Emor 1993 to 1995; Household Surveys of Estonian Statistical Office 1996 to1999; HBEAP 1992 to1998; Ministry of Financial Affairs; Individual surveys by Emor 1995 to1999; Statistical Office of Estonia.

From Figure 4 we can see that total legal sales of cigarettes have decreased since 1997. The main reason for this decrease is not because of a decrease in local legal consumption, but because of the decline in purchases made by foreign visitors, which has probably occurred because the cigarette prices in the duty-free shops on the ferries between

Estonia and Finland and Estonia and Sweden are no longer higher than prices in Estonia, so there is no incentive for foreigners to buy cigarettes in Estonia. The other reason may be that foreigners have started to buy more illegal cigarettes in Estonia. (Note that the number of foreign visitors increased during this period.)

Figure 4 also shows that from 1998 to1999 there was a slight increase in estimated local consumption, whereas local legal consumption and legal sales were decreasing. This could imply that illegal consumption was increasing faster than the decrease in legal consumption. This suggests that there is significant substitution between legal and illegal consumption of cigarettes.

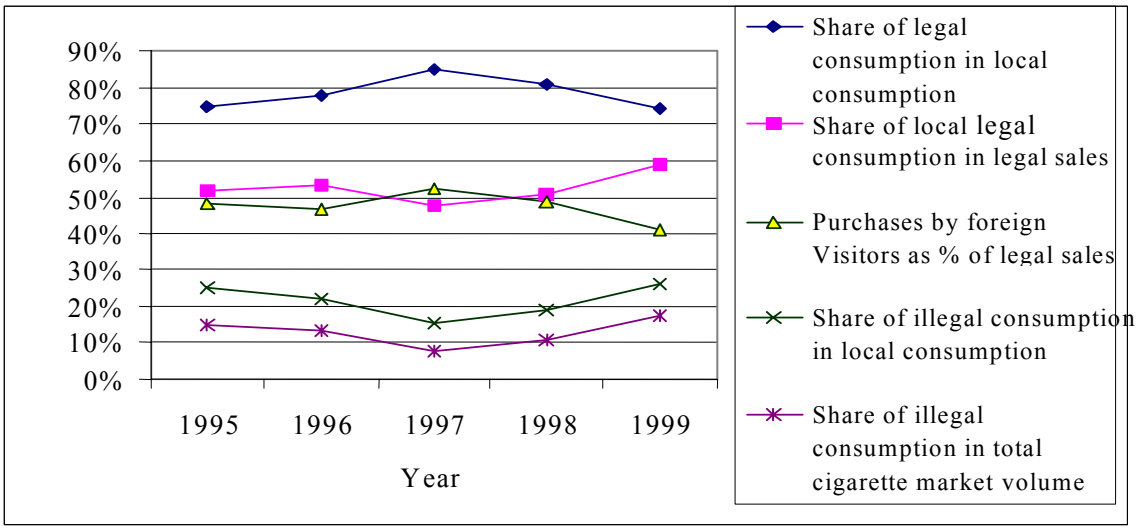
Figure 4. Changes in cigarette market of Estonia in 1995-1999



Source: Table 20

Figure 5 illustrates that in 1997, when the tobacco excise did not increase, the illegal share of the local cigarette market was at its smallest. At the same time, legal purchases made by foreign visitors exceeded local legal consumption. Since 1998, purchases made by foreign visitors have decreased and illegal cigarette sales have increased their share of total local consumption. The share of illegal consumption in local consumption and in the total market volume differ by about 10%.

Figure 5. Trends in structural market changes in Estonia (1995-1999)



Source: Table 20

CHAPTER 8. DEMAND MODELS FOR CIGARETTE CONSUMPTION

We estimated a demand model for cigarettes using monthly and annual data. Monthly data were collected in the Household Income and Expenditure Study by Emor (1992 to 1995) and by the Statistical Office of Estonia (1996 to 1999). These surveys include a sample of 700 to 800 households each month. The database provides information on both the total consumption of cigarettes in the household and the age of each household member. Using this data we created the variable "average monthly cigarette consumption per adult" which is used as the dependent variable in the demand model presented in Table 21. The independent variables are average real income per household member, real tobacco product price index (1992 to 1999, monthly data, Statistical Office of Estonia), quarterly dummies, time trend, and lagged consumption (i.e., consumption in previous months, allowing previous consumption to influence present consumption to account for addiction). SPSS software was used to estimate a log-linear model.

According to the estimated model, the price elasticity of demand for cigarettes is –0.32. This means that a 10% price increase will result in a 3.2% decrease in local consumption of cigarettes. Income elasticity is not statistically significant, but has a coefficient that is typical for this sort of model, indicating that if average per capita incomes rise over time, consumption is likely to increase, by about 0.2% for every 1% increase in real income.

Table 21. Estimated model using monthly data for 1992-1999

	Estimated Parameter	Standard error	t statistic	p	95% confidence interval for parameter	
					Lower	Upper
Constant	0.319	0.175	1.829	0.072	-0.029	0.667
Ln (income)	0.181	0.133	1.367	0.176	-0.083	0.446
ln (price)	-0.319	0.074	-4.332	0.000	-0.466	-0.172
3. quarter	6.3E-02	0.025	2.473	0.016	0.012	0.114
2. lag	0.353	0.101	3.507	0.001	0.152	0.553

F= 16.75 (p=0); R^2=0.7; DW=2.19

To check the reliability of our model, we also used annual data from other sources (Table 22) to estimate the demand model. These other sources were Household Surveys by Emor (1993 to 1995) and the Statistical Office of Estonia (1996 to 1999); HBEAP 1992 to 1998; EHIS 1996; Schoolchildren Survey 1993 to 1994; price statistics from Statistical Office of Estonia and Finland; sales statistics from Ministry of Financial Affairs; individual consumption studies by Emor 1995 to 2000; and statistics and opinions given by importers and experts.

The dependent variable in the demand model using annual data is the volume of local consumption (consumption by Estonians) that we estimated on the basis of different consumption surveys (Table 20). Independent variables in the log-linear model are average disposable real annual income per capita and the real tobacco price index.

Table 22. Annual data for 1993-2000 for demand model

Year	Annual income per person in Estonia (EEK)	CPI*	Estimated local consumption in Estonia (million sticks)	Local legal cons. (million sticks)	CPI* of tobacco products Estonia	CPI *of tobacco products Finland	Sales to foreign visitors (million sticks)	No. of Finnish visitors (000's)
1993	32,502	100	1,903		100	100		
1994	33,169	148	1,977		117	102		
1995	34,127	190	1,918	1,439	169	108	1,335	
1996	30,589	234	1,737	1,355	280	114	1,193	1,663
1997	31,267	261	1,701	1,446	294	117	1,577	1,750
1998	32,856	288	1,568	1,270	348	121	1,220	1,893
1999	33,116	297	1,604	1,187	372	123	824	1,912
2000**	33,254	303	1,600	1,136	394	125	614	1,912

*Consumer price index in Estonia

**Predicted values (using statistics of first quarter or trend)

Table 23. Estimated demand model using annual data, 1993-2000

Dependent variable :	Ln (estimated local consumption)	N=8		
Independent variables	**Estimated parameters**	**Standard error**	**t statistic**	**P**
Constant	7.05	0.22	31.82	0
ln (income/CPI*)	0.09	0.04	2.05	0.09
ln (tobacco CPI/CPI*)	-0.34	0.09	-3.54	0.02

*Consumer price index

The results are very similar to the estimates from the model using monthly data, with a price elasticity of cigarette demand of –0.34 using the annual data. Income elasticity was not statistically significant, and smaller than in the model using monthly data, but also showed the expected positive sign, indicating that consumption is likely to rise as income levels rise over time.

Estimates of the price elasticity of demand for cigarettes in developed countries typically fall between –0.25 and –0.5, that is, 10% price increases lead to declines in consumption of 2.5% - 5%. In developing countries, the price elasticity of tobacco products tends to be slightly higher (up to –0.7), suggesting a greater sensitivity to price in countries with lower incomes (van der Merwe 1998).

Using the estimated volume of local legal sales, we estimated trend models for local legal consumption and purchases made by foreign visitors (Table 24). In regression analysis, consumption depends on more than one independent variable, but our time series are too short to add many more variables in the multiple regression. To ease this problem, we used the trend and financial figures to predict data for the first quarter of 2000 and added one more observation to the existing time series (last row, Table 22).

Table 24. Demand estimate for total legal sales (legal local consumption and legal sales to foreign visitors)

Dependent variable	ln (Local legal sales)	N=5 years	1996-2000	
Independent variables	**Estimated parameters**	**Standard error**	**t statistic**	**p**
Constant	5.78	0.43	13.54	0.01
ln (income/CPI*)	0.35	0.09	4.03	0.01
ln (tobacco CPI/CPI*)	-1.5	0.11	-13.14	0.06

*Consumer price index

In 1995, the first excise tax labels were introduced in Estonia, and in 1996 the local tobacco factory was closed. These two events had an unusually large influence on the tobacco market. Both models were checked to see if data for those years affected the stability of the estimates. Because of instability, the 1995 data were omitted.

The price elasticity in the local consumption model (–0.34) is, according to expectations, lower than in the model in which the dependent variable also includes sales to foreigners

(–1.5). The result is statistically significant at 10%. However, this very high price elasticity in the model that includes sales to foreigners reflects the falls in purchases by foreigners noted above, probably in response to the equalising of duty free prices on the ferries and prices in Estonia. This fall is not likely to be a persistent trend, so the elasticity of –1.5 is not a good predictor of future changes in sales as prices continue to rise. The income elasticity in this model is 0.35 (statistically significant at 1%). This means that a 10% increase in income will increase local legal cigarette sales by 3.5% with probability of 99%.

CHAPTER 9. PREDICTING TAX REVENUES AS TAX RATES CHANGE

This section analyzes the likely effect of a planned increase in tobacco excise taxes from 5.5 EEK to 6.0 EEK per 20 cigarettes. Table 25 shows the effect this increase would have on prices and tax as a percentage of the retail price, if the tax increase were more than fully passed on to consumers, with the retail price increasing by a little more than the tax increase. We did not take into account the possible effect of structural changes from a specific tax to a combined specific plus *ad valorem* excise and thus probably underestimated actual future revenues. An *ad valorem* tax system taxes expensive brands more heavily because taxes are levied as a proportional share of the wholesale value, but the lower market share of expensive brands will balance this effect to some extent.

Table 25. Planned tobacco excise tax increase in 2001

Computing formulas	**Nominal values are used**	
P1	Retail price before tax increase (i.e., in 2000)	EEK 13.5
P2	Retail price after tax increase (i.e., in 2001)	EEK 14.2
C	Excise tax before increase (i.e., in 2000)	EEK 5.5
D	Excise tax after increase (i.e., in 2001)	EEK 6
C/P1*100	Excise tax incidence in retail price in 2000	40.7 %
D/P2*100	Excise tax incidence in retail price in 2001	42.3%
P2-P1	Increase in retail price caused by tax increase	EEK 0.7
E=(P2-P1)/P1*100	Increase in retail price	5.2%

Source: Authors' estimates

In the consumption forecasts we used price elasticities estimated in the previous section. One of the key factors of this simulation is the price elasticity for local legal sales. However, these could only be estimated on the basis of a very short time series (five years). Therefore, it is better to use "best estimate" range rather than a single point. In accordance with the principles of conservative estimation, we considered the lower (in absolute value) end of the confidence range at 95% confidence level. For local legal cigarette demand, the conservative range estimate is –1 (instead of the point estimate –1.5). In Table 26 calculations with both estimates are given. One of the major results shown is that a small tax increase can increase tax revenue from local consumption despite the substitution effect between legal and illegal consumption.

Table 26. Forecast of government excise tax revenue if excise tax increases by EEK 0.5 in 2001

Computing formulas	Influence of planned tax increase on the cigarette consumption and government revenue	The best estimate	Conservative estimate	Units
F	Price elasticity for local consumption	-0.34		
H	Estimated local consumption for 2000 is 1600 million cigarettes i.e.	80,000,000		packs
I=H*C	Excise revenue in 2000 on codition that no illegal consumption exists	440,000,000		kroons
J=E*F	Local consumption decrease in 2001 according to price increase by 5%	-1.8		%
K=H+H/100*J	Estimated local consumption in 2001	78,589,630		packs
L=K*D	Corresponding excise revenue	471,537,778		kroons
L-I	Excise revenue increase in 2001 on condition that no illegal consumption exists	31,537,778		kroons
G	Price elasticity for local legal consumption	**-1.5**	**-1**	
N	Estimated local legal consumption in 2000 is 1136 million cigarettes i.e.	56,800,000	56,800,000	packs
O=N*C	Corresponding excise revenue	312,400,000	312,400,000	kroons
A=N*D	Excise tax revenue in 2001 according to price increase by 5% when local legal concumption will stay to the same level than in 2000	340,800,000	340,800,000	kroons
P=E*G	Decrease in local legal consumption in 2001 according to 5% increase in price	**-7.8**	**-5.2**	%
R=N+N/100*P	Estimated local legal consumption in 2001	52,382,222	53,854,815	packs
Q=R*D	Corresponding excise revenue	314,293,333	323,128,889	kroons
A-Q	Loss of revenue due to substitution effect between legal and illegal consumption	26,506,667	17,671,111	kroons
M=Q-O	Tax revenue increase (despite of decrease in local consumption)	**1,893,333**	**10,728,889**	kroons
I-O	Loss of excise revenue due to illegal consumption in 2000	127,600,000	127,600,000	kroons
L-Q	Expected loss of revenue due to illegal consumption in 2001 (if government doesn't affect illegal consumption)	**157,244,444**	**148,408,889**	kroons
	In estimating excise revenues we should consider also purchases made by foreign visitors			
V	Decrease in amount of cigarette purchases made by foreign visitors in a year	25	25	%
S	Estimated amount of cigarette purchases done by foreign visitors in 2000 is 614 cigarettes i.e.	30,700,000	30,700,000	packs
T=S*C	Corresponding excise revenue	168,850,000	168,850,000	kroons
U=S-S/100*V	Amount of purchases done by foreign visitors in 2001 according to price increase by 5%	23,025,000	23,025,000	packs
X=U*D	Corresponding excise revenue	138,150,000	138,150,000	kroons
Y=T-X	Eexcise revenue decrease due to decrease in purchages made by foreign visitors	30,700,000	30,700,000	kroons
Y-M	Net excise tax revenue decrease in 2001 compared to 2000	**28,806,667**	**19,971,111**	kroons
Z=S*D	Excise revenue in 2001 without decrease in purchases done by foreign visitors in 2001	184,200,000	184200000	kroons
Z-T	Excise tax revenue (from purchases made by foreign visitors) in 2001 compared to 2000 would increase by	15,350,000	15,350,000	kroons

Legal cigarette sales to foreign visitors are a large part of total legal sales. Between 1997 and 1999, the volume of duty-paid cigarette purchases by foreigners decreased 25% a year, probably indicating substitution from duty-paid to duty-free purchases (legal and illegal) by foreign visitors. A continuation of this trend would cause a significant decrease in tax revenues (row with formula Y-M in Table 26)

Table 27 presents the effect of a tax increase on revenues according to two different scenarios. Using a more conservative price elasticity (–1) for local legal consumption and providing the decrease in purchases made by foreign visitors is 15%, the excise tax revenues in year 2001 would be the same as in 2000 in nominal value. If purchases by foreigners remained the same as in the year 2000, a significant revenue increase would be expected (EEK 26 million).

If there were no duty-free sales of cigarettes, tax revenues would be greatest. In the short run, if duty-free sales stay at the same level, the planned increase in excise tax would probably lead to a slight loss of revenues from cigarette excise. But in the long run, if duty-free sales cease inside the European Union, a significant increase in tax revenues from cigarette sales to foreigners could be expected. In reality, the positive effect will probably be smaller than we predict because of foreigners who buy illegal cigarettes from Estonia. Illegal imports and sales remain a problem.

Table 27. Changes in excise tax revenues from legal cigarette sales in 2001 compared to 2000 if the tax increases by 0.5 EEK, various assumptions about change in tax-paid purchases by foreigners

		Price elasticity for local legal consumption	
		–1.5	–1.0
		EEK	EEK
Decrease in amount of cigarette purchases made by foreign visitors in a year	25%	-28,806,667	-19,971,111
	15%	-10,386,667	-1,551,111
	10%	-1,176,667	7,658,889
	0%	17,243,333	26,078,889

Source: Authors' estimates

CHAPTER 10. SUMMARY

Using several databases and statistical observations, we estimated the price elasticity for local total cigarette consumption at –0.34, which means that a 10% increase in price will result in local consumption of cigarettes decreasing by 3.4%. But other factors also affect demand, including consumer information "shocks", advertising and counter-advertising, and restrictions on smoking in workplaces and public places (World Bank 1999). Thus, it remains to be seen in which direction cigarette consumption will change in Estonia.

A special feature of the Estonian cigarette market is the very high percentage of purchases by foreign visitors (mostly from Finland) – up to 50% of legal sales in the late 1990s. Cigarette prices in Finland are up to four times higher than in Estonia. There was a steep decrease in legal cigarette purchases made by foreign visitors to Estonia in the late 1990s because of lower prices in duty-free shops and on the ferries commuting between Estonia and Finland or Sweden. This should be considered when predicting government excise tax revenues, as (tax-paid) sales to foreigners on the mainland are very sensitive to price changes for tax-free sales. Unfortunately it is impossible to estimate the volume of tax-free sales in Estonia and its neighboring countries because they cannot be distinguished from exports.

Assuming no dramatic changes in the economic situation in Estonia, the paper presents short-run predictions for government tax revenues. It was shown that modest tax increases would increase tax revenues from local legal consumption despite the substitution effect between legal and illegal consumption and the fall in consumption in response to a price increase. However, tax revenues could decrease overall because of decreased purchases by foreign visitors.

If Estonia does not join the EU very soon[8], there will be a relative loss in excise tax revenue due to the decrease in purchases by foreign visitors, valued at approximately EEK 15 million a year. In the long run, after joining the EU, duty-free sales will be stopped, and excise tax revenues will increase again, as cigarette prices in Estonia will remain lower than in Finland or Sweden.

If the present situation persists, the revenues lost to illegal trade in cigarettes could exceed the excise revenues gained from tobacco products. In addition to illegal consumption of cigarettes by local people, illegal cigarette purchases made by foreign visitors are a source of tax revenue loss.

Price increases for legal sales of tobacco products due to higher excise taxes are likely to also increase the price of illegal sales and, according to the price elasticity of cigarettes, this will eventually decrease the use of tobacco products. This should be the long-term goal of the tobacco policies of a country aiming to join the EU.

[8] Estonia (and 9 other countries) officially joined the EU on May 1, 2004 (ed.).

APPENDIX 1. ESTIMATING CONSUMPTION VOLUMES OF COMPONENTS OF THE ESTONIAN CIGARETTE MARKET

Using the database of the Health Behavior Among Estonian Adult Population (HBEAP) survey (sample about 1,500 Estonians each time) it is possible to find the percentage of daily smokers in the different age and gender groups. It is also possible to find the average number of cigarettes smoked per day in each of those groups. When we apply the proportion of smokers to the statistics on the Estonian population numbers in specific age and gender groups and multiply the result by the number of cigarettes smoked daily, we can identify the number of cigarettes consumed by Estonians in a day. To estimate the number of cigarettes consumed in a year, we multiply the result by 365.

Since the sample from the HBEAP survey does not cover persons older than 64 years, we have used the Estonian Health Interview Survey (EHIS) 1996 to estimate the prevalence of smoking in the older age groups. Using the same method described above, the number of cigarettes smoked in older age groups can be calculated.

Using special surveys among schoolchildren, we can also take into account the consumption of 15-year-old boys and girls. According to a study carried out during the 1993/1994 school year, about 22% of 15-year-old boys and 8% of girls smoke regularly. Similar results were seen in the survey of schoolchildren in Tallinn in 1995. These surveys also indicated that the average daily consumption of cigarettes is 10 sticks among boys and 5 sticks among girls.

By multiplying corresponding numbers by the population statistics on the number of 15-year-olds, the volume of cigarettes consumed by girls and boys in this age group can be found. (The estimated numbers are given in the Table A.1, column B).

In the calculations, only statistics for daily smokers were used because according to the EHIS 1996, the percentage of occasional smokers among all smokers is only 6%.

Final estimates on the volume of cigarettes consumed (in million sticks) are given in Table A.1 (column C=A+B, numbers in normal print). To check the results, we can use smoking prevalence figures from the EHIS 1996, which can be taken as the most reliable study. The consumption volume estimated on the basis of the EHIS 1996 was 0.01% smaller than the result found on the basis of the HBEAP survey, which is a very good level of consistency.

Table A.1
Estimated volume of cigarette consumption in Estonia in 1995-1999 (pieces)

Year	Cigarette consumption of adult Estonians	Cigarette consumption of 15-year-old children	Estimated local consumption volume	Estimated consumption on the base of household surveys	Difference between estimations on the base of Health Behaviour Survey and household survey	Sale of cigarettes on the base of paid tax-labels	Difference between sale and local consumption	Share of difference in legal sale
	A	B	C	D	E	F	G	H
1990	1,857,450,000	10,639,064	1,868,089,000					
1991		10,529,221	1,931,082,000					
1992	1,983,655,000	10,419,378	1,994,074,000	1,234,151,000	749,504,000			
1993		10,277,466	**1,903,007,000**	**1,133,908,000**	**758,821,500**			
1994	1,967,051,000	10,135,554	1,977,187,000	1,198,912,000	768,139,000			
1995		10,110,113	**1,918,275,000**	**1,170,595,000**	**737,569,500**	2,773,723,000	855,448,487	31%
1996	1,726,953,000	10,084,673	1,737,038,000	1,019,953,000	707,000,000	2,547,507,000	810,469,687	32%
1997		10,067,445	**1,701,299,000**	**1,018,877,000**	**672,355,000**	3,023,475,000	1,322,175,655	44%
1998	1,557,992,000	10,050,217	1,568,042,000	920,282,000	637,710,000	2,490,136,000	922,093,383	37%
1999		10,020,000	**1,603,663,000**	**993,643,000**	**600,000,000**	2,010,758,000	407,095,440	20%

Health behavior surveys have not taken place every year (1990, 1992, 1994, 1996, and 1998 only). For missing years the household surveys done by Estonian Statistical Office and market research corporation Emor were used.

In the case of household consumption studies, we can take the average cigarette consumption per household member and multiply that by the number of habitants of Estonia. The product should estimate the total consumption volume of cigarettes. (Table A.1, column D). This estimate is perceptibly smaller than the previous result (see the difference in column E), but the difference is pretty stable (around 700,000,000 cigarettes in a year). This effect is mainly due to the problem that the household survey notebook of purchases is usually completed by women, but cigarette purchases are mostly made by men who don't declare all the purchases to the women, which means that some of the cigarette purchases are not recorded.

In Table A.1, the differences for missing years (1993, 1995, and 1997) are given as averages of previous and next year differences (bold numbers in column E). To find the estimate for 1999, the trend can be used. Estimated differences for the missing years, estimated consumption volume on the base of the household surveys, and estimated cigarette consumption of children is added to the total consumption of cigarettes in missing years (bold numbers E+D=C,). The estimate for total local consumption in 1991 is just the average of 1990 and 1992 because we have no consumption data for that year.

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