

The economic rationale for intervention in the tobacco market

*Prabhat Jha, Philip Musgrove, Frank J. Chaloupka,
and Ayda Yurekli*

Economic theory starts with the assumption that a consumer usually knows what is best for him or herself—the notion of ‘consumer sovereignty’. The theory also assumes that privately-determined consumption choices, including the decision whether to consume a particular product at all within a free competitive market, will most efficiently allocate society’s scarce resources. Within this framework, economic theory holds that if smokers consume tobacco with full information about its health consequences and addictive potential, and bear all costs and benefits of their choice themselves, there is no justification, on the grounds of inefficiency, for governments to interfere. However, in practice, the market for tobacco is characterized by three specific ‘market failures’—that is, features that result in economic inefficiencies and that may therefore justify public intervention. First, there is an ‘information failure’ about the health risks of smoking: some consumers do not know the risks, and, even where consumers are informed, they may not appreciate the scale of those risks or apply the knowledge to themselves. Second, there is an information failure about the addictive potential of tobacco. Many smokers, and especially adolescents, under-estimate the risk of becoming addicted and, once addicted, face very high costs in trying to quit. These two information failures result in high private costs of death and disability for smokers. The third market failure is the external costs of smoking—that is, the costs imposed by smokers on others. External costs are most clearly apparent as the health effects of passive smoking. There are several ways that governments may intervene. In economic theory, ‘first-best’ interventions, which specifically address the identified inefficiency, should ideally be pursued. In the tobacco market, the first-best interventions would probably be to educate young people about the risks of addiction and disease from smoking, or to restrict their access to tobacco. However, evidence suggests that these measures are largely ineffective. In contrast, taxation, albeit a blunt instrument and thus a ‘second-best intervention’, is highly effective at protecting children from taking up smoking. Taxation is also an effective means of correcting external health costs, and, possibly, also external financial costs. However, taxation and various other interventions impose costs on a wide range of smokers. The policy options available to governments are discussed.

7.1 Introduction

There is no doubt that prolonged smoking is an important cause of premature mortality and disability worldwide (see Chapter 2). Strictly on health terms, then, there is a strong reason to intervene to reduce this damage.

However, smoking is voluntary and is not illegal for adults, so the existence of an enormous health problem is not, *prima facie*, sufficient to justify interference with people's choice to smoke. An *economic* rationale for such intervention requires that failures in tobacco markets are sufficiently large to justify the costs of such interference. Despite the strong consensus that smoking harms health, there is much debate about proper government roles, if any, in reducing smoking (see, for example, *The Economist* 1997).

In this chapter, we explore the economic rationale for government intervention in tobacco markets. We first discuss the two key market failures that justify government intervention on efficiency grounds: first, consumers' incomplete information about the risks of addiction and disease; and, second, external costs. We do not deal with supply-side market failures, such as the monopoly power of the tobacco industry. Next, we discuss which interventions are available to governments to correct these market failures, noting their specificity and effectiveness and their economic costs. We focus in this section on interventions that would protect children and adult non-smokers, and that would inform adult smokers. Third, we discuss whether government intervention in tobacco markets is appropriate to reduce inequity between rich and poor.

This exploration will take account of particular epidemiological features of the tobacco epidemic that are relevant to the economic arguments. The first of these is the early age at which people typically start smoking, which, in high-income countries at least, is during the teen years. The risk of lung cancer is far higher in individuals who start smoking at age 15 and smoke one pack a day for 40 years than among those who start at age 35 and smoke two packs a day for 20 years (Peto 1986). Therefore, the early age of onset has a direct bearing on individuals' health risks. From the standpoint of economics, the early typical age of onset is also relevant because the standard economic concept of consumer sovereignty, which holds that the consumer knows what is best for him or her, may not apply so forcefully to adolescents as to adults. The second key epidemiological feature of the tobacco epidemic is that fully half of smoking-related deaths occur in productive middle age (defined as 35–69 years) (Peto *et al.* 1994). This is relevant to the economic debate about smoking, since it dispels the notion that smoking kills people mostly in old age, when the economic losses (as well as the health losses) are small.

7.2 Inefficiencies in the tobacco market

Smokers clearly receive benefits from smoking; otherwise they would not pay to do it. The perceived benefits include pleasure and satisfaction, stress relief (presumably derived in part from the nicotine content of the smoke), peer acceptance, and a sense of maturity and sophistication (most important for adolescent smokers, and derived from the act of smoking as such). An additional important benefit for the addicted

smoker is the avoidance of nicotine withdrawal. There is little that economics can say about the preferences that determine smoking, except to try to understand how the addictive nature of cigarettes influences subsequent consumption (see Chapter 5). As with other addictive behaviors, the decision to start and the ‘decision’ to continue are quite different, and different economic arguments may be relevant to each. The private costs to be weighed against those benefits include money spent on tobacco products, damage to health, and nicotine addiction. Defined this way, the *perceived* benefits evidently outweigh the *perceived* costs for at least 1.1 billion people who smoke today.

Economic theory assumes that the consumer knows best and that privately-determined consumption will most efficiently allocate society’s scarce resources. Thus, *if* smokers know their risks and internalize all their costs and benefits, there is no justification, on the grounds of inefficiency, for governments to interfere (Pekurinen 1991).

However, these assumptions may not hold for several reasons, leading to market failures. (Note that even efficient markets do not necessarily achieve equity, and that inequity is not normally classified as market failure. We discuss equity issues later in the chapter.) Below, we analyze three failures in the tobacco market. The first is incomplete information about health risks. The second is incomplete information about addiction, specifically the complex issue of children’s tendency to under-estimate the addictive potential of smoking (and therefore the costs of quitting). The third failure consists of costs imposed on others.

7.2.1 Incomplete information about health consequences

Incomplete information about the risks of smoking leads to behavior that smokers would not otherwise choose for themselves. Poorly-informed smokers often underestimate the risks of their action (Weinstein 1998). Since people usually react to known risks by reducing the risky consumption, incomplete information means more smoking than would otherwise occur. There are two principal reasons why smokers tend to be inadequately informed. The first is that the market, far from providing information, has actually hidden or distorted it. The second is the long delay between starting to smoke and the onset of obvious disease, which has obscured the link between the two. Each of these are discussed in turn.

The tobacco industry, like other industries, has no financial incentive to provide health information that would reduce consumption of its products. On the contrary, the industry has consistently hidden product information on the ill effects of smoking or actively misinformed smokers about risks (Sweda and Daynard 1996). Notably, the industry has used advertising and promotion to promote its products as ‘safe’ despite internal evidence that all types of smoking are harmful. For example, the industry has tried to advertise filter cigarettes as ‘healthier’ (USDHHS 1989). The industry has also used advertising to reach young smokers (Institute of Medicine 1994). Other tactics of the industry to leave smokers uninformed or misinformed include dissuading lay journals from reporting on smoking’s health effects Warner *et al.* 1992, and sponsoring biased scientific research (Bero *et al.* 1994). Internal industry documents uncovered in recent lawsuits in the United States confirm such practices (Glantz *et al.* 1995).

Second, consumers derive information on the costs and benefits of smoking primarily from their own experience and what happens to their peers, as well as from

studies largely financed by the public sector. However, the obvious health damage from smoking usually emerges at least 20–30 years after exposure. This differs from most other risky behaviors, such as fast driving, where the costs and benefits are more readily and immediately appreciated.

The long delay between exposure and effect has also impeded the growth of scientific knowledge. In the United States, the 1960s evidence suggested that only one in four smokers died from smoking. When risks were re-assessed decades later, when the epidemic had matured, the evidence showed that the risks were actually much higher: one in two long-term smokers die from smoking (see Chapter 2; Doll *et al.* 1994; Peto *et al.* 1999). Anyone who considered starting or continuing smoking 20 or 30 years ago in high-income countries would, therefore, have under-estimated the risks, even if he or she had based the decision on the best available information. Moreover, as the list of diseases and conditions associated with smoking expands, smokers continue to under-estimate the risks. Most developing countries still do not have estimates of the health hazards of smoking for their own populations. It is, therefore, not surprising that even respectable journals, such as *The Economist* (1997), reveal their confusion about the scale of the true risks or the high proportion of smokers who die in middle age:

... most smokers (two-thirds or more) do not die of smoking-related disease. They gamble and win. Moreover, the years lost to smoking come from the end of life, when people are most likely to die of something else anyway.

As Kenkel and Chen discuss in Chapter 8, there are two key features of consumers' incomplete information: first, in low-income and middle-income countries, absolute awareness of the health risks is still comparatively low. For example, in China, about two-thirds of adult smokers surveyed in 1996 believed that cigarettes did them 'little or no harm' (Chinese Academy of Preventive Medicine 1997). Second, consumers in all countries may not clearly internalize the risks, even when they have been informed about them, nor may they accurately judge the risks of smoking relative to other environmental exposures, such as 'stress' or radiation.

Children and teenagers generally know less about the health effects of smoking than adults. A recent survey of 15- and 16-year-olds in Moscow found that more than half either knew of no smoking-related diseases or could name only one, lung cancer (Levshin and Droggachih 1999). Even in the United States, where young people might be expected to have received more information, almost half of 13-year-olds today think that smoking a pack of cigarettes a day will not cause them great harm (National Cancer Policy Board 1998).

In addition, teenagers—even those with good understanding of the risks of smoking—may have a limited capacity to use information wisely. Teenagers behave myopically, or short-sightedly. It is difficult for most teenagers to imagine being 25, let alone 55, and warnings about the damage that smoking will inflict on their health at some distant date are unlikely to reduce their desire to smoke.

In developing countries, there is less awareness of the hazards of smoking at all ages, including among adults, for several reasons. Education levels are lower, and, since education leads to more rapid and thorough absorption of information, it is reasonable to conclude that less-educated populations will be less receptive to health information.

There are fewer local data on the hazards of smoking and less dissemination of existing data on health risks. Governments less often regulate industry information practices, such as advertising and promotion. For all these reasons, it is unlikely that current smokers and potential smokers in low-income and middle-income countries have adequate knowledge from which to make informed decisions.

7.2.2 Inadequate information about addiction

The second major information failure in the tobacco market involves inadequate information about nicotine addiction. Smokers acquire *psychological addiction* to the act of smoking itself, and *physical addiction* to nicotine (Kessler *et al.* 1997). Psychological addiction to cigarettes is hardly different from habit formation with respect to other products or practices. Nicotine addiction, however, is not simply a matter of choice or taste reinforced by repetition, such as choosing to listen to certain music or keeping company with dangerous friends. Of course, as with all biologically addictive goods, many people can change their behavior and quit using nicotine, as the decline in smoking among adults in high-income countries demonstrates (see Chapter 2 and Chapter 12). However, the costs of quitting are significant, so much so that some people find quitting virtually impossible. Most smokers who quit have to make several attempts before they succeed, and former smokers remain vulnerable to resuming smoking at times of stress (USDHHS 1990).

The addictive properties of nicotine and the fact that most smoking starts early in life have important implications for tobacco markets. Chaloupka *et al.* discuss the economics of addiction in more detail in Chapter 5. Here we elaborate on nicotine's influence on demand and its impact on young people, particularly as concerns their tendency to under-estimate the costs of quitting.

Is addiction alone reason enough for governments to intervene against smoking? If children had full information about the likelihood of becoming addicted and understood the long-run implications of their addiction, they might conceivably become 'happy addicts' who are maximizing their own welfare by smoking. For example, the teenager might argue that it would be 'better to suffer lung cancer at age 60 than to suffer Alzheimer's disease at age 80'. Models of so-called 'rational addiction' (Becker and Murphy 1988) assume that individuals maximize utility over their lifetime, taking into account the future consequences of their choices. However, the key assumptions of the model are that people are fully rational, that they are far-sighted about their choices, and that they have full information on the costs and benefits of their choices. These assumptions are not satisfied in the case of smoking. Children are more myopic, or 'short-sighted', than adults, and they typically have less information. Recent extensions to the rational addiction model by Orphanides and Zervos (1995) take some of this into account when looking at youthful 'decisions' to become addicted. In their model, imperfect information about addiction early in life can result in seemingly rational decisions that are later viewed with regret.

Other recent theoretical work emphasizes the role of 'adjustment costs' for addictive goods (Suranovic *et al.* 1999). The presence of these adjustment costs, in the context of less than fully rational behavior, implies that smokers may continue to smoke while regretting this decision, given that the costs of stopping are greater than the costs of

continuing. In this context, rather than providing benefits, continued smoking for an addicted smoker is the lesser of two evils. Some might interpret the differences between the short- and long-run price elasticities of demand for an addictive good as reflecting the magnitude of these adjustment costs. That is, much of the difference between the long-run and short-run consumer surplus may be thought to reflect the adjustment costs. Assuming a linear demand curve, and given the evidence that the long-run elasticity for cigarette demand is about double the short-run elasticity, this suggests that as much as half of perceived consumer surplus (based on short-run demand) reflects the adjustment costs associated with addiction (see Chapter 6).

Perhaps most importantly, there is clear evidence that young people under-estimate the risk of becoming addicted to nicotine, and, therefore, grossly under-estimate their future costs from smoking. Among high-school seniors in the United States who smoke but believe that they will quit within five years, fewer than two out of five actually do quit. The rest are still smoking five years later (Institute of Medicine 1994). In high-income countries, about seven out of ten adult smokers say they regret their choice to start smoking and two-thirds make serious attempts to quit during their life (USDHHS 1989). In sum, it is the combination of imperfect information about addiction and myopia that results in significant under-estimation of the risks of future health damage. In the absence of addiction, teenagers could more easily quit later, when they become aware of the health risks, as they tend to do where other risky behaviors are concerned. We discuss this further below. The risk that young people will make unwise decisions is recognized by most societies and is not unique to choices about smoking, although in the case of smoking it is compounded by addiction and inadequate information. Therefore, most societies restrict young people's power to make certain decisions. For example, most democracies prevent their young people from voting before a certain age; some societies make education compulsory up to a certain age; and many prevent marriage before a certain age. The consensus across most societies is that some decisions are best left until adulthood. Likewise, many societies consider that the freedom of young people to choose to become addicted should be restricted.

It might be argued that young people are attracted to many risky behaviors, such as fast driving or alcohol binge-drinking, and that there is nothing special about smoking. However, few other risky behaviors carry the high risk of addiction that is seen with smoking, and most others are easier to abandon or modify, and are abandoned or modified in maturity (O'Malley *et al.* 1998; Bachman *et al.* 1997). For example, teenagers often binge drink, but most grow to be responsible moderate drinkers later in life. Driving motor vehicles is risky, but most young drivers survive long enough to learn to drive more responsibly. With smoking, there is no comparable way to behave more prudently, except to quit; even cutting back somewhat on consumption does not reduce the risks proportionally. Also, compared with other risky behaviors, such as alcohol use, new recruits to smoking face a very high probability of premature death. These factors combined create a probability of addiction and premature death that is higher than for other risk behaviors. Using estimates from Murray and Lopez (1996) and WHO (1999), and studies in high-income countries, we estimate that of 1000 15-year-old males currently living in middle-income and low-income countries, 125 will be killed by smoking before age 70 if they continue to smoke regularly. By compari-

son, before age 70, 10 will die because of road accidents, 10 will die because of violence, and about 30 will die of alcohol-related causes, including some road accidents and violent deaths.

The tobacco industry has a clear incentive to subsidize or to give away free cigarettes to potential smokers, especially young people, in order to induce them to smoke and become addicted to nicotine (Becker *et al.* 1994; Ensor 1992). The same incentive applies to creating addiction among adults in low-income and middle-income countries by manipulating price.

Thus, at best, nicotine addiction greatly weakens the argument that smokers should exercise consumer sovereignty. Given the myopia of young consumers and the likelihood of information failure for all smokers, it is inappropriate to regard an addiction-induced demand as representing genuine welfare gains to the smoker.

7.2.3 External costs

Consumers and producers in any transaction may impose costs or benefits on others, which are known as externalities. The costs—or benefits—imposed by smokers on others are of three types. First are the direct physical costs for non-smokers who are exposed to others' smoke. Second are the financial externalities that cause monetary loss (or gain) for non-smokers, whether or not they are exposed to smoke. Last (and most difficult to assess) are the so-called 'caring externalities' or 'existence value' effects of smoking, whereby non-smokers suffer emotionally from the illness and death of smokers unrelated to them personally.

Physical externalities

Physical externalities from smokers involve both health effects for non-smokers, such as a higher risk of disease or death, and other effects, such as the nuisance of unpleasant smells, physical irritation, and smoke residues on clothes, and the greater risks of fire and property damage. The health effects are briefly summarized. They include, for children born to smoking mothers, low birthweight and an increased risk of various diseases (USDHHS 1986; Charlton 1996), and an increased risk of various diseases in children and adults chronically exposed to environmental tobacco smoke either at home or in the workplace (Environmental Protection Agency 1992; Wald and Hackshaw 1996). Importantly, the list of diseases and conditions associated with environmental tobacco smoke is expanding (California Environmental Protection Agency 1997).

Financial externalities

Financial externalities are costs that are imposed by smokers but at least partly financed by non-smokers. In countries where there is an element of publicly financed healthcare, these include medical costs, among them the costs of treating the newborns of mothers who smoke during pregnancy. Non-smokers also help to pay for the damage from fires and the higher maintenance costs of workplaces and homes where smokers are present. Here we briefly summarize the key arguments related to healthcare costs and to pensions.

In high-income countries, the overall annual cost of healthcare that may be

attributed to smoking has been estimated to be between 6% and 15% of total healthcare costs. In most low-income and middle-income countries today, the annual costs of healthcare attributable to smoking are lower than this, partly because the epidemic of tobacco-related diseases is at an earlier stage, and partly because of other factors, such as the kinds of tobacco-related diseases that are most prevalent and the treatments that they require. However, these countries are likely to see their annual smoking-related healthcare costs rise in the future as the tobacco epidemic matures (World Bank 1992).

For those concerned with public spending budgets, it is vital to know these annual healthcare costs and the fraction borne by the public sector, because they represent real resources that cannot be used for other goods and services. For individual consumers, on the other hand, the key issue is the extent to which the costs will be borne by themselves or by others. As the following discussion shows, the assessment of these costs is complex, and therefore it is not possible yet to draw definitive conclusions about whether or how they may influence smokers' consumption choices.

In any given year, on average, a smoker's healthcare is likely to cost more than that of a non-smoker of the same age and sex. However, because smokers tend to die earlier than non-smokers, the *lifetime* healthcare costs of smokers and non-smokers in high-income countries may be fairly similar. Studies that measure the lifetime healthcare costs of smokers and non-smokers in high-income countries have reached conflicting conclusions (see Chapter 4 for more details). In the Netherlands (Barendregdt *et al.* 1997) and Switzerland (Leu and Schwab 1983), for example, smokers and non-smokers have been found to have similar costs, while in the United Kingdom (Atkinson and Townsend 1977) and the United States (Hodgson 1992), some studies have concluded that smokers' lifetime costs are, in fact, higher. Part of this confusion stems from the fact that it is relatively easy to make actuarial estimates of the potential for smokers' earlier deaths to bring savings in public health or pension expenditures. In contrast, the external financial costs of smoking are more difficult to measure reliably, and may be considerably under-estimated (Chaloupka and Warner, in press). Recent reviews that take account of the growing number of tobacco-attributable diseases and other factors conclude that, overall, smokers' lifetime costs in high-income countries are somewhat greater than those of non-smokers, despite their earlier deaths (Chapter 4; Chaloupka and Warner, in press). There are no such reliable studies on lifetime healthcare costs in low-income and middle-income countries.

Clearly, for all regions of the world, smokers who assume the full costs of their medical services will not impose costs on others, however much greater those costs may be than non-smokers'. In developing countries, higher proportions of healthcare costs are borne by private individuals, rather than by the public system (Bos *et al.* 1999). Nonetheless, even in low-income countries, a significant percentage of medical care, especially that associated with hospital treatment, is financed either through government budgets or through private insurance. To the extent that taxes, co-payments, or social insurance premiums are not differentially higher for smokers, the higher medical costs attributable to smokers will be at least partly borne by non-smokers. To the extent that private business healthcare costs are passed on to consumers in the form of higher prices, or to workers in the form of lower wages, any costs incurred by workers who smoke will similarly be partly passed on to non-smokers. However, such costs are small

in low-income and middle-income countries (Collins and Lapsley 1998). Out-of-pocket payments and risk-adjusted insurance schemes do not burden non-smokers with some of the costs of smokers. For private insurance, where premiums for non-smokers are lower than for smokers, there may be little economic justification for public intervention. In reality, however, most health insurance plans are increasingly group-based and contain no risk-adjustment for smoking.

In low-income and middle-income countries, intra-household transfers of income or welfare may be as important a source of externalities as formal, extra-household transfers (James 1994). Manning *et al.* (1991) and others argue that intra-household transfers are irrelevant, since adults' decisions to smoke are made on behalf of a whole household, and reflect the preferences of all family members. This is implausible, since adults are likely to become smokers before marrying or having children. They are likely to find it difficult to quit later—even if spouses or children urge them to. Furthermore, very young children, who may be the most severely affected by exposure to others' smoke, have no voice in such decisions. Spouses may, in deciding to marry, have taken into account the addiction of their partner, and may, therefore, be said to acquiesce in the decision; but that is not the same thing as helping to make the decision or approving of it.

In high-income countries, public expenditure on health accounts for about 65% of all health expenditures, or about 6% of GDP (Bos *et al.* 1999). If smokers have higher net lifetime healthcare costs, then non-smokers will subsidize the healthcare costs of smokers. The exact contribution is complex and variable, depending on the type of coverage, and the source of taxation that is used to pay for public expenditures. If, for example, only the healthcare costs of those over 65 are publicly funded, then the net use of public revenues by smokers may be small, to the extent that many require smoking-related medical care and die *before* they reach this age. Equally, if public expenditure is financed out of consumption taxes, including cigarette taxes, or if third-party private insurance adjusts smokers' premiums because of their higher health risks, then their costs may not be imposed on others. Once again, the situation differs in low-income and middle-income countries, where the public component of total healthcare expenditure is on average lower than in high-income countries, at around 44% of the total, or 2% of GDP (Bos *et al.* 1999). However, as countries spend more on health, the share of total expenditure that is met by public finance tends to rise too (World Bank 1993).

While it is difficult to assess the relative healthcare costs of smokers and non-smokers, the issue of pensions has proved at least as contentious, and has attracted some popular debate. For example, an editorial in *The Economist* (1995) expressed the view that smokers 'pay their way'. It continued:

... what they cost in medical bills, fires and so on, they more than repay in pensions they do not live to collect.

This assertion is based on analyses from high-income countries that suggest that smokers contribute more than non-smokers to pension schemes, because many pay contributions until around retirement age and then die before they can claim a substantial proportion of their benefits (Manning 1989; Viscusi 1995). There are several problems with this assertion. First, there is an ongoing academic debate over definitions of the social costs of smoking, and particularly the extent to which

'savings' from not collecting pensions should be included. Depending on differing assumptions, other studies (see, for example, Atkinson and Townsend 1977) have not found net costs for smokers to be lower. Second, the issue is not currently relevant to many of the low-income and middle-income countries where most of the world's smokers live. In low-income countries, only about one in ten adults has a public pension, and in middle-income countries the proportion is between a quarter and half of the population, depending on the income level of the country; private pension plans are less common (James 1994). Finally, and perhaps most importantly, most of these studies have followed traditional notions of economic externalities, and have not placed any value on life *per se*. Even if smokers do reduce the net costs imposed on others by dying young, it would be misleading to suggest that society is better off because of these premature deaths. To do so would be to accept a logic that says society is better off without its older adults (Harris 1994).

Caring externalities

The third group of externalities that we consider are those that are the most difficult to assess: they are known as 'existence value' or 'caring' externalities (Krutilla 1967). There is evidence that people are willing to pay for another's well being, even if they do not know the person and even if they do not benefit directly themselves. Public spending on health partly reflects such externalities. Existence value is most readily applied to children, whom society typically protects more than adults. In contrast, caring externalities for adults almost directly contradict the notion of consumer sovereignty. Clearly, caring externalities differ across cultures and countries, depending among other things on the importance society assigns to individual sovereignty. Non-smokers may be willing to subsidize efforts to prevent people taking up smoking or efforts to help smokers quit. They may also be prepared to contribute towards the care of sick smokers, even when these represent a financial burden. However, their attitudes may change over time as knowledge about the health effects of smoking becomes more widespread and non-smokers' tolerance for smokers may decline (Gorovitz *et al.* 1998). In any case, there is little solid information of such willingness, so it is difficult to use it to formulate public policies.

In sum, there are clearly direct costs imposed by smokers on non-smokers, such as health damage. There are probably also financial costs, although it is more difficult to identify or quantify these.

7.3 Government responses to market failure: what, for whom and at what price?

Given that, as we have argued, the markets for tobacco products suffer efficiency failures that result in premature death and illness, and costs imposed on others, it is appropriate to ask if government intervention can correct them. Here we ask whether governments have interventions available to correct these failures, and discuss the costs and effectiveness of these interventions.

Below we describe briefly those interventions that respond to, or deal with, each of the types of inefficiency in the tobacco market that we have described above. Governments can use information, regulation, taxation, or subsidies to address these market failures.

Government responses to *incomplete or erroneous information* include, specifically, mass information campaigns, warning labels, and publicly-financed research to create more, or better, or more easily assimilated, information. All are public goods, which the market is unlikely to provide adequately. Public responses to existing addiction in adults include, specifically, incentives to quit, such as cessation programs (with or without pharmacological therapies) offered free or at subsidized prices, and education campaigns that raise awareness of the risks of smoking and the benefits of cessation. In addition, governments can encourage deregulation of the market for nicotine replacement therapy (see Chapter 12). Public responses to preventing new addiction in children (discussed in more detail below) include education campaigns about the danger of addiction, restricting children's access to tobacco products, bans on the advertising and promotion of tobacco products, and taxation. Increased taxation will also increase cessation rates among adults.

Government responses to *direct physical externalities* include education campaigns emphasizing the right of non-smokers to a smoke-free environment, restrictions on smoking in public places and workplaces, and taxes. Government responses to *financial externalities* may include risk-adjusted health or pension premiums, or anything that restricts tobacco consumption, whether or not in the presence of non-smokers. These may include taxation, information campaigns, and restrictions on where people can smoke.

Government responses to '*existence value*' externalities also include any intervention that restricts consumption and thereby reduces the health damage from smoking. Concern for smokers at highest risk—those already addicted who have smoked for many years—would lead to specific subsidies for cessation programs, the deregulation of nicotine replacement markets, and information campaigns emphasizing the dangers of long-term smoking. However, in reality, governments do not always aim interventions directly at the sources of market failures themselves, but to particular constituencies or population groups affected by those market failures. In the case of the tobacco market, government intervention is often designed to protect children.

We turn now to a discussion of the appropriateness of the various available interventions.

7.4.1 Choosing 'first-best' and 'second-best' interventions

Government intervention in the tobacco market is most easily justified to deter children and adolescents from smoking and to protect non-smokers. But it is also justified for the purposes of giving adults all the information they need to make an informed choice. Ideally, government interventions should address each identified problem with a specific intervention tailored to solve that particular problem and none other. These may be thought of as first-best interventions. However, a neat one-to-one correspondence between problems and solutions is not always possible, and some interventions

may have broader effects. We discuss first-best interventions, their effectiveness, and their limitations, first for protecting children, then for correcting the physical and financial costs imposed by smokers on others, and lastly for informing adult smokers. A common theme emerges: the use of taxes, though a second-best and more blunt instrument, is more effective.

Protecting children

Several economists have suggested that protection of children is the most compelling economic argument for higher taxes (Warner *et al.* 1995). Governments can choose to protect children for several reasons. First, childhood is when nicotine addiction is likely to begin. Second, children are not yet sovereign adults making informed choices, so the principal argument for *not* intervening does not apply to them as strongly as to adults. Third, there is evidence that the tobacco industry targets children with glamorous advertisements and promotion. Fourth, compared with many consumer goods that may appear desirable to children, such as automobiles, cigarettes are generally affordable and accessible: thus the market does not spontaneously protect children from them. Finally, children have no way to become better or safer smokers as they mature, except by quitting.

A priori, parents would ideally always be willing and able to protect children from tobacco themselves. If this happened, there would be little need for governments to duplicate such efforts (Musgrove 1999). Perfect parents, however, are rare. Adults may smoke themselves, thereby modeling this behavior for their children, and, even though few would actually encourage their children to start smoking, they may also fail to educate them about the risks. Parents' responsibilities on the question of smoking are not comparable to, say, their responsibilities to ensure their children are immunized. In the latter case, the parent or caregiver has a defined responsibility to protect the child through a fairly simple action, and where the child's lack of information is irrelevant.

The next best public or non-parental interventions would be to try to educate children, restrict advertising and promotion targeted to children, and to restrict their access to tobacco products. As discussed above and in more detail by Kenkel and Chen (Chapter 8), information campaigns have had an important impact on overall declines in smoking in high-income countries. But information campaigns targeted at children are likely to be less effective than those targeted at adults, because children discount the future more, and have difficulty considering consequences of today's behavior that may not take effect for three or four decades. Individual youth-centered programs, including school health programs, have often been found ineffective (Reid 1996).

For a specific campaign aimed at children, governments would need to ban advertising and promotion of tobacco products in the media that children are most often exposed to, such as television or radio. Empirical evidence cited by Saffer (Chapter 9), suggests that partial bans cause the tobacco industry to shift to other media, including promotional goods (such as free samples), and sponsorship of sports events, which do influence children (Charlton *et al.* 1997). Finally, efforts to restrict young people's access to tobacco products in shops, restaurants, and bars appear to have had mixed success to date, given that the enforcement of bans is difficult. Moreover, youth restrictions have relatively high administrative costs (Chapter 11; Reid 1996).

In contrast to these measures, there is ample evidence that tax increases are the single most effective policy measure for reducing children's consumption of tobacco products (see Chapter 10). Young people are more sensitive to price changes than older people. Estimates suggest that a tax increase of \$2 per pack in the United States would reduce overall youth smoking by about two-thirds (National Cancer Policy Board 1998). To the extent that low-income and middle-income countries have younger populations than high-income countries, tax increases would be expected to be effective in these countries too (see Chapter 18).

In theory, if cigarette taxes are to be used mainly to deter children and adolescents from smoking, then the tax on children should be higher than any tax on adults. Such differential tax treatment would, however, be virtually impossible to implement. Yet a uniform rate for children and adults, the practical option, would impose a burden on adults. Societies may nevertheless consider that it is justifiable to impose this burden on adults in order to protect children. Moreover, if adults reduce their cigarette consumption, children may smoke less, given evidence that children's propensity to smoke is influenced by whether their parents, and other adult role-models, smoke (Murray *et al.* 1983).

Physical costs imposed on non-smokers

Governments can choose to protect non-smokers from the health effects of exposure to environmental tobacco smoke, including the effects on children and babies born to smoking parents. The externalities of maternal smoking for infants are less clear than for other non-smokers exposed to others' smoke, at least where mothers are assumed to have rights over fetuses, including the right to submit them to risks. However, the literature on the attitudes of pregnant women to their own health and that of their fetuses suggests that those who are informed about healthy behaviors are more likely to act to protect their fetuses' health (Charlton 1996).

Costs to non-smokers' health would appear, a priori, to be easily reduced through bans on public and workplace smoking. These 'clean-air' restrictions have the advantage that they limit the conditions under which people can smoke, without directly addressing the choice of whether to smoke. It should be noted that direct physical externalities do not by themselves justify widespread government interventions, such as advertising and promotion bans, and tax increases, since what matters is not how much people smoke, but whether others are exposed to tobacco smoke. As discussed by Woollery and others (Chapter 11), restrictions in high-income countries on smoking in public places and private workplaces reduce both smoking prevalence and average daily cigarette consumption. Data from developing countries are much less complete, but experience from South Africa suggests that restrictions do reduce smoking (Van der Merwe 1998). Such restrictions are clearly weakened where there is a lack of enforcement, or a reliance on self enforcement. However, a more significant problem with this approach is that the vast majority of exposure to environmental tobacco smoke is in homes, and this is where children are also more likely to be exposed. (Mannino *et al.* 1996; NCI 1999). In contrast to clean-air restrictions, tax increases, by significantly reducing smoking in all settings, could lower this cost to children.

Financial costs borne by non-smokers would, a priori, be best reduced through adjusted risk premiums on health services or pension services. Financial costs could be

calculated over short intervals, but lifetime medical costs for today's young smokers are more unpredictable. Private insurance markets sometimes include such price differentials, without requiring regulation; publicly-financed insurance seldom or never does. As the administrative costs for adjusting risk premiums are high, a less precise but more efficient method would be to simply tax cigarettes at the source. Note that in contrast to physical externalities, financial externalities would justify such general consumption-reducing measures, since what matters is how much people smoke rather than where they do it.

Giving adult smokers information

Governments can use a number of measures to protect adult smokers' health by inducing them to quit or to smoke less, but this most directly conflicts with the assumption of consumer sovereignty, except in the case of smokers who want to quit but find it difficult because they are already addicted. Public policy responses include information about the health risks, subsidization of cessation programs and tax increases. Only the last of these conflicts with permitting individuals to take risky decisions (such as playing dangerous sports, or associating with dangerous friends) on the assumption that individuals know their risks and bear the costs of their choices. Providing information, and helping individual smokers who want to quit, are not in conflict with the principal of consumer sovereignty.

Publicly financed information campaigns and research on the health risks of smoking for adults are justified as a 'first-best' intervention. As Kenkel and Chen elaborate (Chapter 8), such information has had a powerful impact on smoking in high-income countries, although the effects take time to appear. Statutory warnings on tobacco products and regulations on tar and nicotine content are also common throughout the world, but few countries use strong and varied warning labels that convey meaningful information on the hazards of smoking (WHO 1997). An extension of information measures are bans on advertising and promotion. Such bans can help smokers to quit or to avoid starting again (USDHHS 1990). As discussed above, historically the tobacco industry has used advertising to make misleading claims about the health risks. Thus, bans on advertising and promotion are justified as a more intrusive but effective intervention.

Governments may also deregulate nicotine replacement, finance, or provide cessation advice, or even subsidize cessation treatment. As discussed by Novotny *et al.* (Chapter 12) and Gajalakshmi *et al.* (Chapter 2), an individual's risk of premature mortality drops sharply on quitting, especially at younger ages (Doll *et al.* 1994). Note that nicotine replacement products are not public goods, and are in fact provided by the private market: smokers wanting to quit can buy private cessation-help programs and nicotine-delivering patches to ease withdrawal. The argument for public intervention is only that the private market's response may be sub-optimal, partly due to regulation that restricts the public's access to cessation aids.

Taxation is also an effective intervention. Cigarettes are taxed in nearly all countries, sometimes heavily, but mainly because of the administrative ease of collecting tobacco taxes and the relatively inelastic demand. Adults are less price-responsive than children to increases in tobacco tax.

7.3.2 The economic costs of intervening

Given that the effective interventions do not neatly correspond to the market failures they were designed to correct, an important consideration is whether they also generate further economic costs that may be worse than the original market failure. This specifically applies to taxes, given that they are the most blunt, and also most effective, measure to protect children. Below we discuss the key economic costs of intervening, including the costs of foregone pleasure from smoking. Unfortunately, there are few empirical studies of the economic costs of intervening (Warner 1997). We focus on the conceptual framework of costs from various interventions, emphasizing the costs to individuals. We do not discuss costs to producers. Estimates by Peck *et al.* (Chapter 6) suggest that consumer satisfaction is the lion's share of any plausible estimate of benefits from smoking, with producers' benefits being much smaller. Ranson *et al.* (Chapter 18) provide estimates of cost-effectiveness from the perspective of the public sector.

Control measures would cause regular smokers to forego the pleasure of smoking, or incur the costs of quitting, or both. A priori, this loss of consumer surplus would appear to be the same as it would be for bread or any other consumer good. However, tobacco is not a typical consumer good with typical benefits. For the addicted smoker who regrets smoking and expresses a desire to quit, the benefits of smoking are largely the avoidance of the costs of withdrawal. If tobacco control measures reduce individual smokers' consumption, those smokers will face significant withdrawal costs. Furthermore, the costs would differ between current smokers and potential smokers who have not yet begun.

Clean-air restrictions impose costs on smokers by reducing their opportunities to consume cigarettes, or by forcing them outdoors to smoke, raising the time and discomfort associated with smoking, or by imposing fines for smoking in restricted areas. Such restrictions raise the individual's costs relative to his or her benefits, and prompt some smokers to quit or cut back their consumption. For non-smokers, however, restrictions on smoking in public places will bring welfare gains. Given that most regular smokers express a desire to quit but few are successful on their own, it seems likely that the perceived costs of quitting are greater than the perceived costs of continuing to smoke, such as damage to health. By making the costs of continued smoking greater than the costs of withdrawal, higher taxes can induce some smokers to quit. However, smokers who quit or cut back would face withdrawal costs from higher taxes. The extent of the loss depends on levels of tax already paid, price responsiveness, and other factors (see Chaloupka and Warner, *in press*, for a related discussion on the distributional impacts of taxes).

The provision of information about the health consequences of smoking would increase the perceived costs of continuing to smoke, and alert smokers to the benefits of quitting. Widened access to nicotine replacement therapy and other cessation interventions would help also to reduce the costs of quitting.

In considering economic costs to smokers, it is important to distinguish between regular smokers and others. For children and adolescents who are either beginners or merely potential smokers, the costs of avoiding tobacco are likely to be less severe, since addiction may not yet have taken hold and, therefore, withdrawal costs are likely to be lower. Other costs may include, for example, reduced acceptance by peers, less

satisfaction from the thwarted desire to rebel against parents, and the curtailment of other pleasures of smoking.

Bans on advertising and promotion might be expected to increase the costs for smokers of obtaining information about their preferred products. However, to the extent that tobacco advertising focuses more on establishing brand loyalty among the new smokers it attracts rather than on providing information of value to current smokers, even established adult smokers would suffer little information loss or search costs if advertising and promotion were banned (Chapman 1996).

In sum, interventions in the smoking market vary by specificity to the market failure and groups most affected. It is obvious that some interventions are fairly specific to particular problems. This is notably the case for bans on smoking in public places, which are intended to control physical externalities. It is also the case for measures to make smokers pay any additional medical costs due to their behavior, which are intended to control financial externalities. But measures that are aimed at reducing cigarette consumption, rather than controlling where it occurs or who pays the associated costs, are much more general. Taxation and information campaigns are both measures of this type. When it comes to protecting or affecting particular population groups, there is similarly a mixture of more specific and more general connections between an intervention and the group(s) it is meant to affect.

7.4 Government interventions to protect the poor

Aside from government interventions to correct for market failures, intervention to protect the poor is a well-recognized government role (Musgrove 1999). Investing in health is one method but another is to reduce poverty or alleviate its consequences (World Bank 1993). We examine next the issues of how smoking burdens are distributed and the equity implications of some of the interventions analysed above.

In most countries of the world, tobacco consumption is highest among poorer socio-economic groups, and, accordingly, so is the incidence of tobacco-related disease (Chapter 3). Comparison between countries reveals that the poor have higher death rates from smoking-related diseases. Moreover, the poor spend a considerable amount on tobacco as a percentage of their household income, which adversely affects household consumption of items beneficial to children's health (Cohen 1981; World Bank 1993). To some extent, the market failure of incomplete information is more pronounced among the poor (Townsend *et al.* 1994).

Government interventions to reduce the impact of smoking among the poor include taxation, information, and subsidizing access to cessation advice or nicotine replacement therapies (NRT). Differences in the relative importance of different problems imply that the optimal combination of interventions should probably be different for poor and non-poor populations. Several studies suggest that information is less effective in reducing smoking among poor groups than among richer groups (see, for example, USDHHS 1989; Townsend 1998). Smoking prevalence has declined much faster among higher socio-economic groups than among lower groups (Chapter 3). The provision of information (such as mass information campaigns and warning labels),

and bans on advertising and promotion are justified on efficiency grounds. There is little doubt, however, that the poor would use such information less, or less quickly, than would the rich. Another strategy would be to finance or provide cessation advice and cessation aids to help the poor quit smoking if they could not afford to pay for them (Musgrove 1999), provided the effects justify the costs. Delivering these services may be costly or difficult, however, since the poor tend to have less access to basic health services than the rich, and the costs of expanding these services to reach the poor might be considerable.

In contrast to information, tax increases on tobacco reduce consumption more among the poor and less educated than among the rich and more educated. Evidence from the United Kingdom and the United States (CDC 1998; Townsend 1998; Chaloupka 1991) suggests that price elasticities in the lowest income groups are significantly higher than in the highest income groups. Tobacco taxation would thus narrow the difference in consumption between rich and poor (Warner *et al.* 1995). In high-income countries, the poor usually spend a larger share of their incomes on tobacco than do the rich. Thus, a tax on tobacco is necessarily regressive *among those who continue to smoke*. Whether the overall effect of tax increases is regressive, depends on what share of each group, poor and non-poor, would react to the higher price by quitting. If more of the poor quit, then the tax effect could even be progressive. Tobacco taxes, like any other single tax, need to work within the goal of ensuring that the entire system or tax and expenditure is proportional or progressive. (Townsend 1998; Chaloupka and Warner, *in press*). Studies of tobacco taxation in the United States and the United Kingdom suggest that tax increases are less regressive than presumed, and may even be progressive (see Chapter 10). In contrast to the taxation of other goods, when the poor reduce their consumption of tobacco they gain a health benefit in return for the tax burden they continue to pay. Finally, the poor may benefit in another way from increased tobacco taxes, if health and social services are targeted to the poor and financed by those taxes (Saxenian and McGreevey 1996; WHO 1999).

It might be argued that taxes and other tobacco control measures would impose bigger costs on poor individuals. But if this is true for tobacco, it is not unique in public health. Compliance with many health interventions, such as child immunization or family planning, is often more costly for poor households. For example, poor families may have to walk longer distances to clinics than rich families and may lose income in the process. Yet health officials do not hesitate to argue that the health benefits of most interventions, such as immunization, are worth the cost, provided the costs do not rise so high that poor individuals are deterred from using services.

In summary, the fact that the poor devote relatively more of their income to tobacco does not provide any strong equity-based argument against the tobacco control measures analyzed here.

7.5 Conclusion

We have described specific failures in the tobacco market: first, inadequate information about the health risks of smoking; second, inadequate information about the risks of addiction (and particularly the youthful onset of use of an addictive product); and,

third, the external costs of smoking. We argue that because of these market failures, government intervention is justified on economic grounds. However, the interventions themselves are often non-precise and impose costs on even informed adult smokers. What then do these findings imply for public policy?

First, the public health arguments and the economic arguments for tobacco control differ on goals. Public health goals would, rationally, be to eradicate smoking if possible, given that tobacco hazards increase with increasing exposure and overwhelm any possible beneficial effects on health. In contrast, the economic arguments suggest that the socially-optimal level of consumption of tobacco would not be zero. Ideally in economic terms, children would not smoke, but adults who knew their risks and bore their costs entirely themselves could smoke (Warner 1998).

Such a situation would involve considerably less smoking than at present, but would stop well short of eradication. Preventing children from smoking could, in theory, eventually lead to the epidemic disappearing. In reality, slightly older cohorts may take up smoking, and it is unlikely that the recruitment of new smokers would cease. Several of the interventions discussed here, particularly those designed to prevent smoking in youth, protect non-smokers from externalities, and leave smokers better informed.

However, a major problem for the 'economically optimal' view of smoking is the fact that nicotine is addictive. This undermines the consumer-sovereignty argument against intervention, because all evidence suggests that the conditions for a rational choice to become addicted are not met, and the addicted smoker is to some degree a different person from the one who decided to start smoking. If addiction is taken into account, a 'middle-ground' rationale that is justifiable by both economic and public-health arguments becomes feasible. It still falls short of eradication, but is more realistic and justifiable than a purely economics-led view that defines adult consumers as rational and informed. The economic rationale for intervention described here largely involves information and regulation, and not direct public finance or the provision of private goods, except perhaps to the poor. As such, it leaves much room for private choice.

As with other areas of public policy, governments have to make choices, drawing here on economics, epidemiology, and public health. Even limited reductions in the prevalence of smoking, achieved as the result of interventions to correct market failures, would, by any measure, constitute an enormous public health victory, avoiding millions of deaths per year.

References

- Atkinson, A. B. and Townsend, J. L. (1977). Economic aspects of reduced smoking. *Lancet*, 2(8036), 492-5.
- Bachman, J. G., Wadsworth, K. N., O'Malley, P. M., Johnston, L. D., and Schulenberg, J. (1997). *Smoking, drinking, and drug use in young adulthood: The impacts of new freedoms and new responsibilities*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Barendregt, J. J., Bonneux, L., and van der Maas, P. J. (1997). The health care costs of smoking. *New England Journal of Medicine*, 337(15), 1052-7.

- Becker, G. S. and Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy*, **96**(4), 675–700.
- Becker, G. S., Grossman, M., and Murphy, K. M. (1994). An empirical analysis of cigarette addiction. *American Economic Review*, **84**(3), 396–418.
- Bero, L. A., Glantz, S. A., and Rennie, D. (1994). Publication bias and public health policy on environmental tobacco smoke. *JAMA*, **13**, 133–6.
- Bos, E. R., Hon, V., Maeda, A., Chellaraj, G., and Preker, A. (1999). *Health, Nutrition, and Population Indicators: a Statistical Handbook*. Washington, DC : World Bank.
- California Environmental Protection Agency (1997). *Health Effects of Exposure to Environmental Tobacco Smoke: Final Report*. Office of Environmental Health Hazard Assessment (OEHHA). <http://www.oehha.org/scientific/ets/finalets.htm>
- Centers for Disease Control and Prevention (CDC) (1998). Response to increases in cigarette prices by race/ethnicity, income, and age groups – United States, 1976–1993. *Morbidity and Mortality Weekly Report*, **47**(29), 405–9.
- Chaloupka, F. J. (1991). Rational addictive behavior and cigarette smoking. *Journal of Political Economy*, **99**(4), 722–42.
- Chaloupka, F. J. and K. E. Warner. The economics of smoking. In *The Handbook of Health Economics* (ed. J. Newhouse and A. Culyer). Amsterdam: North Holland. (In press.)
- Chapman, S. (1996). The ethics of tobacco advertising and advertising bans. *Br. Med. Bull.*, **52**(1), 121–31.
- Charlton, A. (1996). Children and smoking: the family circle. *Br. Med. Bull.*, **52**(1), 90–107.
- Charlton, A., While, D., and Kelly, S. (1997). Boys smoking and cigarette-brand-sponsored motor racing. *Lancet*, **350**(9089), 1474.
- Chinese Academy of Preventive Medicine (1997). *Smoking in China: 1996 National Prevalence Survey of Smoking Pattern*. Beijing: China Science and Technology Press.
- Cohen, N. (1981). Smoking, health, and survival: prospects in Bangladesh. *Lancet*, **1**(8229), 1090–3.
- Collins, D. and Lapsley, H. (1998). Estimating and disaggregating the social costs of tobacco. In *The Economics of Tobacco Control: Towards an Optimal Policy Mix* (ed. I. Abedian, R. van der Merwe, N. Wilkins and P. Jha), pp. 155–78. Cape Town, Applied Fiscal Research Centre: University of Cape Town.
- Doll, R., Peto, R., Wheatley, K., Gray, R., and Sutherland, I. (1994). Mortality in relation to smoking: 40 years observations on male British doctors. *British Medical Journal*, **309**(6959), 901–11.
- The Economist* (1995). An anti-smoking wheeze: Washington needs a sensible all-drugs policy, not a ‘war on teenage smoking’. 19 August, pp. 14–15.
- The Economist* (1997). Tobacco and tolerance. 20 December, pp. 59–61.
- Ensor, T. (1992). Regulating tobacco consumption in developing countries. *Health Policy and Planning*, **7**, 375–81.
- Environmental Protection Agency (1992). *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*. EPA, Office of Research and Development, Office of Air and Radiation. EPA/600/6–90/006F.
- Glantz, S. A., Barnes, D. E., Bero, L., Hanauer, P., and Slade, J. (1995). Looking through a keyhole at the tobacco industry. The Brown and Williamson documents. *JAMA*, **274**(3), 219–24.
- Gorovitz, E., Mosher, J., and Pertschuk, M. (1998). Pre-emption or prevention?: lessons from efforts to control firearms, alcohol, and tobacco. *Journal of Public Health Policy*, **19**(1), 36–50.
- Harris, J. E. (1994). *A Working Model for Predicting the Consumption and Revenue Impacts of Large Increases in the U.S. Federal Cigarette Excise Tax*. Working paper no. 4803. Cambridge (MA): National Bureau of Economic Research.
- Hodgson, T. A. (1992). Cigarette smoking and lifetime medical expenditures. *Milbank Quarterly*, **70**(1), 81–125.

- Institute of Medicine (1994). *Growing Up Tobacco Free*. National Academy Press: Washington DC.
- James, E. (1994). *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*. Oxford and New York: World Bank and Oxford University Press.
- Kessler, D. A., Barnett, P. S., Witt, A., Zeller, M. R., Mande, J. R., and Schultz, W. B. (1997). The legal and scientific basis of FDA's assertion of jurisdiction over cigarettes and smokeless tobacco. *JAMA*, **277**, 405–9.
- Krutilla, J. V. (1967). Conservations reconsidered. *American Economic Review*, **57**, 776–86.
- Leu, R. E. and Schaub, T. (1983). Does smoking increase medical care expenditure? *Social Science and Medicine*, **17**(23), 1907–14.
- Levshin, V. and Droggachih, V. (1999). *Knowledge and Education Regarding Smoking Among Moscow Teenagers*. Paper presented at the workshop on Tobacco Control in Central and Eastern Europe. Las Palmas de Gran Canaria. February 26.
- Manning, W. G. (1989). The taxes of sin: do smokers and drinkers pay their way? *Journal of the American Medical Association*, **261**(11), 1604–09.
- Manning, W. G., Keeler, E. B., Newhouse, J. P., Sloss, E. M., and Wasserman, J. (1991). *The Costs of Poor Health Habits*. Cambridge, Mass.: Harvard University Press.
- Mannino, D. M., Siegel, M., Husten, C., Rose, D., and Etzel, R. (1996). Environmental tobacco smoke exposure and health effects in children: results from the 1991 National Health Interview Survey. *Tob. Control*, **5**(1), 13–18.
- Murray, C. J. and Lopez, A. D. (ed.) (1996). *The Global Burden of Disease: a Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020*. Cambridge, Mass.: Harvard School of Public Health.
- Murray, M., Swan, A. V., Johnson, M. R., and Bewley, B. R. (1983). Some factors associated with increased risk of smoking by children. *Journal of Child Psychology and Psychiatry*, **24**(2), 223–32.
- Musgrove P. Public spending on health care: how are different criteria related? *Health Policy* 1999 Jun. **47**(3):207–23.
- National Cancer Institute (NCI) (1999). *Health Effects of Exposure to Environmental Tobacco Smoke*. The Report of the California Environmental Protection Agency. Smoking and Tobacco Control Monograph no. 10. Bethesda, MD. US Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 99–4645.
- National Cancer Policy Board (1998). *Taking Action to Reduce Tobacco Use*. Washington, DC: National Academy Press.
- O'Malley, P.M., Bachman, J.G., and Johnston, L.D. (1988). Period, age and cohort effects on substance use among young Americans: a decade of change, 1976–86. *American Journal of Public Health*, **78**(10), 1315–21.
- Orphanides, A., and Zervos, D. (1995). Rational addiction with learning and regret. *Journal of Political Economy*, **103**(4), 739–58.
- Pekurinen, M. (1991). *Economic Aspects of Smoking: Is There a Case for Government Intervention in Finland?* Helsinki: Vapok-Publishing.
- Peto, R. (1986). Influence of dose and duration of smoking on lung cancer rates. In *Tobacco: a Major International Health Hazard*. (ed. R. Peto, and D. Zaridze), pp. 23–34. International Agency for Research on Cancer, 1986 (IARC Scientific Publications, no. 74).
- Peto, R., Lopez, A. D., Boreham, J., Thun, M., and Heath, C. Jr. (1994). *Mortality from Smoking in Developed Countries 1950–2000*. Oxford: Oxford University Press.
- Peto, R., Chen, Z. M., and Boreham, J. (1999). Tobacco: the growing epidemic. *Nature Medicine*, **5**(1), 15–7.
- Reid, D. (1996). Tobacco control: overview. *British Medical Bulletin*, **52**(1), 108–20.

- Saxenian, H. and McGreevey, B. (1996). *China: Issues and Options in Health Financing*. World Bank Report No. 15278-CHA, Washington, DC.
- Suranovic, S. M., Goldfarb, R. S., and Leonard, T. C. (1999). An economic theory of cigarette addiction. *Journal of Health Economics*, **18**, 1–29.
- Sweda, E. L. Jr. and Daynard, R. A. (1996). Tobacco industry tactics. *Br. Med. Bull.*, **52**(1), 183–92.
- Townsend, J., Roderick, P., and Cooper, J. (1994). Cigarette smoking by socioeconomic group, sex, and age: effects of price, income, and health publicity. *British Medical Journal*, **309**(6959), 923–27.
- Townsend (1998). The role of taxation policy in tobacco control. In *The Economics of Tobacco Control* (ed. I. Abedian, R. van der Merwe, N. Wilkins, and P. Jha), pp. 85–101. Cape Town, South Africa: Applied Fiscal Research Centre, University of Cape Town.
- US Department of Health and Human Services (1986). *The Health Consequences of Smoking For Women*. US Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on smoking and Health. Rockville, Maryland
- US Department of Health and Human Services (1989). *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General*. Rockville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. DHHS Publication No. (CDC)89–8411.
- US Department of Health and Human Services (1990). *The Health Benefits of Smoking Cessation: A Report of the Surgeon General*. Rockville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. DHHS Publication No. (CDC) 90–8416.
- Van der Merwe, R. (1998). The economics of tobacco control in South Africa. In *The Economics of Tobacco Control* (ed. I. Abedian, R. van der Merwe, N. Wilkins, and P. Jha), pp. 251–71. Cape Town, South Africa: Applied Fiscal Research Centre, University of Cape Town.
- Viscusi, W. K. (1995). Cigarette taxation and the social consequences of smoking. In *Tax Policy and the Economy*. (ed. J. M. Poterba). Cambridge, MA, MIT Press. **9**, 51–101.
- Wald, N. J. and Hackshaw, A. K. (1996). Cigarette smoking: an epidemiological overview. *British Medical Bulletin*, **52**(1), 3–11.
- Warner, K. E., Goldenhar, L. M., and McLaughlin, C. G. (1992). Cigarette advertising and magazine coverage of the hazards of smoking. A statistical analysis. *N. Engl. J. Med.*, **326**, 305–9.
- Warner, K. E. (1997). Cost-effectiveness of smoking cessation therapies: interpretation of the evidence and implications for coverage. *Pharmacoeconomics*, **11**, 538–49.
- Warner, K. E. (1998). The economics of tobacco and health: an overview. In *The Economics of Tobacco Control* (ed. I. Abedian, R. van der Merwe, N. Wilkins and P. Jha), pp. 55–75. Cape Town, South Africa: Applied Fiscal Research Centre, University of Cape Town.
- Warner, K. E., Chaloupka, F. J., Cook, P. J., Manning W. G., Newhouse, J. P., Novotny, T. E. *et al.* (1995). Criteria for determining an optimal cigarette tax: the economist's perspective. *Tobacco Control*, **4**, 80–6.
- Weinstein, N. D. (1998). Accuracy of smokers risk perceptions. *Annals of Behavioral Medicine*, **20**(2), 135–40.
- World Bank (1992). *China: Long-term Issues and Options in the Health Transition*. Washington, DC.
- World Bank (1993). *The World Development Report 1993: Investing in Health*. New York: Oxford University Press.
- World Health Organization (1997). *Tobacco or Health: a Global Status Report*. Geneva, Switzerland.

- World Health Organization (1999). *The World Health Report 1999: Making a difference*. Geneva, Switzerland.
- Zatonski, W. (1996). *Evolution of Health in Poland Since 1988*. Warsaw: Marie Skeodowska-Curie Cancer Center and Institute of Oncology, Department of Epidemiology and Cancer Prevention.