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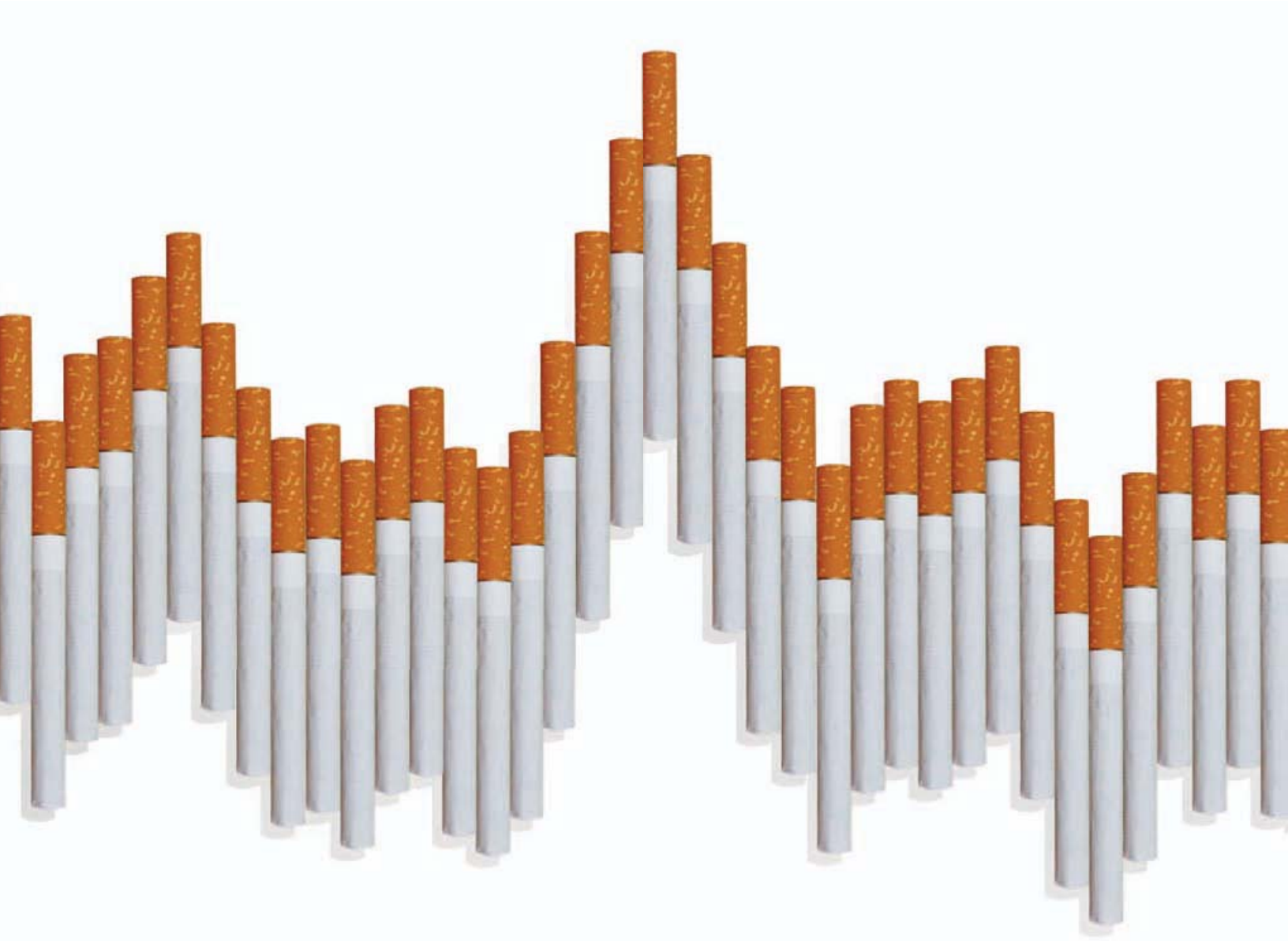
Tobacco Taxes

A Win–Win Measure for Fiscal Space and Health



Asian Development Bank

Tobacco Taxes

A Win–Win Measure for Fiscal Space and Health

November 2012

Asian Development Bank

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Abbreviations

ADB	–	Asian Development Bank
CDC	–	Centers for Disease Control and Prevention
GATS	–	Global Adult Tobacco Survey
GDP	–	gross domestic product
IARC	–	International Agency for Research on Cancer
PPP	–	purchasing power parity
PRC	–	People's Republic of China
SES	–	socioeconomic status
UN	–	United Nations
WHO	–	World Health Organization

Foreword

The Asian Development Bank (ADB) is committed to inclusive growth and poverty reduction in the Asia Pacific region. Mitigating the impact of tobacco use is an important priority in this region. ADB commissioned an expert group to estimate the health and fiscal impacts of higher taxes on cigarettes in the region, with a focus on the People's Republic of China, India, the Philippines, Thailand, and Viet Nam. The report finds that there is a win–win situation in terms of reduced disease and disability from smoking as well as increases in revenue.

Aside from being a leading cause of the early deaths of adults worldwide, the report notes that smoking contributes to poverty traps from diseases leading to household consequences. The addictive nature of tobacco use crowds out other more productive household spending. The report finds that increasing taxes is likely to result in direct and indirect health benefits that outweigh impact on household income of the poor. It concludes that based on current data, the poorest in each country would bear only a small proportion of the extra tax burden, but would reap most of the health benefits.

Tobacco control is of growing importance because of population aging and rising health care costs in countries in which ADB is actively engaged. Indeed, a survey of business leaders conducted by the World Economic Forum recognized chronic diseases, most of which are made more common by smoking, to be potentially one of the major global risks in terms of cost and scale. Thus, all governments need to take steps to prevent and reduce smoking, in particular among young people. Increasing taxation of tobacco is an important policy option to discourage smoking and increase funds for disease prevention and care.

The report is timely as the results were presented at the World Conference on Tobacco or Health held in Singapore in March 2012 and the World Health Organization's Conference of Parties for the Framework Convention on Tobacco Control met in Seoul, Republic of Korea in November 2012 to discuss taxation and other key elements of global tobacco control.

We hope that this report will help to inform readers about the economics of tobacco control, and will contribute to the discussions by policy makers and development partners in this region.

Signed

Vincent de Wit
Chairperson, ADB Health Community of Practice
Manila, November 2012

Acknowledgments

This report was commissioned by the Asian Development Bank's Health Community of Practice in recognition of the link between the rising threat of premature death from noncommunicable diseases (NCD) and increased use of tobacco products in Asia and the Pacific, particularly in countries with ageing populations.

The report was written by a team led by Prabhat Jha of the Centre for Global Health Research (CGHR), University of Toronto, Canada. The other authors were Renu Joseph, David Li, and Cindy Gauvreau, CGHR, and Ian Anderson of Ian Anderson Economics, Canberra, Australia. Patricia Moser, Sekhar Bonu, Indu Bhushan, Iris Claus, and Satoru Araki of the Asian Development Bank and Frank J. Chaloupka of the University of Illinois provided invaluable comments. The team thanks Ulysses Dorotheo, Paul Isenman, and Emmanuel Guindon for helpful comments and Rodel S. Bautista for editorial assistance. We thank the participants at an ADB-led consultation on tobacco taxes in the region held in Manila on 14–15 July 2012 (see Appendix 1 for a list of participants). Honey May Manzano-Guerzon, Marian Lagmay, and Lizamour Tabora provided support to the tobacco tax consultations. We also thank the Disease Control Priorities 3 for additional technical support for the analytical work.

Executive Summary

Two-thirds of the world's tobacco users live in just 15 countries, and 5 of these high-burden countries (People's Republic of China, India, Philippines, Thailand, and Viet Nam) are in Asia. This report aims to assess how changes in cigarette taxes can reduce consumption and save lives in these high-burden countries. In the absence of intervention, smoking will eventually kill about 267 million current and future cigarette smokers who are alive today in the five countries. We find that for all five countries, increases in cigarette prices (in the range of 25%–100%) effectively reduce the number of smokers and the number of smoking-related deaths, and generate substantial new revenues. In the five countries, a 50% price increase, corresponding to a tax increase of about 70%–122%, would reduce the number of current and future smokers by nearly 67 million and reduce tobacco deaths by over 27 million, while generating over $24 billion in additional revenue annually (a 143%–178% increase over each country's current cigarette tax revenue). The revenue increase, or "fiscal space," averages 0.30% of gross domestic product, with a wide range of 0.07%–2.52%. The poorest socioeconomic groups in each country bear only a relatively small part of the extra tax burdens, but reap a substantial proportion of the health benefits of reduced smoking. The ratio of health benefits accrued to the poor to the extra taxes borne by the poor ranges from 1.4 to 9.5. Thus, large increases in the cigarette tax in all of these countries are unusually attractive for public health and public finance, and are pro-poor in their health benefits.

1 Background

Smoking is a global health hazard, and has long-term health and economic implications. It is now increasingly becoming an epidemic of the poorer, less developed parts of the world. An estimated 5 million–6 million deaths were caused by tobacco use in 2010 (WHO 2011a; Jha 2009). The mortality burden attributed to tobacco is estimated to nearly double by 2030, with approximately 70% of these deaths projected to occur in developing countries. On current smoking patterns, about 1 billion people will be killed from smoking this century, unless there are major increases in smoking cessation among adults. Cessation substantially reduces the risks of continued smoking, and in particular those who quit before age 40 achieve death rates close to nonsmokers (Doll et al. 2004; Peto et al. 1992; Jha 2009). Yet, while cessation has become very common in high-income countries (such that there are more ex-smokers than current smokers in the United Kingdom), cessation is not widespread in Asian countries (CDC 2010). A key pillar of tobacco control thus involves use of price and non-price interventions to substantially raise the number of adults who quit smoking, and preferably at younger ages.

Two-thirds of the world's tobacco users live in 15 countries (WHO 2011a), and 5 of these high-burden countries (People's Republic of China, India, Philippines, Thailand, and Viet Nam) are in Asia. The number of daily cigarettes consumed per smoker in Asian countries is low compared to that in developed countries (WHO 2011a). Despite the lower rates of consumption, smoking death rates per smoker appear to be as extreme as seen in the high-income countries, where smoking has been prevalent for decades. For example, Indian male smokers of cigarettes can expect to lose a full decade of life (Jha et al. 2008), which is comparable to the loss of life expectancy observed among British doctors who were smokers as studied over a 50-year period (Doll et al. 2004). Moreover, many of these years of life lost occur in productive middle age (30–69 years) rather than at more advanced ages. Importantly, with stronger tobacco control measures, most of these deaths are preventable and years lost can be saved.

Tobacco consumption is already disproportionately prevalent among the poor. A recent World Health Organization (WHO) report (2011b) found that people with a low income smoke more than those with a higher income. Not only do the poor tend to smoke more, there is some evidence to support that the harm caused by tobacco to them is greater. Notably, WHO report states that lower income groups were more susceptible to tobacco-related illnesses, particularly in all-cause mortality, lung diseases, and low birth weight. The increased likelihood of low birth weight occurrences in babies born to smokers is also arguably another transmission mechanism for intergenerational poverty, as low birth weight is associated with subsequent metabolic disorders and potential ill health.

In addition, the opportunity costs for households from male tobacco smoking are notably high. Far more men than women smoke worldwide, especially in Asia (CDC 2010). Smoking is maintained by an addiction, and this also affects household decision-making and gender

balance in decision making when spending scarce household resources. In addition, it is two times more likely that males in poor households in Bangladesh with an income below $24 a month are smokers as compared with households with higher incomes. The average amount spent on tobacco by the poorest 10 million male smokers is estimated to equal the costs of an additional 1,400 calories of rice per day, or significant amounts of protein, for each family of these smokers. The World Bank (2006) reports that among poor Indonesians, cigarettes are the second largest commodity item consumed after rice. The amount spent on tobacco was comparable to that spent by the poor on key food items such as vegetables, and six times more than what was spent on eggs and milk.

The Asian Development Bank and its member countries have a joint institutional commitment to inclusive economic growth and to poverty reduction. In this context, an examination of the health and fiscal impacts of higher tobacco taxes is appropriate. This report aims to assess how changes in cigarette taxes can reduce consumption and save lives in these countries as well as to assess the impact of these increases on the health and financial tax burden on the poorest socioeconomic groups. We focus on cigarettes, as these are the dominant type of smoking in the region overall. In India, the most common type of smoked tobacco is bidi, a hand-rolled product that contains about a quarter of the tobacco of cigarettes. Bidis remain largely untaxed (Jha et al. 2011), and their taxation strategies differ from the established patterns of taxation of cigarettes, which are administratively easier to tax than are bidis or other types of tobacco (WHO 2010). Moreover, cigarette smoking is steadily displacing bidi smoking in India (Joseph et al. 2012). Thus, it makes sense for governments to focus on taxation strategies for cigarettes while expanding efforts to tax tobacco products more broadly. A recommendation of this work is to extend this analysis to other tobacco products prevalent in these countries (particularly bidis and chewed tobacco in Bangladesh, India, and Nepal) and to examine issues of substitution of one type of product for the other. Furthermore, the report suggests further work to assess how price changes affect the different strata of society.

2 Methods and Assumptions

We construct a simple, static, but robust compartment model, in which population structure, age- and gender-specific smoking, and expected deaths are estimated. The baseline scenario involves no changes in cigarette consumption patterns. We evaluate the impact of three cigarette price increases (25%, 50%, and 100%) on the current and projected number of future smokers, and smoking-related mortality, stratified by gender and four broad age groups (15–24, 25–44, 45–64, and 65 and above). We also consider the impact that these large price increases have on cigarette sales and revenues. Finally, we consider the impact of the increase in taxes on financial burdens and health gains of the poorest socioeconomic groups.

For each age group, the change in the number of smokers due to a price increase is a product of the (i) original number of smokers in that age group, (ii) price elasticity of cigarette demand, (iii) net impact of half the price change on prevalence (which we take as 50% [IARC 2011]), and (iv) actual magnitude of the price increase. The change in smoking mortality from a given price increase on cigarettes is the product of the (i) magnitude of the price change for that product, (ii) price elasticity of cigarettes, (iii) net impact of half this price change on reductions in the prevalence of smoking, (iv) number of expected smoking-related deaths prior to the price increase, and (v) reductions in deaths among those who quit, adjusted for the age group at which they quit.

The population information is from the United Nations Population Division (UN 2011), and cigarette prevalence data are from the Global Adult Tobacco Survey (GATS) results (CDC 2010). Cigarette sales data are derived from Euromonitor (2009) and the tax rates and cigarette prices for each country from MPOWER 2011 (WHO 2011a). The future adult smoking prevalence of youths already alive but not yet smoking (those currently under the age of 15) is assumed to be the current prevalence rate for the age group at which smoking rates peak (30–44 years) in the GATS data. Our model assumes that there is no additional initiation among those 15 years and older. This is a conservative approach as the prevalence for those 15–29 years old is likely to rise given the peak for those 30–44, as has been shown in India (Jha et al. 2008). The increased annual cigarette revenues are from the one-time tax increase.

Based on accumulated epidemiological evidence, we assume that half of all regular cigarette smokers will eventually die from smoking-related illnesses based on a substantial amount of epidemiological studies worldwide (Doll et al. 2004; Peto et al. 1992; Jha 2009; see Jha et al. 2006 for a review). Quitting confers benefits and the longer one has quit, the greater the accrual of these benefits. For the youngest age group of smokers who quit (15–24 years old), we assume that 97% of those who quit avoid premature death, while this figure decreases to 85% for those 25–44 years old and to 75% for those 45–64 years old. For those who quit at 65 years and above, only 25% are assumed to avoid premature death (Doll et al. 2004; Jha et al. 2006). In the region, given the younger age of the population, the overall reduction in risk

Table 1 Price Elasticities for Cigarettes in Recent Studies in Asia

Country	High Estimate	Low Estimate	Citations
People's Republic of China	–0.84	–0.007	Hu et al. 2008
India	–1.00	–0.350	John et al. 2010; Guindon et al. 2011
Philippines	–0.87	–0.150	Quimbo et al. 2012
Thailand	–0.67	–0.090	Guindon, Perucic, and Boisclair 2003; Sarntisart 2003
Viet Nam	–0.53	–0.390	Guindon et al. 2010

Source: Author reviews.

approaches 80% of those who were nonsmokers. Children who do not start smoking avoid 100% of the premature death risk that would have occurred had they become smokers.

A "universal" price elasticity of –0.4 is used for adults (i.e., a 100% increase in the price of cigarettes is associated with a 40% reduction in the quantity demanded). Note that some local price elasticity studies in the region find higher price responsiveness to cigarettes, but we have used a consistent value of –0.4 as this represents the modal estimates of price elasticity studies done around the world (IARC 2011). Many, but not all, of the studies in the region find greater price responsiveness (Table 1). In most high-income countries, the measured elasticities over the last few decades have centered on –0.4 (IARC 2011). Greater elasticity will imply more of a public health impact and less revenue generation, while lower elasticity will imply smaller public health impact and more revenues (WHO 2010; IARC 2011).

To evaluate the potential impact of price changes, other important assumptions are applied, including that (i) young smokers are twice as responsive to price changes as adults (see reviews in IARC 2011; WHO 2010); (ii) males and females have the same response to price changes; and (iii) one half of price increases impacts the smoking rate (participation elasticity), and the other half affects the consumption of non-quitters. We presume that no health benefits arise from reduced consumption due to a price hike among continuing smokers, although this is likely not to be the case (meaning our analyses of mortality reduction from higher taxes are conservative). We also undertake sensitivity analyses by looking at the impact of three different price elasticity estimates (–0.1, –0.2, and –0.4) and three price rise scenarios (25%, 50%, and 100%) to evaluate the impact on cigarette sales and revenue. This variation also permits us to examine the lower end of price elasticities published in the region (Sarntisart 2003; Guindon, Perucic, and Boisclair 2003; Hu et al. 2008; Guindon et al. 2010; John et al. 2010; Guindon et al. 2011; Quimbo et al. 2012). Future research will study more extreme price elasticities (–0.6 to –0.8).[1]

In order to examine the regressivity of tobacco taxes, we constructed models in which average price elasticities were standardized to the universal elasticity of –0.4, while the ratio of price elasticities across socioeconomic groups remained the same as in the local elasticity studies, defined as those stratified by income or education (Sarntisart 2003; Kinh et al. 2006; Mao et al.

[1] The basic spreadsheets used can be requested by writing to the corresponding author Prabhat Jha at Jhap@smh.ca.

2007; Guindon et al. 2011; Quimbo et al. 2012). Assumptions were similar to those outlined previously. A tiered cigarette price and tax structure was constructed for each country using various data sources, including the GATS, such that wealthier groups paid higher prices and taxes (CDC 2010; Kostova et al. 2012). The effect of a 50% price rise on marginal taxes and smoking deaths was modeled by socioeconomic group. Similar models were also constructed for each country using local elasticities (with similar results to the universal elasticity models).

3 Results

A. Cigarette Smoking Patterns and Taxes

Table 2 provides a brief overview of cigarette smoking in the five countries. Adult male prevalence of cigarette smoking ranges from around 53% in the People's Republic of China (PRC) to around 10% in India. Male smoking is significantly higher than female smoking in these countries, which is in line with global patterns. The price per pack expressed in United States (US) dollars adjusted for purchasing power parity (PPP) varies from $0.63 in the Philippines to $2.43 in India. (PPP is preferable to US dollars at market exchange rates, because PPP takes into account local prices and affordability in each country.) Tax rates as a percentage of prices vary from 69% in Thailand to 41% in the PRC. In this region, the PRC is the largest consumer of cigarettes (at 1.7 trillion sticks). Though of a lesser magnitude, cigarette consumption in the other countries in this report is noteworthy because they are large, fast-growing markets. Adult men constitute about 95% of the current smokers in the five countries. The average number of cigarettes per man per day ranges from 0.5 in India (where bidi smoking dominates) to close to 8 in the PRC.

Table 2 Cigarette Smoking: Prevalence, Price, and Tax Information

Country	Adult Cigarette Prevalence (%)			Price Per Pack			Cigarettes Consumed		GDP in $ Billion (per capita in '000 PPP-adjusted $)
	Male	Female	Total	Local Currency	PPP-Adjusted $	Tax Per Pack (%)	Sticks Per Year (billion)	Per Adult Male per day	
PRC	52.9	2.4	28.1	5	1.29	41	1,700	7.9	5,879 (7.5)
India	10.3	0.8	5.7	70	2.43	46	93	0.5	1,729 (3.0)
Philippines	47.2	8.7	27.9	22	0.63	41	81	6.2	319 (3.5)
Thailand	45.4	2.8	23.5	58	2.68	69	39	3.7	200 (8.1)
Viet Nam	39.7	1.2	19.9	14,000	0.78	42	81	6.5	104 (3.1)
All countries							**1,994**		**8,230**
% of global total (cigarette consumption or GDP)							36		13

GDP = gross domestic product, PPP = purchasing power parity, PRC = People's Republic of China.

Sources:

a. Prevalence information has been gathered from Global Adult Tobacco Survey (GATS) reports and fact sheets (2008–2010; CDC 2010).

b. Price data for the most popular brand and tax rates are obtained from MPOWER (WHO 2011) in US dollars at official exchange rates (except for the Philippines), which are based on Southeast Asia Tobacco Control Alliance reports.

c. Sales information is obtained from Euromonitor reports.

d. Price in US dollars adjusted for PPP, the GDP are from the World Bank Development Indicators (2011), and the GDP per capita is from Kostova et al. (2012).

e. Data for India excludes bidi smoking.

Table 3 Cigarette Consumption in Current and Future Smokers and Future Deaths Attributable to Smoking (million)

Country	No. of Smokers Today			Future Smokers	Deaths Expected		
	Male	Female	Total	Total	Current Smokers	Future Smokers	Total
PRC	293.8	12.7	306.5	88.6	153.3	44.3	197.6
India	44.5	3.3	47.8	23.9	23.9	11.9	35.8
Philippines	18.3	3.6	21.9	9.9	10.9	5.0	15.9
Thailand	11.8	0.8	12.6	3.4	6.3	1.7	8.0
Viet Nam	12.9	0.4	13.3	5.7	6.7	2.9	9.5
Total	**381.3**	**20.8**	**402.1**	**131.6**	**201.0**	**65.8**	**266.8**

PRC = People's Republic of China.

Source: Author calculations.

The total number of cigarette smokers alive today is over 400 million in the five countries, and the number of additional future cigarette smokers at current rates is projected to be about 132 million. Thus, in the presence of generally low cessation rates in the five countries, smoking will kill about 267 million of these 530 million current and future cigarette smokers. The majority of these deaths (201 million) will be among current smokers. Therefore, the main strategy for all countries is to raise substantially the number of current smokers who quit via price and non-price interventions.

B. Summary Impact of Higher Taxes

Taxation, leading to a price increase, is the most direct and effective measure to reduce smoking (Jha and Chalpouka 1999). In Table 4, we examine the effects of a price increase of 50% or 100% to determine the number of smokers who quit or do not start, the number of deaths avoided, and the extra revenue raised.

A 50% price rise in cigarettes substantially reduces current and future consumption in all five countries, causing nearly 67 million current smokers to quit or youths not to start. This represents 12% of the total current and future smokers across the countries. A 50% price increase in cigarettes avoids about 27 million tobacco-attributable deaths, most of which are in the two most populous countries in the world: The PRC avoids nearly 20 million tobacco deaths, and India avoids over 4 million tobacco deaths. An even higher price increase of 100% yields greater benefits, saving nearly 55 million lives in the five countries (or about 20% of the projected deaths). The extra annual revenue raised with a 50% price increase is about $25 billion, most of which ($20 billion) is in the PRC. This represents an increase of about 138%–178% over baseline revenue in each of the countries, or an average of 0.30% of gross domestic product (with a substantial range of 0.07%–2.52% depending on the elasticity and price increase). Even with much higher prices from tax increases and with a wide range of price elasticities used, revenues continue to increase and consumption continues to fall substantially (see Appendix 2 for the detailed calculations for each country).

Table 4 Changes in Cigarette Consumption and Deaths and Revenue with Various Price Increases

Country	No. of Smokers Who Quit/ Do Not Start (million) After a 50% Price Increase	Deaths Avoided (million)		Increases in Annual Revenue with 50% Price Increase		Range	
		50% Price Increase	100% Price Increase	Extra Revenue in $ Billion (current dollars)*	% Increase Over Baseline	With 25%–100% Price Increases	As % of GDP with 25%–100% Price Increase
PRC	48.4	19.6	39.2	20.0	178	145%–310%	0.20%–0.92%
India	9.6	4.1	8.1	2.2	167	139%–286%	0.07%–0.35%
Philippines	4.2	1.8	3.5	0.6	177	145%–309%	0.11%–0.53%
Thailand	1.9	0.8	1.6	0.9	138	123%–220%	0.27%–1.45%
Viet Nam	2.5	1.0	2.1	1.0	175	144%–304%	0.54%–2.52%
Total	**66.5**	**27.2**	**54.5**	**24.7**			**0.30% (average)**
% of total	12.0	10.0	20.0				

GDP = gross domestic product, PRC = People's Republic of China.

* The above values are shown with a price elasticity of –0.4. Appendix 2 shows the results using alternative elasticities of –0.1 to –0.4 for price increases of 25%, 50%, or 100%.

Source: Author calculations.

Table 5 Tax Proportions, Increases Required, and Street Price with 50% or 100% Price Increase

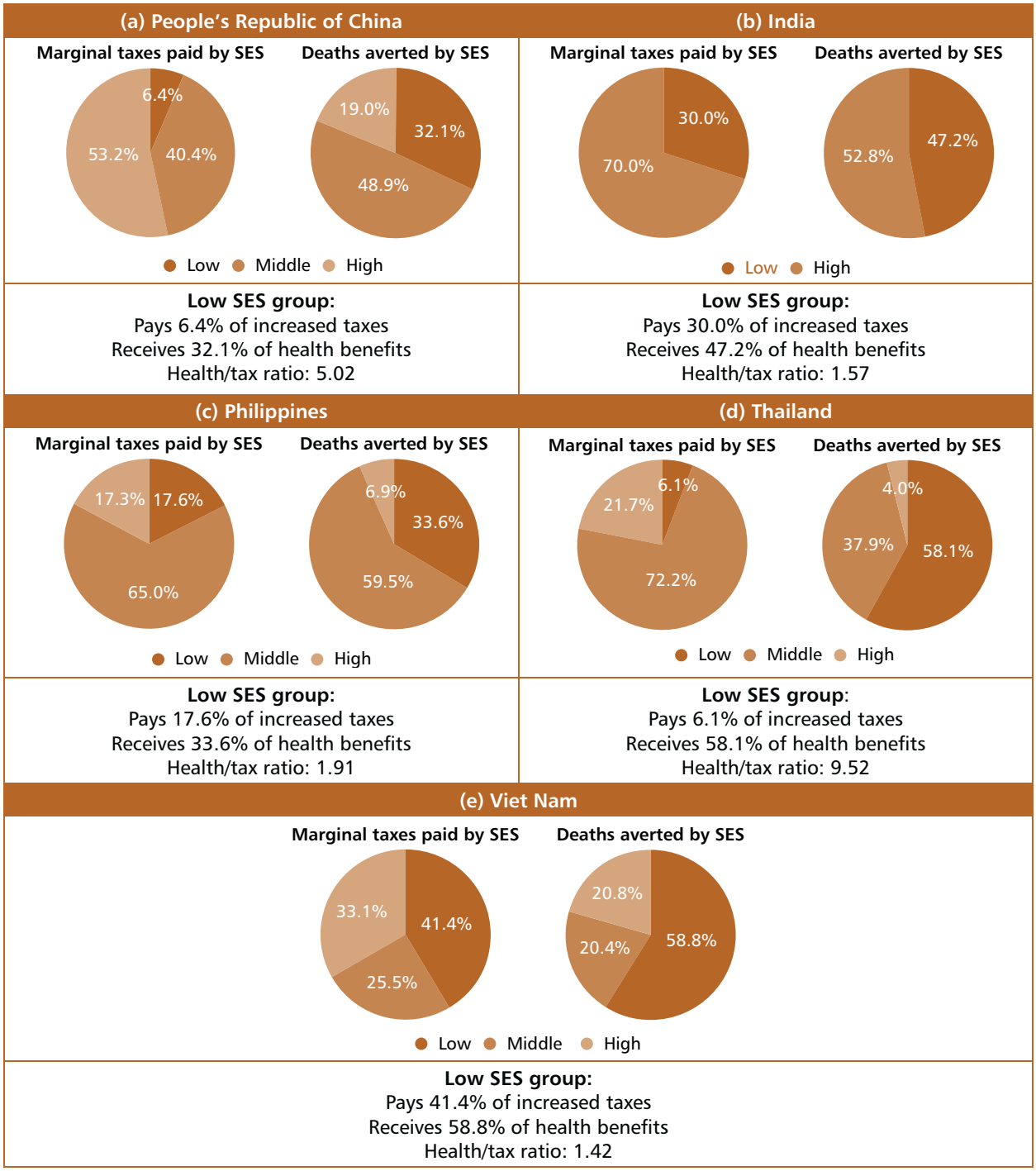
Country	Tax as % of Street Price			Tax Increase (%) Needed to Achieve		Retail Price in Local Currency (and in PPP $)	
	Current	50% Price Increase	100% Price Increase	50% Price Increase	100% Price Increase	50% Price Increase	100% Price Increase
PRC	41	61	71	222	344	8 (1.94)	10 (2.58)
India	46	64	73	209	317	105 (3.65)	140 (4.86)
Philippines	41	61	71	222	343	33 (0.95)	44 (1.26)
Thailand	69	79	85	172	245	87 (4.02)	116 (5.36)
Viet Nam	42	61	71	219	338	21,000 (1.17)	28,000 (1.56)

PPP = purchasing power parity, PRC = People's Republic of China.

Source: Author calculations.

The tax increases required to achieve a 50% or 100% increase in retail price are large (Table 5), but not outside the range of tax increases that other countries, such as France, have implemented (Jha et al. 2011), or which are being considered by the Government of the Philippines. A tax increase of about 172%–222%, depending on country, would raise the retail prices by 50%, and a tax increase of about 245%–344% would double the retail prices. Even with these apparently large increases in tax, the proportion of the retail price that is tax would be well within the range of 75%–90% that is observed in the high-income countries that have substantially reduced

Figure 1 Model Projections Using Universal Price Elasticities Based on a 50% Increase in Prices, by SES



SES = socioeconomic status.

Source: Author calculations.

tobacco smoking and tobacco-attributable deaths (WHO 2010, 2011a). Moreover, the retail price in US dollars (adjusted for PPP) would range from less than $1 to over $5, well within the range of cigarette prices that are now commonly charged in high-income countries. As noted above, even in a wide range of price elasticities used, these tax increases would continue to substantially increase revenue from cigarette taxes.

The socioeconomic status (SES) group analysis using universal price elasticities (adjusted for local SES differences) suggests that the extra tax burdens from a 50% price rise are not borne mostly by the poor (Figure 1). However, given that the prevalence of smoking is greater among the poor, the reduction in mortality is strongly concentrated among the poor in the various countries in Asia. In the PRC, following a 50% price rise, the low SES group would account for 6% of marginal taxes paid, but 32% of smoking deaths averted. In India, the low SES group would account for 30% of marginal taxes paid, but 47% of smoking deaths averted. Similar patterns were observed in low SES groups in the Philippines, with 18% of marginal taxes paid, but 34% of deaths averted; in Thailand, with 6% versus 58%; and in Viet Nam, with 41% versus 59%, respectively. The ratio of health benefits accrued to the poor to the extra taxes borne by the poor ranges from 1.4 to 9.5. The wide variability reflects not only differences in cigarette smoking, but also quite a wide variation in the price elasticities by SES group across countries. The use of a universal elasticity of –0.4, however, reduces the variation by imposing an overall elasticity. Similar results show higher taxes at the margin, not borne by the poor, even if local price elasticities are used (data not shown).

4 Discussion

We find that for the five countries in Asia, increases in cigarette prices (in the range of 25%–100%) effectively reduce the number of smokers and the number of smoking-related deaths, and generate substantial revenues. In these countries, a 50% price increase, corresponding to a tax increase of about 70%–122% would reduce the number of current and future smokers by nearly 67 million and reduce tobacco deaths by over 27 million, while generating over $24 billion in additional revenue annually (a 143%–178% increase over each country's current tax revenue), expanding the financial resources ("fiscal space") available to each government. Revenue increases average 0.30% of GDP, with a substantial range of 0.07%–2.52%. The poorest socioeconomic groups in each country bear only a relatively small part of the extra tax burdens, but do reap a substantial proportion of the health benefits of reduced smoking. The ratio of health benefits accrued to the poor to the extra taxes borne by the poor ranges from 1.4 to 9.5.

In all countries in this analysis, the number of male smokers far exceeds that of female smokers. Thus, the benefits of higher prices in terms of reduced numbers of smokers and deaths accumulate more for males than for females, across the region. The countries in this study have lower per capita cigarette consumption than high-income countries. However, all the countries are populous, growing economies, where cigarette smoking is on the rise. A failure to stem the tobacco epidemic will have major public health implications for both current and future generations.

In most countries, *overall* tobacco taxes are regressive, meaning that a greater proportion of the tax is borne by the poorest versus richest current smokers. In the five countries studied here, *marginal* tax increases appear to be progressive, and health benefits are also greater in poorer groups. Finally, it is of note that there is no issue of regressivity among future smokers who have yet to start—higher taxes do not incur any additional financial hardship if future smokers simply do not take up smoking (Jha and Chaloupka 1999).

Governments might be influenced by tobacco industry claims that large price hikes would reduce revenues. The results from a series of price increases with a range of price elasticities demonstrate that large increases in taxes need not be detrimental from the standpoint of revenue generation and have the additional benefit of saving lives.

Even if revenue were to decline in extreme scenarios (well beyond the approximately 300% tax increases we have modeled), these declines should be viewed in the context of overall increased revenues from economic growth, productivity, reduced health expenditures, and other benefits of tobacco control. Thus, any net revenue loss (or indeed gain) is likely to be a small part of the economies of nearly all these countries. In contrast, the economic gains from better adult health are likely to be much larger than the small change in revenue. Recent analyses by the

United States Congressional Budget Office (2012) found that a $0.50 increase in US federal excise tax on cigarettes would reduce federal budget deficits over the next 50 years from a combination of higher revenue and the income growth from improvements in health. The analyses took into account the increased outlays due to longer life expectancy (which were small as a percentage of GDP). More widely, the welfare benefit of better and longer life is substantial and suggests that, on the whole, aggressive tobacco control via higher taxation enhances overall economic welfare. The World Economic Forum (2011) and the Copenhagen Consensus (Jha et al. 2012) recently came to similar conclusions. In the case of the PRC, the most extreme case (a 100% price hike with a price elasticity of –0.1) generates additional revenues of $54 billion, or 0.92% of GDP. Previous analyses by the World Bank (McGreevey and Saxenian 1999) suggested that a much smaller 10% price hike would be sufficient to generate sufficient revenues so as to finance about one-third of a basic package of health care services for the poorest rural PRC residents.

In practical terms, the 50% price rise here would translate to a tax increase of 143%–178% across countries. While a 50% price rise would require a large tax increase, Barbados and other countries have implemented tax hikes of this magnitude. France used a substantial annual tax increase above the rate of inflation to triple the price of tobacco in real terms over a decade or so. As a result, per capita consumption of cigarettes has been halved and, more recently, French lung cancer rates at younger ages (a sensitive indicator of recent smoking) have fallen (Jha 2009). Maintaining tax increases in real terms (i.e., prices adjusted for inflation and in line with real income growth) is an important pricing strategy. Failure to increase the real price of cigarettes means that cigarettes become more affordable over time as incomes—and prices of other products—rise (WHO 2010; IARC 2011). The real value of government revenues from tobacco taxation also erodes over time if not adjusted for inflation and real income growth. France's tax revenues increased in real terms from about 6 million euros to 12 billion euros in 1 decade. More recently, Mexico introduced a substantial increase in taxes, despite obvious political opposition.

Substitution of cigarettes with bidis is an obvious concern for India (as well as Bangladesh and Nepal, which are not studied here). Emerging evidence finds that cigarettes are displacing bidis in India (Joseph et al. 2012), and that the markets for the two products might well be quite segmented. Nonetheless, some switching to bidis would be expected if cigarette prices were to rise. The best solution is to adopt a parallel and feasible tax increase on bidis along with better enforcement that monitors bidi industry economic activity, sales, and distribution (Jha et al. 2011).

We do not discuss here the key concerns about smuggling of tobacco. For this, more detailed reviews are available (WHO 2010; IARC 2011). Smuggling is a real concern, yet analyses have demonstrated that higher taxes still lead to reductions in consumption and increases in revenue, even in the presence of smuggling. For example, Indonesia has raised taxes in the last few years, but revenues continue to increase. A similar pattern was seen in South Africa, which substantially raised tobacco taxes in the 1990s. Consumption fell by over 30% and revenues doubled in real terms, even though reported smuggling rose from 0% to 6% (Van Walbeek 2005). Thus, the best response to smuggling is not to lower tax rates, but to clamp down on large-scale organized smuggling that evidence suggests in some countries may be aided by the tobacco industry. Prominent health warning labels with local tax stamps can help enforcement. The provisions in

the Framework Convention on Tobacco Control on tax increases and on countering smuggling would, if implemented, substantially reduce contraband sales (WHO 2010).

In sum, our simple model suggests that large increases in cigarette prices, anywhere from 25% to 100%, are an effective instrument in reducing the number of smokers and smoking-related deaths, while increasing revenue. These reductions in deaths, paired with the progressive nature of the health benefit and the less regressive nature of the new tax burden, strongly support a rationale for governments in the region to review their tobacco taxation policy.

Appendix 1

Regional Consultation on Tobacco Taxation (14–15 June 2012, Manila, Asian Development Bank)

Co-chairs

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Appendix 2

Detailed Analyses for Each Country

People's Republic of China

Model Parameters for Cigarette Smoking in the People's Republic of China at Baseline, by Gender	Males	Females	Both
Number of current smokers	293,823,000	12,703,000	306,526,000
Premature deaths from smoking	146,911,500	6,351,500	153,263,000
Youth future smokers	86,702,000	1,930,000	88,632,000
Premature deaths among future smokers	43,351,000	965,000	44,316,000
Total number of current and future smokers	380,525,000	14,633,000	395,158,000
Premature deaths in current and future smokers	190,262,500	7,316,500	197,579,000

Scenario for Increase in Price	Current	+25%	+50%	+100%
Tax (%)	41.00	53.00	61.00	71.00
Base (non-tax) price in local currency	2.95	2.95	2.95	2.95
Tax amount in local currency	2.05	3.30	4.55	7.05
Retail price in local currency	5.00	6.25	7.50	10.00
Tax increase needed for price goal (%)	–	161.00	222.00	344.00
Retail price ($)	0.74	0.93	1.11	1.48
Exchange rate (to $)	6.76			
Exchange rates (PPP $)	3.88			

People's Republic of China (all absolute values are in millions)

	Price Increase (tax increase needed)								
	25% Higher Price (161% tax increase)			50% Higher Price (222% tax increase)			100% Higher Price (344% tax increase)		
Alternative price elasticity estimates	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**
Baseline number of smokers	*306.5*								
% reduction in prevalence	–1.3	–2.5	–5.0	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0
Number of smokers who quit	–3.8	–7.7	–15.3	–7.7	–15.3	–30.7	–15.3	–30.7	–61.3
Number of smokers remaining after price increase	302.7	298.9	291.2	298.9	291.2	275.9	291.2	275.9	245.2
Baseline deaths from smoking among adults	*153.3*								
Reduction in premature deaths among adults	**–1.5**	**–3.1**	**–6.1**	**–2.7**	**–5.4**	**–10.7**	**–5.4**	**–10.7**	**–21.5**
% reduction in deaths in adults	–1.0	–2.0	–4.0	–1.8	–3.5	–7.0	–3.5	–7.0	–14.0
Number of deaths after price increase	151.7	150.2	147.1	150.6	147.9	142.5	147.9	142.5	131.8
Youth future smokers	*88.6*								
Youth elasticity	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8
% reduction in youth prevalence	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Youth prevented from starting	–2.2	–4.4	–8.9	–4.4	–8.9	–17.7	–8.9	–17.7	–35.5
Number of youth smokers after price increase	86.4	84.2	79.8	84.2	79.8	70.9	79.8	70.9	53.2
Premature deaths from smoking among youth	*44.3*								
Reduction in smoking deaths among youth	**–1.1**	**–2.2**	**–4.4**	**–2.2**	**–4.4**	**–8.9**	**–4.4**	**–8.9**	**–17.7**
% reduction in smoking deaths among youth	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Total premature deaths avoided	**–2.6**	**–5.3**	**–10.6**	**–4.9**	**–9.8**	**–19.6**	**–9.8**	**–19.6**	**–39.2**
Baseline sales in sticks	*1,700,000*								
Baseline sales in packs	85,000								
Baseline revenues in local currency	174,250								
New sales after price increase	82,875	80,750	76,500	80,750	76,500	68,000	76,500	68,000	51,000
New revenues after price increase	273,488	266,475	252,450	367,413	348,075	309,400	539,325	479,400	359,550
Increase in revenues in local currency	99,238	92,225	78,200	193,163	173,825	135,150	365,075	305,150	185,300
Increase in revenues ($)	14,687	13,649	11,574	28,588	25,726	20,002	54,031	45,162	27,424
% increase in revenues above baseline	**157**	**153**	**145**	**211**	**200**	**178**	**310**	**275**	**206**

PPP = purchasing power parity.

Source: Author calculations.

India

Model Parameters for Cigarette Smoking in India at Baseline, by Gender	Males	Females	Both
Number of current smokers	44,510,000	3,265,000	47,775,000
Premature deaths from smoking	22,255,000	1,632,500	23,887,500
Youth future smokers	22,994,000	870,000	23,864,000
Premature deaths among future smokers	11,497,000	435,000	11,932,000
Total number of current and future smokers	67,504,000	4,135,000	71,639,000
Premature deaths in current and future smokers	33,752,000	2,067,500	35,819,500

Scenario for Increase in Price	Current	+25%	+50%	+100%
Tax (%)	46.00	57.00	64.00	73.00
Base (non-tax) price in local currency	37.80	37.80	37.80	37.80
Tax amount in local currency	32.20	49.70	67.20	102.20
Retail price in local currency	70.00	87.50	105.00	140.00
Tax increase needed for price goal (%)	–	154	209.00	317.00
Retail price ($)	1.51	1.89	2.27	3.02
Exchange rate (to $)	46.36			
Exchange rates (PPP $)	28.81			

India (all absolute values are in millions)

	Price Increase (tax increase needed)								
	25% Higher Price (154% tax increase)			50% Higher Price (209% tax increase)			100% Higher Price (317% tax increase)		
Alternative price elasticity estimates	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**
Baseline number of smokers	*47.8*								
% reduction in prevalence	–1.3	–2.5	–5.0	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0
Number of smokers who quit	–0.6	–1.2	–2.4	–1.2	–2.4	–4.8	–2.4	–4.8	–9.6
Number of smokers remaining after price increase	47.2	46.6	45.4	46.6	45.4	43.0	45.4	43.0	38.2
Baseline deaths from smoking among adults	*23.9*								
Reduction in premature deaths among adults	**–0.2**	**–0.5**	**–1.0**	**–0.4**	**–0.8**	**–1.7**	**–0.8**	**–1.7**	**–3.3**
% reduction in deaths in adults	–1.0	–2.0	–4.0	–1.8	–3.5	–7.0	–3.5	–7.0	–14.0
Number of deaths after price increase	23.6	23.4	22.9	23.5	23.1	22.2	23.1	22.2	20.5
Youth future smokers	*23.9*								
Youth elasticity	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8
% reduction in youth prevalence	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Youth prevented from starting	–0.6	–1.2	–2.4	–1.2	–2.4	–4.8	–2.4	–4.8	–9.5
Number of youth smokers after price increase	23.3	22.7	21.5	22.7	21.5	19.1	21.5	19.1	14.3
Premature deaths from smoking among youth	*11.9*								
Reduction in smoking deaths among youth	**–0.3**	**–0.6**	**–1.2**	**–0.6**	**–1.2**	**–2.4**	**–1.2**	**–2.4**	**–4.8**
% reduction in smoking deaths among youth	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Total premature deaths avoided	**–0.5**	**–1.1**	**–2.1**	**–1.0**	**–2.0**	**–4.1**	**–2.0**	**–4.1**	**–8.1**
Baseline sales in sticks	*93,063*								
Baseline sales in packs	4,653								
Baseline revenues in local currency	149,831								
New sales after price increase	4,537	4,420	4,188	4,420	4,188	3,723	4,188	3,723	2,792
New revenues after price increase	225,479	219,698	208,135	297,056	281,422	250,153	427,995	380,440	285,330
Increase in revenues in local currency	75,648	69,867	58,304	147,225	131,591	100,322	278,164	230,609	135,499
Increase in revenues ($)	1,632	1,507	1,258	3,176	2,839	2,164	6,000	4,975	2,923
% increase in revenues above baseline	**150**	**147**	**139**	**198**	**188**	**167**	**286**	**254**	**190**

PPP = purchasing power parity.

Source: Author calculations.

Philippines

Model Parameters for Cigarette Smoking in Philippines at Baseline, by Gender	Males	Females	Both
Number of current smokers	18,294,000	3,564,000	21,858,000
Premature deaths from smoking	9,147,000	1,782,000	10,929,000
Youth future smokers	8,748,000	1,155,000	9,903,000
Premature deaths among future smokers	4,374,000	577,500	4,951,500
Total number of current and future smokers	27,042,000	4,719,000	31,761,000
Premature deaths in current and future smokers	13,521,000	2,359,500	15,880,500

Scenario for Increase in Price	Current	+25%	+50%	+100%
Tax (%)	41.000	53.00	61.00	71.00
Base (non-tax) price in local currency	12.960	12.96	12.96	12.96
Tax amount in local currency	9.042	14.54	20.04	31.04
Retail price in local currency	22.000	27.50	33.00	44.00
Tax increase needed for price goal (%)	–	161.00	222.00	343.00
Retail price ($)	0.480	0.60	0.72	0.96
Exchange rate (to $)	45.830			

Philippines (all absolute values are in millions)

	Price Increase (tax increase needed)								
	25% Higher Price (161% tax increase)			**50% Higher Price** (222% tax increase)			**100% Higher Price** (343% tax increase)		
Alternative price elasticity estimates	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**
Baseline number of smokers	*21.9*								
% reduction in prevalence	–1.3	–2.5	–5.0	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0
Number of smokers who quit	–0.3	–0.5	–1.1	–0.5	–1.1	–2.2	–1.1	–2.2	–4.4
Number of smokers remaining after price increase	21.6	21.3	20.8	21.3	20.8	19.7	20.8	19.7	17.5
Baseline deaths from smoking among adults	*10.9*								
Reduction in premature deaths among adults	**–0.1**	**–0.2**	**–0.4**	**–0.2**	**–0.4**	**–0.8**	**–0.4**	**–0.8**	**–1.5**
% reduction in deaths in adults	–1.0	–2.0	–4.0	–1.8	–3.5	–7.0	–3.5	–7.0	–14.0
Number of deaths after price increase	10.8	10.7	10.5	10.7	10.5	10.2	10.5	10.2	9.4
Youth future smokers	*9.9*								
Youth elasticity	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8
% reduction in youth prevalence	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Youth prevented from starting	–0.2	–0.5	–1.0	–0.5	–1.0	–2.0	–1.0	–2.0	–4.0
Number of youth smokers after price increase	9.7	9.4	8.9	9.4	8.9	7.9	8.9	7.9	5.9
Premature deaths from smoking among youth	*5.0*								
Reduction in smoking deaths among youth	**–0.1**	**–0.2**	**–0.5**	**–0.2**	**–0.5**	**–1.0**	**–0.5**	**–1.0**	**–2.0**
% reduction in smoking deaths among youth	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Total premature deaths avoided	**–0.2**	**–0.5**	**–0.9**	**–0.4**	**–0.9**	**–1.8**	**–0.9**	**–1.8**	**–3.5**
Baseline sales in sticks	*81,352*								
Baseline sales in packs	4,068								
Baseline revenues in local currency	36,779								
New sales after price increase	3,966	3,864	3,661	3,864	3,661	3,254	3,661	3,254	2,441
New revenues after price increase	57,672	56,194	53,236	77,447	73,371	65,219	113,640	101,014	75,760
Increase in revenues in local currency	20,893	19,414	16,457	40,668	36,591	28,439	76,861	64,234	38,981
Increase in revenues ($)	456	424	359	887	798	620	1,677	1,401	850
% increase in revenues above baseline	**157**	**153**	**145**	**211**	**199**	**177**	**309**	**275**	**206**

PPP = purchasing power parity.

Source: Author calculations.

Thailand

Model Parameters for Cigarette Smoking in Thailand at Baseline, by Gender	Males	Females	Both
Number of current smokers	11,816,000	770,000	12,586,000
Premature deaths from smoking	5,908,000	385,000	6,293,000
Youth future smokers	3,305,000	128,000	3,433,000
Premature deaths among future smokers	1,652,500	64,000	1,716,500
Total number of current and future smokers	15,121,000	898,000	16,019,000
Premature deaths in current and future smokers	7,560,500	449,000	8,009,500

Scenario for Increase in Price	Current	+25%	+50%	+100%
Tax (%)	69.00	75.00	79.00	85.00
Base (non-tax) price in local currency	17.98	17.98	17.98	17.98
Tax amount in local currency	40.02	54.52	69.02	98.02
Retail price in local currency	58.00	72.50	87.00	116.00
Tax increase needed for price goal (%)	–	136.00	172.00	245.00
Retail price ($)	1.80	2.25	2.70	3.60
Exchange rate (to $)	32.22			
Exchange rates (PPP $)	21.64			

Thailand (all absolute values are in millions)

	Price Increase (tax increase needed)								
	25% Higher Price (136% tax increase)			**50% Higher Price** (172% tax increase)			**100% Higher Price** (245% tax increase)		
Alternative price elasticity estimates	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**
Baseline number of smokers	*12.6*								
% reduction in prevalence	–1.3	–2.5	–5.0	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0
Number of smokers who quit	–0.2	–0.3	–0.6	–0.3	–0.6	–1.3	–0.6	–1.3	–2.5
Number of smokers remaining after price increase	12.4	12.3	12.0	12.3	12.0	11.3	12.0	11.3	10.1
Baseline deaths from smoking among adults	*6.3*								
Reduction in premature deaths among adults	**–0.1**	**–0.1**	**–0.3**	**–0.1**	**–0.2**	**–0.4**	**–0.2**	**–0.4**	**–0.9**
% reduction in deaths in adults	–1.0	–2.0	–4.0	–1.8	–3.5	–7.0	–3.5	–7.0	–14.0
Number of deaths after price increase	6.2	6.2	6.0	6.2	6.1	5.9	6.1	5.9	5.4
Youth future smokers	*3.4*								
Youth elasticity	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8
% reduction in youth prevalence	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Youth prevented from starting	–0.1	–0.2	–0.3	–0.2	–0.3	–0.7	–0.3	–0.7	–1.4
Number of youth smokers after price increase	3.3	3.3	3.1	3.3	3.1	2.7	3.1	2.7	2.1
Premature deaths from smoking among youth	*1.7*								
Reduction in smoking deaths among youth	**0.0**	**–0.1**	**–0.2**	**–0.1**	**–0.2**	**–0.3**	**–0.2**	**–0.3**	**–0.7**
% reduction in smoking deaths among youth	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Total premature deaths avoided	**–0.1**	**–0.2**	**–0.4**	**–0.2**	**–0.4**	**–0.8**	**–0.4**	**–0.8**	**–1.6**
Baseline sales in sticks	*38,657*								
Baseline sales in packs	1,933								
Baseline revenues in local currency	77,352								
New sales after price increase	1,885	1,836	1,740	1,836	1,740	1,546	1,740	1,546	1,160
New revenues after price increase	102,743	100,109	94,840	126,734	120,064	106,723	170,510	151,565	113,674
Increase in revenues in local currency	25,392	22,757	17,488	49,382	42,712	29,371	93,159	74,213	36,322
Increase in revenues ($)	788	706	543	1,533	1,326	912	2,891	2,303	1,127
% increase in revenues above baseline	**133**	**129**	**123**	**164**	**155**	**138**	**220**	**196**	**147**

PPP = purchasing power parity.

Source: Author calculations.

Viet Nam (all absolute values are in millions)

Model Parameters for Cigarette Smoking in Viet Nam at Baseline, by Gender	Males	Females	Both
Number of current smokers	12,902,000	410,000	13,312,000
Premature deaths from smoking	6,451,000	205,000	6,656,000
Youth future smokers	5,649,000	75,000	5,724,000
Premature deaths among future smokers	2,824,500	37,500	2,862,000
Total number of current and future smokers	18,551,000	485,000	19,036,000
Premature deaths in current and future smokers	9,275,500	242,500	9,518,000

Scenario for Increase in Price	Current	+25%	+50%	+100%
Tax (%)	42.00	54.00	61.00	71.00
Base (non-tax) price in local currency	8,120.00	8,120.00	8,120.00	8,120.00
Tax amount in local currency	5,880.00	9,380.00	12,880.00	19,880.00
Retail price in local currency	14,000.00	17,500.00	21,000.00	28,000.00
Tax increase needed for price goal (%)	–	160.00	219.00	338.00
Retail price ($)	0.75	0.94	1.13	1.50
Exchange rate (to $)	18,667.00			
Exchange rates (PPP $)	17,949.00			

Viet Nam (all absolute values are in millions, except where specified)

	Price Increase (tax increase needed)								
	25% Higher Price (160%% tax increase)			50% Higher Price (219% tax increase)			100% Higher Price (338% tax increase)		
Alternative price elasticity estimates	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**	**–0.1**	**–0.2**	**–0.4**
Baseline number of smokers	*13.3*								
% reduction in prevalence	–1.3	–2.5	–5.0	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0
Number of smokers who quit	–0.2	–0.3	–0.7	–0.3	–0.7	–1.3	–0.7	–1.3	–2.7
Number of smokers remaining after price increase	13.1	13.0	12.6	13.0	12.6	12.0	12.6	12.0	10.6
Baseline deaths from smoking among adults	*6.7*								
Reduction in premature deaths among adults	**–0.1**	**–0.1**	**–0.3**	**–0.1**	**–0.2**	**–0.5**	**–0.2**	**–0.5**	**–0.9**
% reduction in deaths in adults	–1.0	–2.0	–4.0	–1.8	–3.5	–7.0	–3.5	–7.0	–14.0
Number of deaths after price increase	6.6	6.5	6.4	6.5	6.4	6.2	6.4	6.2	5.7
Youth future smokers	*5.7*								
Youth elasticity	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8	–0.2	–0.4	–0.8
% reduction in youth prevalence	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Youth prevented from starting	–0.1	–0.3	–0.6	–0.3	–0.6	–1.1	–0.6	–1.1	–2.3
Number of youth smokers after price increase	5.6	5.4	5.2	5.4	5.2	4.6	5.2	4.6	3.4
Premature deaths from smoking among youth	*2.9*								
Reduction in smoking deaths among youth	**–0.1**	**–0.1**	**–0.3**	**–0.1**	**–0.3**	**–0.6**	**–0.3**	**–0.6**	**–1.1**
% reduction in smoking deaths among youth	–2.5	–5.0	–10.0	–5.0	–10.0	–20.0	–10.0	–20.0	–40.0
Total premature deaths avoided	**–0.1**	**–0.3**	**–0.6**	**–0.3**	**–0.5**	**–1.0**	**–0.5**	**–1.0**	**–2.1**
Baseline sales in sticks	*81,036*								
Baseline sales in packs	4,052								
Baseline revenues in local currency (billion)	23,825								
New sales after price increase	3,951	3,849	3,647	3,849	3,647	3,241	3,647	3,241	2,431
New revenues after price increase (billion)	37,056	36,106	34,205	49,578	46,968	41,750	72,495	64,440	48,330
Increase in revenues in local currency (billion)	13,231	12,281	10,381	25,753	23,144	17,925	48,670	40,615	24,505
Increase in revenues ($)	0.7	0.7	0.6	1.4	1.2	1.0	2.6	2.2	1.3
% increase in revenues above baseline	**156**	**152**	**144**	**208**	**197**	**175**	**304**	**270**	**203**

PPP = purchasing power parity.

Source: Author calculations.

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