Price and consumption of tobacco

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Progressive increases in cigarette tax rates provide a powerful contribution to policy for reducing cigarette consumption and generate extra government revenue. The policy has been most effective in groups for whom health publicity effects have been least so, but special provision may be necessary to avoid hardship to poor families.

In the seventeenth century, James I of England initiated probably the first ‘tax for health reasons’ and raised tobacco tax 40-fold from 2 to 82 pence per pound, making tobacco more expensive than silver. Currently tobacco is again a cheap product; even in countries where the price is relatively high, a cigarette will cost considerably less than a snack item or a drink, so smokers can afford not the odd one or two, but usually 20 or so a day. This is the major health problem of cigarettes. This chapter will consider the impact of changes in tobacco prices on different groups of smokers, as well as the political and social implications.

As an illustration of smokers’ response to price changes, Figure 1 shows how cigarette consumption has varied inversely with the real price of cigarettes in the UK over the last quarter of a century. It is apparent that smoking increased during periods when the price of cigarettes fell in real terms, during the early 1970s and late 1980s, and fell when real cigarette prices rose in the mid-1970s and during the early 1980s and 1990s. Similar counter movements of smoking with relative cigarette price have been shown for several countries including France, Canada and South Africa.

Price (or income) elasticity of demand is the usual measure of responsiveness to changes in real price of cigarettes (or real income). It is unit free and is defined as the percentage change in consumption for each 1% change in price (or income), usually adjusted for the rate of inflation. Elasticities of demand for cigarettes or tobacco, have been assessed for many countries over several time periods using a variety of econometric models. Estimates have varied between about −0.2 and −0.9 and have clustered about −0.5 (Table 1) (the negative sign denotes the negative relationship between price and demand). This suggests that, on average, cigarette consumption reduces by about 0.5% for every 1% increase in its real price. Few studies, apart from some for specific subsets
of smokers, report significantly different values. Estimates have been surprisingly robust over time, place and price level, being higher mostly for periods of rapid price increase, and lower for countries with relatively low tobacco prices and high incomes such as the USA. There seems to be some indication from USA, Ireland and the UK that price elasticities have fallen slightly over time, possibly due to rising income levels. Higher price responses have been reported for lower income and socioeconomic groups and possibly for teenagers as will be discussed later.

**Table 1** Estimates of price and income elasticities of demand for cigarettes

<table>
<thead>
<tr>
<th>Study</th>
<th>Data</th>
<th>Price elasticity</th>
<th>Income elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrews &amp; Franko (1991)*</td>
<td>Meta-analysis</td>
<td>-0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>UK</td>
<td>1970-1994</td>
<td>-0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>US</td>
<td>1970-1994</td>
<td>-0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Other</td>
<td>1970-1994</td>
<td>-0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Townsend (1988)**</td>
<td>Europe 1986-88</td>
<td>-0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Chapman &amp; Richardson*</td>
<td>New Guinea 1973-86</td>
<td>-0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Worgottor &amp; Kunze (1986)**</td>
<td>Austria 1955-63</td>
<td>-0.5</td>
<td></td>
</tr>
<tr>
<td>Walsh (1980)**</td>
<td>Ireland post 1961</td>
<td>-0.4</td>
<td></td>
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* Cited in Andrews & Franko (1991)*

**Price effects by age**

The price response of young smokers and young potential smokers is of particular interest, as this is the age of recruitment to smoking and there has been an apparent lack of success of health education in reducing teenage smoking. Lewit and Coate studied teenage smoking in the USA.
and concluded that teenagers are highly responsive to cigarette prices (elasticity —1.4). There is now differing evidence from the USA suggesting a much lower price elasticity among teenagers, not significantly different from the estimate of —0.23 for American adults7. A UK study of smoking during 1972–90, reported8 that the most price sensitive smokers were women, and men aged 25–60 years. Young men, on the other hand, were more influenced by income than price, showing a high response to income changes and a non-significant response to price. Young people generally have relatively low incomes with a high proportion available for discretionary expenditure, so changes in income are likely to have relatively greater effect on their smoking patterns. These results do not confirm the findings of Lewit and Coate and are more compatible with the more recent results for the USA. They do, however, suggest that cigarette consumption in teenage women may be significantly affected by price rises, although for them the effects of price and income appear to be interrelated. There will be an indirect longer term price influence also via effects on parents, as it is well established that the probability of a young person becoming a regular smoker is positively related to parental smoking.

**Price effects by socioeconomic group**

Tobacco price and taxation are likely to have different effects on different income and socioeconomic groups. Low income groups tend to smoke more, but reduce their smoking more in response to tax increases. Conversely, they are more likely to be encouraged to smoke by a reduction in the real price. The above UK analysis of cigarette consumption reported8 that men and women in socioeconomic group (SEG) 1 and 2 (professional workers, managers and their wives) did not respond to changes in cigarette price, whereas adults in SEGs 3 and 4 (clerical workers, skilled and semi-skilled manual workers) responded in the middle range with a price elasticity of about —0.5 to —0.7. Unskilled manual workers and their wives (SEG 5) showed the highest response with elasticities of —1.0 for men and —0.9 for women (Table 2).

There has been much debate about whether cigarette price affects the prevalence of smoking as well as the average adult consumption. The recent UK analysis8 reported significant elasticities of prevalence of —0.6 for men in socioeconomic group 5 (unskilled manual workers), —0.23 for all women and —0.5 for women in socioeconomic group 5. These are important results as socioeconomic group 5 is the group for whom prevalence of smoking is highest, and for whom health education has been least effective.
Atkinson et al.⁹ and Fry and Pashardes¹⁰ have also reported significantly different responses to tobacco price in UK households with different incomes (Table 2) and by factors related to socioeconomic group, such as house ownership. There has been little work on smoking by income and socioeconomic group for other countries, and it is important that relevant data are collected, so that the impact of price changes may be more fully understood.

**Cigarette prices and the Health of the Nation targets**

Many countries have targets for indicators of the health of their citizens. The UK Government has set targets for the year 2000 for various indicators in the *Health of the Nation* report including reductions in heart disease and cancer mortality¹¹. To support these and other *Health of the Nation* concerns, specific targets have been set to reduce adult smoking prevalence from about 30% in 1990 to 20% by the end of the decade, to reduce underage smoking from 8% to less than 6% of 11–15 year olds, and smoking during pregnancy so that at least one-third of smokers give up at the beginning of their pregnancy. The UK Government has committed itself to using the rate of tobacco taxation as one instrument for achieving these targets (i.e. as a sumptuary tax) by raising tax rate on cigarettes in real terms by at least 3% per annum in...
future budgets, thus increasing cigarette prices by about 2.5% per annum. The 23% reduction in smoking in the UK during 1976–1988 was achieved about equally (17% each) by an overall rise in cigarette prices and by health publicity\textsuperscript{12}. These effects were reduced, however, by some 12% due to the influence on smoking of the rise in real income over the period. Predictions of the potential for different elements of smoking control policy to achieve the national targets, estimate that the combined effects of an advertising ban, sustained health promotion about tobacco, GP smoking advice to 95% of patients who smoke, good smoking control policies in public places and the work place and the effects of a modest increase in real incomes of 1.5% per annum would, on optimistic projections from present known effects, achieve at best half the reduction necessary to achieve the adult targets. The full achievement would need a considerable extra boost from the remaining policy, a 5% price rise annually above the rate of inflation\textsuperscript{12} until the year 2000. The Government’s commitment to a 3% annual tax rise would not achieve this and neither is there a full commitment to the other policies, particularly regarding a ban on advertising. Without the latter, tobacco price would need to be increased still further, probably to about 6.5% per annum until the year 2000. In fact tax rises have been above the minimum and the adult targets are on trend at present. Underage smoking prevalence, however, has not reduced towards the targets\textsuperscript{13}, and current data on smoking in pregnancy are not yet available.

**Price and consumption in Europe**

Cigarette prices and consumption vary within the European Union both absolutely and relative to incomes\textsuperscript{14}. There is a 5-fold price range between 0.71 ECUs for the most popular brand of cigarettes sold in Spain to 3.60 ECUs a pack in Denmark (1 ECU is approximately £0.82 or US$1.32). If prices are standardised for cost of living, the range narrows to 4-fold. Average smoking varies from about 5 cigarettes per day per adult in The Netherlands to about twice that level in Greece. A cross sectional study of smoking and price in 27 European countries, including all EC countries, carried out for the World Health Organization, reported a price elasticity of demand for cigarettes across Europe of $-0.4$ and an income elasticity of demand for cigarettes of 0.5\textsuperscript{15}. This means that cigarette consumption will rise with incomes unless there are counter policies.

The type of tobacco used also varies, with hand rolling being particularly important in The Netherlands (49% of all consumption), Denmark (27%) Belgium (21%), Germany (10%), France (5%) and UK
(4%). This is relevant to pricing policy, as in many countries (although not the UK) hand rolling materials are taxed at a significantly lower rate than are manufactured cigarettes, although, when made into hand rolled cigarettes, they often lead to higher tar yields. In some countries, significant amounts of tobacco are smoked as cigars or in pipes, or used as oral or nasal snuff. The relative prices of these alternatives and the relative associated health risks, have important implications for overall tobacco consumption and disease. It is important to have equivalent taxation of alternative tobacco products, if taxation is to be effective in reducing health risks.

**Tobacco tax structure**

The European Union’s excise harmonization agreement set the minimum total tax on cigarettes at 70% of the retail price. This theoretically leaves member countries free to increase cigarette taxes as they wish subject to a maximum proportion of the tax (55%) to be raised as a ‘specific’ tax per cigarette in money terms, whereas the *ad valorem* element (percentage of price) may be anything up to 95% of the tax. The agreement does not substantially reduce the wide range of cigarette tax levels in the European Union, and there is concern that if cross border buying is substantial, average cigarette prices will effectively fall, although this does not appear to be the case. Smuggling between high and low tax countries has not been widespread, but still presents a strong rationale for trying to harmonise taxes and prices upwards. (Smuggling has been mainly of ‘duty free’ cigarettes from outside the European Union, and it is estimated that 30% of cigarette exports globally are illegally imported.) In the interests of public health and harmonization, the minimum tax rate needs to be raised and expressed in money terms, i.e. the specific rate, rather than *ad valorem* as at present. Whatever the tobacco tax structure in operation, the industry may try to minimise its impact. If tax is by weight of tobacco, manufacturers may try to reduce the tax per cigarette by reducing the size of each cigarette as in the UK prior to joining the European Union. If tax is per cigarette, the industry may try to reduce the impact of the tax by increasing cigarette size to king size or super kingsize. The industry has most control over tax (per cigarette or by weight) when tax is entirely or mainly levied as an *ad valorem* tax, as a high percentage of a low price will still yield a low tax, as is in evidence in Spain and much of southern Europe (Table 3). This is shown by the low prices found where this structure operates: because basic cost of tobacco is low, the price paid by consumers, even after application of a high percentage tax, is still relatively low, which encourages high tobacco...
Tobacco and health

Table 3  Effects of tax structure

<table>
<thead>
<tr>
<th>Tobacco tax</th>
<th>Effect</th>
<th>Public health implication</th>
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<tbody>
<tr>
<td>By weight of tobacco</td>
<td>Manufacturers reduce size of cigarette</td>
<td>Beneficial</td>
</tr>
<tr>
<td>By cigarette</td>
<td>Manufacturers increase size of cigarette</td>
<td>Detrimental</td>
</tr>
<tr>
<td>Specific</td>
<td>Manufacturers' influence limited</td>
<td>Beneficial if high</td>
</tr>
<tr>
<td>Per volume</td>
<td>Manufacturers keep base level low</td>
<td>Limited benefit</td>
</tr>
<tr>
<td>Low tax for non cigarette products</td>
<td>Smokers switch to non-cigarette</td>
<td>Limits benefit of tax</td>
</tr>
<tr>
<td>High tax for high tar</td>
<td>Smokers switch to lower tar</td>
<td>Slightly beneficial</td>
</tr>
</tbody>
</table>

consumption. In the interest of health, tax should be related in some way to weight of tobacco. Policies, such as careful monitoring of imports and possibly stamping packets for country of origin and excise duty paid are needed to deter illegal trading.

Tax revenue efficiency

Governments have three reasons to raise taxes: to raise revenue; to correct for externalities, such as health costs; and to deter consumption (sumptuary tax). Tobacco tax probably fulfils all these criteria. It is in the unique position also of being a popular tax in several countries, as surveys have reported a significant part of the population in favour – even a significant minority of smokers. Tobacco tax is a relatively efficient vehicle for raising revenue as it has an elasticity of total revenue with respect to tax rate of possibly 0.6–0.9 in the UK compared with 0.2 for spirits and 0.6 for wine. This means that a 1% increase in tobacco tax results in about a 0.6–0.9% increase in tax revenue. This is demonstrated in Figure 2 which shows how real value of tobacco tax revenue has risen and fallen with changes in real cigarette price (determined mostly by tax) in the UK 1971–93 and demonstrates that tax revenue not only rises with tax rises but falls dramatically if tax does not keep up with inflation.

Given that a government needs revenue, the criteria for economic efficiency in taxation are, after Ramsey and Baumol and Bradford, that they should have the effect of reducing demand for all commodities in the same proportion, should distort consumer choice as little as possible, and direct tax payers as little as possible to less preferred patterns of consumption. This efficiency criterion has sometimes been interpreted to mean that all commodities should be taxed at the same rate, but this is false for two reasons. A uniform tax will distort the choice both between leisure and work and between goods with different price elasticities. If higher taxes are levied on goods with inelastic demand, which will be bought in some measure in any case, a lower rate can be levied on other goods, disincentive to work is decreased and there
is little distortion in consumption of goods. Similarly, the argument goes, higher taxes should be imposed on goods which are substitutes for work or complements to leisure, and lighter taxes on activities which are complementary to work. The related argument for higher tax on goods with relatively low price elasticity of demand, is that the dead weight welfare loss or excess burden is thus minimised. (The excess burden of a tax increase is the consumers' loss of utility [roughly satisfaction] from buying less of the product at the higher price, minus the gain to the government in tax revenue. It can be expressed as a percentage of the tax revenue from the tax increase. For tobacco, the percentage excess burden is relatively low at 17% compared, for example, with 500% for spirits. This means that £100 extra tax revenue would cost supposedly £117 in ‘lost satisfaction’ to the smoker or £600 to the spirit drinker.) It is also argued that the optimal tax rate may well depend, for similar reasons, inversely on the income elasticity of demand. Economic efficiency would, therefore, tend to indicate the taxing of commodities in inverse relation to their price and income elasticities of demand. For the UK, and probably for most economies, cigarettes and other tobacco products have both relatively low price and income elasticities of demand (the average for all goods and services being 1.0) and so, on grounds of economic efficiency alone, there is a strong case for shifting taxes from other commodities to tobacco. This does not include considerations of equity (which may indicate the opposite), nor of health (which would favour the shift).

Tax policies may or should also consider external costs or factors not taken into account by individuals in their consumption decisions, but borne by others in society. One criterion may be to set a tax such that
consumers would choose the level of consumption they would have chosen, had they to pay the relevant (external) costs. These externalities include real resource costs, such as extra costs of health services (estimated at £610 million per annum in the UK)\textsuperscript{23}, costs of fires caused by tobacco smoking (£20 million per annum for the UK)\textsuperscript{24} and loss of real output not borne by the smoker (50 million working days per annum in the UK)\textsuperscript{24}. They may also be considered to include externalities of transfer payments such as retirement pensions, pensions to dependants and sickness and invalidity welfare payments (net £190 million per annum in the UK)\textsuperscript{25}. They would not include tobacco tax as this is included in the price the smoker actually pays and is willing to pay for tobacco. These approximate estimates of externality costs of about £800 million per annum would support an extra tax for social costs or externalities in the region of £0.20 per packet in the UK.

Tobacco tax has fallen in importance in its contribution to UK Government revenue due to the increase in revenue from other sources and the fall in tobacco consumption for reasons other than tax rises, so that whereas in 1950 tobacco tax provided 16\% of all Government revenue, this fell to 8\% by the late 1960s, is currently 3.6\% and may be even less significant by the end of the century.

**Smoking, taxation and poverty**

Before the widespread publicity about the health effects of smoking in the early 1960s, there was little difference between the smoking habits of different socioeconomic groups, but in the UK and in some other countries, smoking prevalence is now highest among people in poor socioeconomic circumstances. The decline in UK smoking rates over the last few decades has been relatively low among such people. Survey results suggest that smoking rates are particularly high among the unemployed\textsuperscript{26} and young adults with families, especially lone parents\textsuperscript{27}. Families with low incomes tend to have high smoking rates, and to spend a disproportionately large share of their income on cigarettes. Smoking, therefore, decreases the resources available to them more generally as well as directly harming their health.

The differential health effects are quite clear, particularly for mortality from smoking-induced disease. A man in an unskilled manual occupation in the UK is more than 4 times as likely to die of lung cancer as a professional, and twice as likely to die from coronary heart disease. For women there is a 3-fold difference for lung cancer and a 4-fold difference for heart disease\textsuperscript{8}. For lung cancer, heart disease and chronic bronchitis,
the inequalities between manual and non-manual groups widened between 1971 and 1981.

As we have seen, response to price tends to be particularly high among people in disadvantaged circumstances and, on average, they are likely to reduce not only levels of consumption but also total expenditure on cigarettes when there is a price rise. Raising relative prices would be expected to narrow the differentials in smoking prevalence and consumption between social and economic groups. Unfortunately, a direct consequence of such policies would be to further reduce the effective spending ability of people in poverty if they continue to smoke at the same rate.

This presents a dilemma. Should the price of cigarettes be held down to avoid hardship to families in poor economic circumstances? The difficulty with this is that price does have most effect on smoking by lower income groups, where health education has had the least. Erosion of cigarette prices could be seriously detrimental to public health, particularly to the health of lower income groups. The dynamic relationship between smoking, health and inequalities stretches over a lifetime and price is a potential force to break this link at any stage, reducing the harmful effects in terms of smokers' health and that of their children. A rational solution may be to increase benefits to poor families such as lone mothers, as well as raising cigarette prices. This would provide a disincentive to smoke without a detrimental effect on living standards. Expenditure on cigarettes would mostly be clawed back to the government through the tobacco tax. More work is necessary to find ways of ameliorating these problems.

**Conclusion**

There is little doubt that price has a major effect on cigarette consumption and thus smoking induced disease, especially in low income groups. To use this as a tool of preventive medicine, therefore, seems the right public health policy. Fiscal policy is not an alternative to other methods of reducing the harm of tobacco, but it is one of the most powerful elements of the type of comprehensive policy recommended by the World Health Organization and other authoritative bodies. Raising tobacco tax also has the advantage to governments of increasing revenue. Public information and health promotion campaigns reduce smoking in their own right; they may also pave the way to make cigarette tax increases for health reasons politically acceptable. Progressive increases in taxes will reduce smoking and smoking disease, to the interest of
health in all countries. Special measures may be necessary to ameliorate effects on the cost of living of poor families.

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